Racial Differences in the Use of Most Commonly Performed Medical Procedures in the United States

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Syed S. Haque , *University of Medicine & Dentistry of New Jersey*
Mohammad A. Faysel , *University of Medicine & Dentistry of New Jersey*
Hafiz M. R. Khan , *Florida International University*

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Abstract

Objective: This study investigates racial disparities in the use of commonly performed medical procedures in U.S. hospitals. Methods: To examine racial disparities, we calculated age-adjusted rate of procedures used by all Whites, Blacks, Hispanics, Asians or Pacific Islanders and Native Americans and calculated corresponding Relative Risks(RRs) of White vs. all other races based on procedure utilizations and insurance types using 20% random sample of Nationwide Inpatient Sample (NIS) data between 2001 and2003. Results: Whites were significantly more likely to receive 3 of the study procedures than Blacks, 3 of the procedures than Hispanics, 2 of the procedures than Asians or Pacific Islanders and 4 of the procedures than Native Americans ($p<0.05$). We also found racial disparities to receive medical procedures based on patients' insurance status.However, only in a few cases were these differences substantial. Conclusion: Race plays a significantly important role in the use of commonly performed medical procedures in U.S. hospitals.

Keywords

Discrimination in medical care; Ethnic disparity; Health disparity; Minority health disparity; Racial disparity

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School of Community Health Sciences
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Syed S. Haque, University of Medicine & Dentistry of New Jersey
Mohammad A. Faysel, University of Medicine & Dentistry of New Jersey
Hafiz M. R. Khan, Florida International University

ABSTRACT

Objective: This study investigates racial disparities in the use of commonly performed medical procedures in U.S. hospitals. Methods: To examine racial disparities, we calculated age-adjusted rate of procedures used by all Whites, Blacks, Hispanics, Asians or Pacific Islanders and Native Americans and calculated corresponding Relative Risks (RRs) of White vs. all other races based on procedure utilizations and insurance types using 20% random sample of Nationwide Inpatient Sample (NIS) data between 2001 and 2003. Results: Whites were significantly more likely to receive 3 of the study procedures than Blacks, 3 of the procedures than Hispanics, 2 of the procedures than Asians or Pacific Islanders and 4 of the procedures than Native Americans ($p<0.05$). We also found racial disparities to receive medical procedures based on patients' insurance status. However, only in a few cases were these differences substantial. Conclusion: Race plays a significantly important role in the use of commonly performed medical procedures in U.S. hospitals.

Keywords: Racial disparity, ethnic disparity, health disparity, minority health disparity.

INTRODUCTION

Racial and ethnic disparities in healthcare have been well documented for decades by researchers from various health related fields (Escarce, Epstein, Colby, & Schwartz , 1993; Escarce & McGuire, 2004; McBean & Gornick, 1994). After examining hundreds of studies on health disparities, the Institute of Medicine reported consistent findings of racial disparities in the utilization of medical procedures regardless of patients' age, financial status, insurance status, and severity of medical conditions (Smedley, Stith, & Nelson, 2003). It was also reported that minorities experienced racial discrepancies in the utilization of routine medical procedures and lower quality of services (Smedley, Stith, & Nelson, 2003). Numerous other studies have also shown the existence of persistent racial and ethnic disparities in the utilization of healthcare facilities by examining data from various sources. Very little information is available about healthcare disparities for rapidly growing non-Black minorities in the United States. Government as well as other public and private sectors have taken national efforts to identify and eliminate the root causes of racial and ethnic disparities in the U.S. healthcare systems.

Healthy People 2010 project (Carter-Pokras & Baquet, 2002) is one such effort taken to eliminate racial and ethnic discrepancies in healthcare; however, very little information is known about the success of these efforts. This study examines the current status of racial disparities in healthcare systems across the country by utilizing nationwide healthcare data and by including all races.

Related Works

Racial disparities in healthcare utilization have been well documented from various healthcare data sources. Most of the studies have compared only Whites and Blacks (Escarce et al., 1993; Escarce & McGuire, 2004; McBean & Gornick, 1994) to examine health disparities and have included only one procedure (mostly cardiac procedure) (Bertoni, Bonds, Lovato, Goff, & Brancati, 2004; Bertoni, Goonan, Bonds, Whitt, Goff, & Brancati, 2005; Daumit, Hermann, Coresh, & Powe, 1999; Fiscella , Franks, Gold, & Clancy, 2000; Kressin & Petersen, 2001; Kurian & Cardarelli, 2007; Wheeler, Klemm, Hardie, Plowfield, Birney, Polek, & Lynch, 2004). Some studies have included a wide range of medical procedures to examine healthcare disparities between Blacks and Whites only (Escarce et al., 1993; Escarce & McGuire, 2004; McBean & Gornick, 1994); and most of these studies have focused on elderly population. Very few studies have included other races such as Hispanics, Asians or Pacific Islanders, and Native Americans along with Blacks and Whites (Daumit et al., 1999; Kressin & Petersen, 2001; Wheeler et al., 2004). In an update on health disparities literatures, Long, Chang, Ibrahim, and Asch (2004) found that Black patients were less likely than White patients to receive mammography, diabetic retinal examination, post acute myocardial infarction beta-blockers, and post hospitalization for mental illness in the settings where healthcare facilities were accessible equally to all races. Long et al. (2004) also documented that Blacks were less likely than Whites to receive interventional cardiac procedures under an equal access healthcare plan. In a study on hospitalized elder patients with chronic heart failure, Wheeler et al. (2004) found that Asian Americans or Pacific Islanders received more procedures than Whites, Blacks and Hispanics. Based on 1986 Medicare data, Escarce et al. (1993) found that Whites were more likely than Blacks to receive 23 of the selected 32 procedures and Whites were three times more likely to receive selected cardiac procedures. In another study, comparing 1986 and 1997 Medicare data, Escarce & McGuire (2004) found that the gap between Whites and Blacks narrowed since 1986 in the use of 18 of the 30 medical procedures compared. In a review of literature, Kressin & Petersen (2001) noted that Whites were more likely than Blacks, Hispanics and Asian Americans to receive cardiac catheterization. Although, many studies have found that Blacks were less likely to receive cardiac procedures than Whites, Blacks have the higher risk of being hypertensive than Whites among other cardiovascular risk factors (Kurian & Cardarelli, 2007). McBean & Gornick (1994) showed that Black Medicare recipients were consistently less likely than Whites to be hospitalized for a surgery. Blacks were also less likely to undergo cardiac catheterization than Whites between 1986 and 1992 (McBean & Gornick, 1994). After examining racial trends of nine surgical procedures used between 1992 and 2001, it was found that the gap between Whites and Blacks in relation to the rate of procedures used was significantly greater for five procedures, stayed unchanged for three procedures and significantly lowered for one procedure (Jha, Fisher, Li, Orav, & Epstein, 2005). In a study on 77 diagnosis categories, Harris, Andrews, and Elixhauser (1999) found that Blacks were significantly less likely to receive major therapeutic procedures for 48.1% of the diagnosis categories, more likely than Whites to receive a major therapeutic procedure for 9.1% of the diagnosis categories, and had no difference in 42.8% of the diseases. Harris et al. (1999) also found that Blacks were less likely to receive referral sensitive procedures. In a California based study, Braveman, Egerter, Edmonston, and Verdon (1995) found that White women were less likely to undergo cesarean section than other races.

All of these studies have identified persistent health disparities between Whites and Blacks. Only a few studies have included more than two racial categories in a single study and most of the studies have included only Medicare or Medicaid recipients (Escarce et al., 1993; Escarce & McGuire, 2004; McBean & Gornick, 1994). Almost one in every three Americans is a minority and non-Black minorities account for a significant portion of the U.S. population. However, very little information is available about health disparities for the non-Black minorities in the U.S. Patient's insurance status is vital in order to access medical care. Older studies showed that minorities experienced discrepancies to receive medical care regardless of insurance status (Smedley, Stith, & Nelson, 2003). Success of national efforts to eliminate racial disparities in healthcare would be impossible to verify without an inclusive examination of racial/ethnic categories along with patient's insurance status. Including all races and patients' insurance status in a single study will verify the utilization of the most frequently performed medical procedures, and will provide a broader picture of the current status of racial disparities to receive medical procedures in the U. S. hospitals.

Common Medical Procedures in the United States Hospitals

According to Healthcare Cost and Utilization Project (H-CUP) fact book seven (Merrill & Elixhauser, 2006), published by Agency for Healthcare Research and Quality (AHRQ), nine out of the top ten most commonly performed medical procedures in United States hospitals remained unchanged between 1997 and 2003. These frequently performed nine procedures were blood transfusion, medical induction, manually assisted delivery and other procedures to assist labor, diagnostic cardiac catheterization, coronary arteriography, repair of current obstetric laceration, upper gastrointestinal endoscopy, biopsy, circumcision, cesarean section, respiratory intubation and mechanical ventilation and fetal monitoring. We selected eight of these procedures in this study excluding circumcision because it was most exclusively applied to newborn male children. Some of these procedures were also among the top five commonly performed in U.S. community hospitals in 1996 (Elixhauser & Steiner, 1999).

Our goal is to investigate racial disparities in the utilization of commonly performed medical procedures in U.S. hospitals. We further examine racial disparities by comparing insurance status of patients who received one of the selected procedures. Patient's insurance status is critical to receive medical care (Braveman et al., 1995). Patients with similar insurance status should receive similar treatments for the same diagnosis regardless of race or ethnicity. Including insurance status in examining the utilization of common medical procedures could reveal the existence of any racial disparities. This study includes all ages, all races/ethnicities- White, Black, Hispanic, Asian or Pacific Islander and Native American; and all payers - Medicare, Medicaid, private insurance including HMO, self-payer and uninsured with no charge.

METHODS

Data Source

For this analysis, we used Nationwide Inpatient Sample (NIS) data collected and maintained by AHRQ between the years of 2001 and 2003. NIS contains all-payer hospital inpatient stays data provided by about 1,000 participating hospitals from 33, 35 and 37 states for the years of 2001, 2002 and 2003, respectively. For this analysis, we used 20% random sub samples of hospital discharges for each year selected and merged them together to create our final dataset of 3,291,597 records. Records with missing and unspecified race information as well as unspecified payer (insurance status) were excluded. We utilized patient's demographic information such as age and race; clinical information including principle diagnosis and principle procedures; and insurance status from NIS dataset for statistical analysis.

Selection of Procedures

H-CUP fact book seven ranked commonly performed medical procedures in U.S. hospitals based on Clinical Classifications Software (CCS) generated categories or CCS codes (Merrill & Elixhauser, 2006). We extracted data on the selected eight principle procedures based on corresponding CCS codes. NIS database includes principle procedure on a patient discharge record using both ICD-9-CM and CCS codes. The difference between the two is that the CCS classifies ICD-9-CM procedure codes into categories, which are clinically more meaningful (Russo, Merrill, & Friedman, 2007).

Characteristics of Study Population

The study population consisted of 69.3% Whites, 14.2% Blacks, 13.5% Hispanics, 2.7% Asians or Pacific Islanders and 0.3% Native Americans (Table 1). Among all races, Whites constituted about 80% of the elderly population (65 years or older). They also composed the most of the older population of 80 years or older (85.2%) than any other races (Blacks, 7.5%; Hispanics, 5.3%; Asians or Pacific Islanders, 1.8%; and Native Americans, 0.1%).

Table 1. Study Population by Race and Age Group, 2001-2003

	Race					
Age Group	White	Black	Hispanic	Asian or Pacific Islander	Native American	Total
<1	217,959	57,047	104,783	20,026	1,894	401,709
	54.3%	14.2%	26.1%	5.0%	0.5%	100.0%
1-17	83,482	30,997	36,683	3,847	683	155,692
	53.6%	19.9%	23.6%	2.5%	0.4%	100.0%
18-44	515,424	155,867	158,966	27,926	3,697	861,880
	59.8%	18.1%	18.4%	.2%	0.4%	100.0%
45-64	499,986	115,951	65,491	12,868	2,376	696,672
	71.8%	16.6%	9.4%	1.8%	0.3%	100.0%
65-79	561,487	72,349	53,055	14,241	1,569	702,701
	79.9%	10.3%	7.6%	2.0%	0.2%	100.0%
80+	402,815	35,342	25,041	8,731	663	472,592
	85.2%	7.5%	5.3%	1.8%	0.1%	100.0%
Total	2,281,153	467,553	444,019	87,639	10,882	3,291,246
	69.3%	14.2%	13.5%	2.7%	0.3%	100.0%

Data Analysis

For each of the selected eight principle procedures, we extracted related diagnoses from NIS database for the selected years using HCUPnet, an online query system publicly available via the H-CUP website. Based on the related diagnoses for each procedure, we determined the sample size for each of the selected procedures for further statistical analyses.

Age-adjusted rates for selected eight procedures used by all five races (White, Black, Hispanic, Asian or Pacific Islander, Native American) were calculated. All rates were calculated based on per 1,000 population. Age-adjustment was performed based on the year 2000 U.S. standard population by race using direct method (Armstrong, 1969). In order to compare the procedures used among

races, we calculated age-adjusted Relative Risks (RR) for White-Black, White-Hispanic, White-Asian or Pacific Islander and White-Native American. This was done to compare utilization of each of the eight procedures and comparison between all races to their White counterparts. Using the same techniques, we calculated unadjusted RR for each of the procedures utilized by races, based on types of payers to examine disparities. Data analysis was performed using SPSS for Windows version 15 (Chang, 2008). The RRs were calculated and their 95% confidence intervals (CI) were evaluated to determine the statistical significance. Corresponding p-values were also reported. When an expected cell value was less than five, we performed the Fisher's Exact test to calculate RR and its 95% CI (D'Agostino, Sullivan & Beiser, 2006). The unit of our data analysis is single hospital discharge record.

RESULTS

Table 2 shows the detail results of overall procedures used among races.

White vs. Black

Whites were more likely than Blacks to receive three of the selected eight most commonly performed procedures (White-Black RR>1; p< 0.001). For example, Whites were 35% more likely to receive diagnostic cardiac catheterization, coronary arteriography (p<0.001), 10% more likely to receive cesarean section (p<0.001), and 30% more likely to receive repair of current obstetric laceration (p<0.001) than Blacks. On the other hand, Whites were 1.6 times less likely to receive blood transfusion (p<0.001), 15% less likely to receive medical induction, manually assisted delivery, and other procedures to assist delivery (p<0.001), and 20% less likely to receive fetal monitoring (p< 0.001) than Blacks.

White vs. Hispanic

Whites were more likely to receive three of the procedures (p<0.001) than Hispanics. Whites were 44% more likely to receive diagnostic cardiac catheterization, coronary arteriography (p<0.001), 18% more likely to receive cesarean section (p<0.001), and 20% more likely to receive fetal monitoring than Hispanics. On the other hand, Hispanics were more likely than Whites to receive three of the procedures (p<0.05). Hispanics were about 16% more likely to receive medical induction, manually assisted delivery, and other procedures to assist delivery (p<0.001), and 38% more likely to receive blood transfusion than their White counterparts.

White vs. Asian or Pacific Islander

It was found that Whites were more likely than Asians or Pacific Islanders to have two of the eight selected procedures (p<0.001). For example, Whites were about 31% more likely to receive diagnostic cardiac catheterization, coronary arteriography (p<0.001), and 10% more likely to receive cesarean section (p<0.001). For the other six procedures, Asians or Pacific Islanders were 19% more likely to receive respiratory intubation and mechanical ventilation (p<0.001), and 48% more likely to receive blood transfusion (p<0.001) than Whites. They had slightly higher likelihood of receiving upper gastro intestinal endoscopy, biopsy, medical induction, manually assisted delivery, and other procedures to assist delivery, and repair of current obstetric laceration procedures compared to Whites (p<0.001).

Whites vs. Native American

Whites were 2 times more likely to receive cesarean section (p<0.001), and fetal monitoring (p<0.05), about 25% more likely to receive repair of current obstetric laceration (p<0.001), and about 17% more likely to receive respiratory intubation and mechanical ventilation (p<0.05) than Native Americans. Native Americans were about 22% more likely than Whites to receive blood transfusion procedure (p<0.05).

Table 2. Age-Adjusted Rates of Procedure Use by Race, and Relative Risks of White vs. All Other Races

	Age-Adjusted Rates per 1000					Relative Risk (RR)			
Procedure	White	Black	Hispanic	Asian or Pacific Islander	Native American	White-Black RR (95% CI), P-value	White-Hispanic RR (95% CI), P-value	White-Asian or Pacific Islander RR (95% CI), P-value	White-Native American RR (95% CI), P-value
Diagnostic cardiac catheterization, coronary arteriography	53.1	39.2	36.7	40.4	50.6	1.352 (1.316-1.389), p=0.00	1.444 (1.396-1.495), p=0.000	1.315 (1.229-1.408), p=0.000	1.045 (0.892-1.225) p=0.586
Upper gastrointestinal endoscopy, biopsy	64.2	65.1	61.7	71	62.6	.987 (.964-1.009), p=.245	1.042 (1.014-1.070), p=.003	0.905 (0.858-0.955), p=0.000	1.028 (0.887-1.192), p=.710
· Cesarean section	292	263.9	246.7	265.1	158.6	1.106 (1.089-1.123), p=0.000	1.182 (1.167-1.198), p=0.000	1.100 (1.074-1.128), p= 0.000	1.842 (1.659-2.046), p=0.000
· Medical induction, manually assisted delivery, and other procedures to assist delivery	250	294.2	296.9	271.7	243.6	0.850 (0.837-0.862), p=0.000	0.842 (0.832-0.852), p=0.000	0.920 (0.898-0.943), p= 0.000	1.026 (0.947-1.112), p=.522
· Fetal monitoring	17	20.8	13.9	18	8.1	0.800 (0.749-0.854), p=0.000	1.204 (1.131-1.281), p=0.000	0.927 (.830-1.036), p=.180	2.050 (1.237-3.397), p=.004
· Repair of current obstetric laceration	136	103.6	144.9	154.4	106.8	1.308 (1.273-1.343), p=0.000	0.935 (0.918-0.953), p=0.000	0.877 (0.847-0.909), p=0.000	1.269 (1.112-1.447), p=0.000
Respiratory intubation and mechanical ventilation	57.2	53.5	58.7	70.2	48.7	1.069 (1.046-1.093), p=0.000	0.973 (0 .953-0.994), p=.013	0.814 (0.783-0.847), p=0.000	1.171 (1.018-1.349), p=.027
Blood transfusion	35.5	80.2	57.2	67.5	45.5	0.443 (0 .433-0.453), p=0.000	0.620 (0.602-0.640) p=0.000	0.526 (0.497-0.556), p=0.00	0.783 (0.650-0.944), p=.010

Note:
CI – Confidence Interval
· — Indicates that rates of procedures use and Relative Risks were calculated using only adult female population.

Disparity by Insurance Status

Table 3 contains the comparison of procedures used among all races with their White counterparts based on insurance types for payment.

Medicaid

Among the Medicaid recipients, Whites were more likely to receive two of the study procedures than Blacks, three of the study procedures than Hispanics, two of the study procedures than Asians or Pacific Islanders, and two of the study procedures than Native Americans. For example, among Medicaid recipients, Whites were 36% more likely to receive diagnostic cardiac catheterization, coronary arteriography ($p<0.001$) and 31% more likely to receive repair of current obstetric laceration ($p<0.001$) compared to Blacks. Compared to Hispanic Medicaid recipients, White patients were between 1.5 and 2 times more likely to receive diagnostic cardiac catheterization, coronary arteriography ($p<0.001$), and respiratory intubation and mechanical ventilation ($p<0.001$). Whites were also more likely to receive fetal monitoring compared to their Native American counterparts. However, this difference was not statistically significant.

On the other hand, among Medicaid recipients, Blacks were 1.5 times, Hispanics and Asians or Pacific Islanders were 1.3 times as likely as Whites to receive blood transfusion ($p< 0.05$). Asians or Pacific Islanders were also about 1.3 times more likely than Whites to receive repair of current obstetric laceration ($p<0.05$).

Table 3. Relative Risks (RR) of White vs. All Other Races Based on Payer (Insurance Types)

		Relative Risk (RR)			
Procedure	**Insurance Type**	White-Black RR (95% CI), P-value	White-Hispanic RR (95% CI), P-value	White-Asian or Pacific Islander RR (95% CI), P-value	White-Native American RR (95% CI), P-value
Diagnostic cardiac catheterization, coronary arteriography	Medicare	1.07 (1.03-1.10), p=0.00	0.99 (0.95-1.03), p=0.70	1.16 (1.06-1.27), p=0.001	0.88 (0.71-1.09), p= 0.24
	Medicaid	1.36 (1.27-1.47), p=0.00	1.50 (1.38-1.62), p=0.00	0.99 (0.86-1.16), p=0.94	1.07 (0.71-1.62), p=0.74
	Private including HMO	1.10 (1.06-1.14), p=0.00	1.23 (1.17-1.30), p=0.00	1.43 (1.28-1.59), p=0.00	0.854 (0.69-1.06), p=0.15
	Self-pay	1.33 (1.21-1.47), p=0.00	1.24 (1.11-1.38), p=0.00	1.20 (.91-1.58), p=0.20	1.25 (0.69-2.29), p=0.46
	No charge	1.21 (0.91-1.60), p=0.18	0.92 (0.69-1.2), p=0.60	1.49 (0.38-5.80), *p=0.76	0.71 (0.19-2.65), *p=0.65
Upper gastrointestinal endoscopy, biopsy	Medicare	0.93 (0.91-0.97), p=0.00	0.88(0.85-0.91), p=0.00	0.76 (0.71-0.81), p=0.00	1.19 (0.95-1.50), p=0.13
	Medicaid	0.96 (0.90-1.02), p=0.15	1.16 (1.09-1.24),P=0.00	0.96 (0.69-1.33), p=0.80	0.96 (0.69-1.33), p=0.80
	Private including HMO	0.87(0.83-0.90), p=0.00	1.01 (0.96-1.07), p=0.72	0.88 (0.80-0.97), p=0.01	0.94 (0.72-1.22), p=0.62
	Self-pay	1.07 (0.98-1.18), p=0.15	1.054 (0.96-1.16), p=0.28	0.93 (0.72-1.19), p=0.55	0.83 (0.50-1.38), p=0.48
	No charge	1.05 (0.81-1.34),P=0.73	1.02 (0.78-1.33), p=0.90	0.36 (0.20-0.62), *p=.003	0.39 (0.11-1.34), p=0.18
Cesarean section	Medicare	1.01(0.82-1.24),p= 0.95	0.84 (0.66-1.07),p=0.17	1.46 (0.52-4.09), *p=0.58	1.03 (0.19-5.63), *p=1.000
	Medicaid	0.98 (0.96-1.01),p= 0.15	0.85 (0.83-0.87),p=0.00	1.02 (0.96-1.08),p=0.53	0.90 (0.78-1.03),p=0.12
	Private including HMO	0.93 (0.91-0.95),p= 0.00	0.99 (0.97-1.01),p=0.19	1.01 (0.98-1.05),p=0.34	1.02 (0.91-1.13),p=0.77
	Self-pay	1.04 (0.92-1.17),p= 0.51	0.95 (0.87-1.03),p=0.21	0.79 (0.69-0.92),p=0.00	0.93 (0.57-1.52),p=0.77
	No charge	1.22 (0.91-1.65),p= 0.18	1.05 (0.81-1.36),p=0.70	1.01 (0.46-2.23),p=0.98	0.76 (0.15-3.82),*p=1.00
Medical induction, manually assisted delivery, and other procedures to assist delivery	Medicare	1.05 (0.86-1.28),p=0.65	1.09 (0.84-1.42),p=0.51	1.54 (0.55-4.33), *p=0.58	1.09 (0.20- 5.96), *p=1.00
	Medicaid	0.84 (0.83-0.86),p=0.00	1.03 (1.01-1.05),p=0.00	1.10 (1.05-1.15),p=0.00	0.89 (0.81-0.98),p=0.03
	Private including HMO	0.86 (0.85- 0.88),p=0.00	0.89 (0.87-0.90),p=0.00	0.95 (0.93-0.98),p=0.00	1.22 (1.08-1.37),p=0.00
	Self-pay	0.96 (0.89-1.03),p=0.24	0.94 (0.89-1.00),p=0.03	1.06 (0.94-1.19),p=0.33	1.41 (0.91-2.17),p=0.10
	No charge	0.77 (0.61-0.99),p=0.03	0.90 (0.71- 1.13), p=0.36	0.99 (0.49-2.00),p=0.97	--
Fetal monitoring	Medicare	0.93 (0.33-2.66),*p=1.00	1.20 (0.27-5.36),*p=1.000	0.07 (0.02-0.23),*p=.002	--
	Medicaid	0.83 (0.75-0.92),p=0.00	1.03 (0.94-1.14),p=0.53	1.24 (0.96-1.61),p=0.10	2.06 (0.86-4.95),p=0.10
	Private including HMO	0.69 (0.61-0.77),p=0.00	1.06 (0.94-1.19),p=0.37	1.24 (1.03-1.50),p=0.02	1.56 (0.74-3.26),p=0.24
	Self-pay	1.09 (0.69-1.71),p=0.71	1.61 (1.14-2.27),p=0.01	1.05 (0.56-1.99),p=0.87	1.04 (0.15-7.35),*p=1.00
	No charge	0.24 (0.03-1.94),*p=0.27	0.62 (0.07-5.24),p=1.00	--	--
Repair of current obstetric laceration	Medicare	1.31 (0.89-1.94), p=0.16	1.01 (0.64-1.57),p=0.98	0.61 (0.21-1.73),*p=0.417	--
	Medicaid	1.31 (1.25-1.36),p=0.00	0.86 (0.83-0.89),p=0.00	0.69 (0.65-0.74),p=0.00	1.06 (0.87-1.30),p=0.57
	Private including HMO	1.56 (1.49-1.62),p=0.00	1.10 (1.07-1.13),p=0.00	1.14 (1.09-1.19),p=0.00	0.95 (0.83-1.09),p=0.48
	Self-pay	1.42 (1.22-1.66),p=0.00	0.83 (0.76-0.91),p=0.00	0.84 (0.71-0.99), p=0.04	0.84 (0.50-1.41),p=0.51
	No charge	1.45 (0.88-2.40),p=0.15	0.74 (0.49-1.11),p=0.14	0.74 (0.25-2.24),*p=0.711	0.33 (0.06-1.73),*p=0.307
Respiratory intubation and mechanical ventilation	Medicare	0.82 (0.80-0.85),p=0.00	0.93 (0.89-0.98),p=0.01	0.76 (0.71-0.83),p=0.00	1.11 (0.84-1.47),p=0.47
	Medicaid	0.99 (0.94-1.03),p=0.59	1.61 (1.53-1.69),p=0.00	1.15 (1.03-1.28),p=0.01	1.33 (0.97-1.81),p=0.07
	Private including HMO	0.89 (0.84-0.93),p=0.00	1.16 (1.16-1.23),p=0.00	1.12 (1.03-1.22),p=0.01	1.62 (1.13-2.30),p=0.01
	Self-pay	1.15 (1.04-1.26),p=0.01	1.44 (1.30-1.59),p=0.00	1.21 (0.96-1.51),p=0.10	0.79 (0.50-1.25),p=0.32
	No charge	2.12 (1.46-3.08),p=0.00	2.12 (1.46-3.08),p=0.00	1.27 (0.33-4.97),*p=1.00	0.50 (0.14-1.85),*p=0.27
Blood transfusion	Medicare	0.88 (0.85-0.91),p=0.00	0.93 (0.89-0.97),p=0.00	0.91 (0.84-0.99),p=0.03	1.01 (0.79-1.31),p=0.92
	Medicaid	0.49 (0.45-0.52),p=0.00	0.72 (0.67-0.78),p=0.00	0.65 (0.56-0.76),p=0.00	0.78 (0.51-1.20),p=0.26
	Private including HMO	0.59 (0.56-0.62),p=0.00	0.71 (0.66--0.77),p=0.00	0.63 (0.56-0.71),p=0.00	1.09 (0.69-1.72),p=0.71
	Self-pay	0.56(0.49-0.64),p=0.00	0.67 (0.58-0.77),p=0.00	0.56 (0.41-0.76),p=0.00	0.51 (0.26-1.00),p=0.07
	No charge	0.87 (0.62-1.22),p=0.41	0.80 (0.56-1.15),p=0.23	1.95 (0.28-13.62),p=0.72	--

Note:

- * Fisher's Exact test was performed because minimum expected count of a cell of 2X2 table was less than 5
- -- No Relative Risk could be calculated because frequency of one race was 0.

Medicare

Among Medicare recipients, Whites were 16% more likely to receive diagnostic cardiac catheterization, coronary arteriography (p<0.001). On the other hand, Asians or Pacific Islanders were 24% more likely to receive upper gastrointestinal endoscopy, biopsy (p<0.001). Whites were 18% and 24% less likely than Blacks and Asians or Pacific Islanders, respectively, to receive respiratory intubation and mechanical ventilation (p<0.001). White Medicare recipients also had less likelihood of receiving blood transfusion compared to Blacks, Hispanics and Asians or Pacific Islanders (p<0.05).

Private Insurance

Among private insurance holders including HMO, Whites were 1.4 times more likely than Asians or Pacific Islanders to receive diagnostics cardiac catheterization, coronary arteriography (p<0.05), 1.5 times more likely than Blacks to receive repair of current obstetric laceration (p<0.05), 1.6 times more likely than Native Americans to receive respiratory intubation and mechanical ventilation (p<0.05). On the other hand, among the private insurance holders, Blacks, Hispanics and Asians or

Pacific Islanders were between 1.3 and 1.4 times more likely than Whites to receive blood transfusion ($p<0.05$). Blacks were also 1.3 times as likely as Whites to receive fetal monitoring ($p<0.05$).

Uninsured Self-payer

Among the uninsured patients who paid out of pocket for services (self payer), Whites were 1.3 and 1.4 times more likely than Blacks to receive diagnostic cardiac catheterization, coronary arteriography and repair of current obstetric laceration, respectively ($p< 0.001$ for both cases). They were also 1.6 and 1.4 times more likely than Hispanics to receive fetal monitoring and respiratory intubation and mechanical ventilation, respectively ($p<0.05$ for both cases). On the other hand, among self paid patients, Blacks, Hispanics, Asians or Pacific Islanders were between 1.3 and 1.5 times more likely than Whites to receive blood transfusion ($p<0.001$).

Uninsured with No-charge

Among uninsured patients with no-charge, Whites were more than twice as likely as Blacks and Hispanics to receive respiratory intubation and mechanical ventilation procedure ($p<0.001$). On the other hand, among uninsured patients with no charge, Asians or Pacific Islanders were 40% more likely than Whites to receive upper gastrointestinal endoscopy, biopsy than Whites ($p<0.05$).

DISCUSSION

We found racial disparities existed nationwide in the utilization of cardiac catheterization, coronary arteriography. For example, White patients were more likely than any other races to receive this procedure. These differences were significant when we compared Whites to Blacks, Hispanics and Asians or Pacific Islanders. Black and Hispanic Medicaid recipients along with Asian or Pacific Islander private insurance holders were significantly less likely to receive this procedure compared to Whites. Daumit et al. (1999) found a three-fold difference between Whites and Blacks to receive cardio vascular procedures in a seven-year nationwide study; our study showed that this gap has been significantly narrowed. In a study on acute myocardial infarction patients, Bertoni et al. (2005) found smaller disparities in Whites compared to Hispanics than Whites compared to Blacks for cardiac catheterization. We found greater disparity in White-Black comparison than White-Hispanic comparison in relation to the utilization of diagnostic cardiac catheterization, coronary arteriography. We did not find any significant difference between Whites and Native Americans to receive this procedure.

Overall, there was no significant difference among races in utilization of upper gastrointestinal endoscopy, biopsy, but when we compared the insurance status of the patients who had this procedure, we found that there were discrepancies between White and Asian or Pacific Islander Medicare recipients and uninsured patients. Asians or Pacific Islanders were more likely than Whites to receive this procedure. We could not compare these findings since studies on such procedure comparing Whites, Asians or Pacific Islanders and Native Americans are rarely found in published journals. However, a study by Escarce and McGuire (2004) on Medicare patients showed that gap between Whites and Blacks elevated from 7% in 1986 to 20% in 1997 to receive upper gastrointestinal endoscopy procedure, where Blacks were more likely than Whites to receive this procedure. Our study found only a 7% discrepancy in using similar procedure, which was narrowed since 1997.

Our study also found disparities in the use of fetal monitoring. Whites were twice as likely as Native Americans to receive this procedure. Whites were also more likely than Hispanics but less likely than Blacks to receive this procedure. There could be ethical, religious, and socioeconomic factors involved in the causation of such disparity.

For cesarean section, Whites were more likely than any other race to have this procedure. Some previous studies also showed Whites having this procedure at a higher rate based on population in California (Stafford, Sullivan & Gardner, 1993; Williams & Hawes, 1979) and in the United States (Gould, Davey & Stafford, 1989; Placek &Taffel, 1988). Braveman et al. (1995) found that Blacks were more likely to undergo cesarean section than Whites in another California based study. Some other studies found non-White women had a higher rate of receiving this procedure (Newton & Higgins, 1989). We found that White women had a higher likelihood of receiving this procedure. This could be due to using a sample size population based on specific geographic location, consideration of socioeconomic factors, education, quality of communication with healthcare providers, etc. Our study did not focus on these issues. However, the disparity to receive cesarean section between Whites and Native Americans was substantial. Native Americans were about 2 times less likely than Whites to receive this procedure. Some previous studies found that insurance plays an important role in the rate of the utilization of cesarean section (Braveman et al., 1995). We did not find any significant difference between Whites and other races for cesarean section due to insurance status. The only exception was that Asians or Pacific Islanders self-payer were more likely than Whites to have this procedure done. We believe this could be due to lack of access to insurance or community based support. Further studies need to address these issues.

We found significant disparities in the use of blood transfusion regardless of patients' insurance statuses. This procedure is widely used to treat sickle cell patients. Whites were significantly less likely to receive this procedure compared to other races. Blacks used this procedure at a higher rate than others. Although sickle cell anemia is mostly diagnosed in Blacks, Hispanics are also currently diagnosed with this disease (Kaiser Health Disparity Report, 2007). Our findings were consistent with this. However, our study also showed that Asians or Pacific Islanders were significantly more likely than Whites to receive this procedure.

Despite nationwide efforts to eliminate health disparity, the root causes of racial disparities in healthcare are still unknown. We examined the existence of health disparities across races using nationwide data but identifying the underlying factors would be beyond the scope of our study. However, previous studies documented over utilization of cardiac procedures among Whites regardless of severity of illness (Daumit et al., 1999). Braveman et al. (1995) found that patients' insurance status played an important role in the rate of using medical procedures. Fiscella, Franks, Doescher, and Saver (2002) found language barriers to be influential to receive medical care for Spanish-speaking minorities. Barrier to access to medical care could be due to financial status of patients. Escarce et al. (1993) found Whites to be more likely to purchase additional private insurance to supplement their Medicare coverage compared to Blacks. Whether these findings are isolated examples or persistent across the nation is unknown.

We believe that in order to identify the root causes of racial disparities to receive medical procedures, issues such as patients' education and financial status, language barrier, socio-cultural factors involving physician decision making, physicians' attitude towards races, co-morbid diseases, after procedure complications, mistrust to healthcare systems, and patient-physician interaction need to be carefully examined.

CONCLUSION

The strengths of our study are that we utilized nationwide data sample and we included all races and all payers in our study to examine racial disparities to receive commonly performed medical procedures in U.S. hospitals. Despite national initiatives to deter health disparities, we found racial disparities still existed in the utilization of commonly performed medical procedures. We found that Whites were significantly more likely to receive three of the study procedures than Blacks,

three of the study procedures than Hispanics, two of the study procedures than Asians or Pacific Islanders, and four of the procedures than Native Americans. However, the differences were narrowed compared to previous studies. We found discrepancies among Whites and other races to receive procedures based on patient's insurance status. However, these differences were substantial in only a few cases. We could not identify the major causes of racial differences to receive medical procedures since H-CUP data did not include detail descriptions for each patient and procedure. Most of the data sets available lack information on patients' socioeconomic factors. Further research needs to thoroughly investigate these issues.

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Syed S. Haque
University of Medicine & Dentistry of New Jersey

Mohammad A. Faysel
University of Medicine & Dentistry of New Jersey

Hafiz M. R. Khan
Florida International University