Racial Disparities in Patient Safety Indicator (PSI) Rates in the Veterans Health Administration

Stephanie L. Shimada, PhD; Maria E. Montez-Rath, PhD; Susan A. Loveland, MAT; Shibei Zhao, MPH; Nancy R. Kressin, PhD; Amy K. Rosen, PhD

Abstract

Objective: The Patient Safety Indicators (PSIs) developed by the Agency for Healthcare Research and Quality identify potential patient safety events through administrative records. We sought to determine whether there were racial disparities in patient safety event rates in Veterans Health Administration (VHA) hospitals. **Methods:** We explored 5 years of VHA inpatient data for significant differences between racial/ethnic groups in their odds of experiencing PSIs. **Results:** No racial group had consistently higher or lower odds of experiencing PSIs. For example, African Americans had significantly higher odds of decubitus ulcer (OR = 1.35, $P < 0.0001$) and postoperative pulmonary embolism (PE)/deep vein thrombosis (DVT) (OR = 1.23, $P < 0.0001$) but significantly lower odds of accidental puncture or laceration (OR = 0.69, $P = 0.0003$) compared with whites. **Conclusion**: Although significant differences between racial/ethnic groups in the odds of experiencing PSIs were few, the underlying causes of the disparities that were found must be explored to understand how they can be eliminated and to improve patient safety for all patients.

Introduction

Racial disparities in the delivery of health care services are a significant problem. The Institute of Medicine's 2003 Report, *Unequal Treatment: Confronting Racial and Ethnic Disparities in Healthcare*,[1] synthesized the research to date on racial disparities in health and health care and documented large gaps in our understanding of disparities that need to be addressed. Among their recommendations was additional research to identify sources of disparities and to monitor progress toward eliminating those disparities. Although numerous studies have focused on unequal access to services or recommended treatments, little is known about disparities in the delivery of safe inpatient care.[2]

Patient Safety Indicators (PSIs) were developed by the Agency for Healthcare Research and Quality (AHRQ) and revised by the University of California-Stanford University Evidence-based Practice Center (UCSF-Stanford EPC). PSIs can be used to screen for potential patient safety events in hospital discharge data and are potentially useful for identifying and tracking disparities over time. PSIs have been used within the Veterans Health Administration (VHA) and in the private sector to identify potential patient safety events for the overall patient population[3, 4, 5] and have been described in detail in numerous articles.[2, 6, 7] PSIs have been found to be reliable measures, with good construct validity and stability over time.[3, 4, 5, 8]

Previous research using PSIs has demonstrated that the odds of experiencing an adverse event (AE) vary by patient race in the non-VHA population.[2, 6, 9, 10] In this article, we explore whether

this is equally true in the VHA, a setting in which previous research has suggested that there are fewer disparities in access to care, utilization, and outcomes,[11, 12, 13] with some studies showing better outcomes in the VHA for African American than for white veterans.[14, 15, 16, 17]

This study has important implications for delivery of inpatient care within the VHA. As the largest integrated health care system, the VHA is responsible for providing care to approximately 4 million veterans. If disparities in delivery of safe care exist, then further work will be required to understand why those disparities exist and how systems-level interventions can address them.

Methods

Data

Data were obtained from two VHA administrative databases: the VHA Medical SAS Inpatient Data Files [also known as the Patient Treatment Files (PTF)], and the VHA Medical SAS Outpatient Data Files (also known as the Outpatient Care Files). VHA hospital discharge data (PTF) from FY2001-FY2005 were modified in preparation for running the PSI software, as described previously.[8] Data from the Outpatient Care Files were used solely to obtain race information for patients when that information was missing from or inconsistent in the PTF.

Sample

Our overall analytic sample consisted of veterans receiving inpatient acute care at one of 128 VHA acute care hospitals between FY2001 and FY2005 (N = 2,281,286 hospitalizations, N = 1,032,103 unique individuals). Due to detailed inclusion and exclusion criteria,[18] only a subsample of all discharges was considered at risk for a given PSI. Patients were excluded if no race could be determined for them, which resulted in 3.4 to 4.8 percent of the patients at risk for each PSI—or 3.6 percent of the overall sample—being excluded from our logistic regression analyses. A more detailed description of how race was determined is described below.

Variables

The main outcome of interest was the PSI, a binary variable indicating whether the AHRQ software had determined that a patient at risk for a given potentially preventable patient safety event had experienced a corresponding patient safety event. Independent variables included age (continuous), sex (binary), race (categorical), and binary indicators for 27 comorbidities. A categorical variable identifying the VHA hospital or hospital group where treatment was received was used to control for clustering at the hospital level. The AHRQ Comorbidity Software[19] also used Diagnosis Related Groups (DRGs) and International Classification of Diseases, 9th Edition, Clinical Modifications (ICD-9-CM) codes to generate the indicators for the comorbidities and risk-adjusted rates for each PSI.

Dependent variables: The PSIs. This research used version 3.0 of the AHRQ SAS PSI Software[20] and Version 3.1 of the AHRQ Comorbidity Software.[19] The provider-level PSIs included seven PSIs that were applicable only to surgical patients: postoperative hip fracture (PSI 8), postoperative hemorrhage or hematoma (PSI 9), postoperative physiologic and

metabolic derangements (PSI 10), postoperative respiratory failure (PSI 11), postoperative pulmonary embolism or deep vein thrombosis (PE/DVT) (PSI 12), postoperative sepsis (PSI 13), and postoperative wound dehiscence (PSI 14).

Nine PSIs applied to medical/surgical inpatients: complications of anesthesia (PSI 1), death in low-mortality DRGs (PSI 2), decubitus ulcer (PSI 3), failure to rescue (PSI 4), foreign body left during procedure (PSI 5), iatrogenic pneumothorax (PSI 6), selected infections due to medical care (PSI 7), accidental puncture or laceration (PSI 15), and transfusion reaction (PSI 16).

Four PSIs applied only to obstetric patients, which we excluded in this study due to extremely low numbers of veterans at risk. We also excluded transfusion reaction (PSI 16) due to extremely low incidence. PSIs 1 to 15 were included in these analyses.

Independent variable: Race. To minimize missing race data and to obtain the most accurate data possible, we combined multiple years of inpatient and outpatient race data to obtain one race value for each individual. Self-reported race is by definition the "gold standard" in race identification and is preferable to observed race.[21, 22] Self-reported race has been available in VHA datasets since 2003, due to VHA Directive 2003-027, which mandated that self-reported race and self-reported ethnicity be gathered separately in VHA.[23] However, outpatient race data[24] and self-report data are often missing in VHA datasets. In addition, we knew that there was a strong concordance between observed and self-rated data in these same datasets.[25]

Therefore, in order to construct one race variable for all patients, the available race information was prioritized in the following manner: (1) self-reported race from inpatient record, (2) observed race from inpatient record, (3) self-reported race from outpatient visits, and then, (4) observed race from outpatient visits. If self-reported race data were available in the inpatient data and were consistent over multiple records (for patients with more than one hospitalization), then those data (six race variables and one for ethnicity) were used to determine final race. If self-reported race values were inconsistent, the race recorded in the majority of cases was used. If no majority could be determined, then race data from the next category were obtained, continuing to move down the categories until no further reliable race information was available.

The self-reported race collected since 2003 is based on six race variables and one ethnicity variable, thereby allowing for various multiracial combinations of race and ethnicity. However, prior to 2003, the observed race data consisted of one variable with seven mutually exclusive categories: Hispanic white, Hispanic black, American Indian, Asian, black, white, and unknown. Therefore, as a final step in constructing one race variable, it was necessary for us to reconstruct the new race data into a single-category race variable that took on the following mutually exclusive values: white, African American, Latino, Asian American/Pacific Islander (whom we refer to henceforth as Asian American), and American Indian/Alaska Native (whom we refer to as American Indian).

We assigned multiracial veterans to a single race category using a standard bridging technique that assigns multiracial individuals to the largest (i.e., most prevalent) minority group of which they are members. This technique has been found to make almost no difference to the sizes of the white and African American groups and little difference to the size of other minority groups,[25] thereby allowing us to exclude multiracial individuals from the white reference group. Veterans whose self-reported ethnicity was Hispanic or Latino and self-reported race was white, African

American, or missing were considered Latino, as were those with observed races of Hispanic white or Hispanic black collected prior to 2003.

Control variables: Comorbid conditions. The 27 comorbidities are a subset of the 30 comorbidities identified by Elixhauser, et al., and known to be related to patient utilization, cost, and mortality.[26] The comorbidities were generated by running the AHRQ Comorbidity Software (version 3.1)[19] on PTF discharge records and are based on ICD-9-CM codes and DRGs. The comorbidities include congestive heart failure, valvular disease, pulmonary circulation disorders, peripheral vascular disorders, hypertension, paralysis, other neurological disorders, chronic pulmonary disease, diabetes without chronic complications, diabetes with chronic complications, hypothyroidism, renal failure, liver disease, peptic ulcer disease, AIDS, lymphoma, metastatic cancer, solid tumor without metastasis, rheumatoid arthritis or collagen vascular diseases, obesity, weight loss, chronic blood loss anemia, deficiency anemias, alcohol abuse, drug abuse, psychoses, and depression.

Analyses

We ran the AHRQ Comorbidity Software[19] and the AHRQ SAS PSI Software[20] on 5 years of VHA discharge data to obtain indicators for the 27 comorbidities and for each PSI and to calculate observed and risk-adjusted rates for each PSI. The risk adjustment uses the Health Care Cost and Utilization Project State Inpatient Databases (HCUP-SID) as the reference population. We then ran a Generalized Estimating Equations (GEE) logistic regression model to examine the relationship between race and the occurrence of a PSI, adjusting for age, sex, and the 27 comorbidities. The GEE model allows us to control for clustering at the hospital level.

Although there may be multiple hospitalizations per veteran, we did not control for repeated measures at the individual level. Instead, we controlled for clustering at the hospital level for two reasons: (1) to make the results more comparable to results outside the VHA, where repeated hospitalizations by the same patient are often treated as independent because data on multiple hospitalizations are not always available; and (2) to adjust for unknown hospital characteristics thought to have an impact on patient safety outcomes in addition to the patient characteristics in our model, such as patient safety culture. All analyses were conducted using SAS®, ver. 9.1.3 for Windows (SAS Institute Inc., Cary, NC).

Results

Table 1 shows the sample characteristics overall and by race at the hospitalization level. By supplementing inpatient records with outpatient race data, we were able to lower the number of records with missing race from 9.0 percent to 3.6 percent. Overall, our sample was 73 percent white, 19 percent African American, 3.2 percent Latino, 0.8 percent Asian American/Pacific Islander, and 0.5 percent American Indian/Alaska Native. The racial groups differed significantly on all demographic and clinical characteristics examined, including age, percentage of female

Table 1. Sample characteristics by race and overall

	Overall	White	African American	Latino	Asian American/ Pacific Islander	American Indian/ Alaska Native
Hospitalizations (N)	2,198,674	1,664,488	432,721	72,728	17,051	11,686
Mean age (years)	64.94	65.73	62.09	64.20	65.57	61.41
Sex (%)						
Male	96.82	96.87	96.39	98.37	96.6	95.76
Female	3.18	3.13	3.61	1.63	3.40	4.24
Race (%)						
White	72.96					
African American	18.97					
Latino	3.19					
Asian American/ Pacific Islander	0.75					
American Indian/ Alaska Native	0.51					
Comorbidities (%)						
Deficiency anemias	11.46	10.67	14.56	10.87	12.16	12.01
Congestive heart failure	7.22	7.36	6.98	5.49	7.04	6.32
Depression	5.63	6.06	4.18	4.49	5.34	6.81
Diabetes, no chronic complications	21.8	21.4	22.29	26.76	24.9	23.71
Hypertension	47.10	45.93	51.82	46.06	50.31	41.46
Peripheral vascular disease	5.79	6.20	4.50	4.30	5.68	4.35
Obesity	3.20	3.46	2.37	2.22	3.11	3.65
Weight loss	2.39	2.43	2.39	1.70	1.92	3.00

NOTE: ANOVA (for age), and Chi-square analyses (for all other variables), revealed significant differences ($P < 0.0001$) in all sample characteristics across racial groups.

veterans, and the prevalence of comorbidities ($P < 0.0001$ for all). The average age of hospitalized patients was 64.9 years, ranging from 18 to 112 years. On average, only 3.2 percent of hospitalizations were of women, although this varied by race, such that 1.6 percent of Latinos and 4.2 percent of American Indians hospitalized during this time were women. Racial groups also differed in the prevalence of comorbidities. For example, nearly 52 percent of African American veterans had hypertension compared to only 42 percent of American Indians; nearly 27 percent of Latino veterans had diabetes, compared to only 21 percent of white veterans.

Tables 2a and 2b show the number of hospitalizations at risk for each PSI (the denominator), the number who potentially had the AE (the numerator), both overall and by race group. The number of patients at risk for each PSI varied from 93,488 to 2,280,482. However, because of the relatively small percentage of our sample in certain racial groups (in particular, American Indians and Asian Americans, and for a few selected PSIs, Latinos), both the number of hospitalizations at risk for many of the less frequent PSIs and the number of hospitalizations with PSIs were quite low. For example, the number of American Indians in the denominator varied from 507 to 11,678 based on the PSI, and the numerator varied from 1 to 70. Consequently, some events were extremely rare: only one Asian American and two American Indians had a PSI for postoperative sepsis (PSI 13), and no Asian Americans had a PSI for postoperative hip fracture (PSI 8).

The observed and risk-adjusted PSI rates are also shown in Tables 2a and Table 2b, with the exception of the PSIs for death in low mortality DRGs (PSI 3) and foreign body left during procedure (PSI 5), for which only observed rates are reported. The AHRQ PSI software does not generate risk-adjusted rates for these PSIs because their occurrence is thought to be independent of patient risk factors.[18] We found some variation in PSI rates across racial groups, with a wide range in rates for some PSIs [e.g., rates per 1,000 hospitalizations of failure to rescue (PSI 4) ranged from 124.0 for African Americans to 174.5 for Latinos; rates per 1,000 of postoperative hemorrhage or hematoma (PSI 9) ranged from 1.97 for Latinos to 3.12 for African Americans]. Although differences in rates were not necessarily significantly different from each other, every racial group had the highest rate for at least two PSIs, and all minority groups also had the lowest rate for at least two PSIs.

African Americans had the highest rates of all racial groups for postoperative hemorrhage or hematoma (PSI 9) and postoperative PE/DVT (PSI 12), but they had the lowest rates for failure to rescue (PSI 4), foreign body left during procedure (PSI 5), postoperative wound dehiscence (PSI 14), and accidental puncture or laceration (PSI 15). Latinos had the highest rates for death in low mortality DRGs (PSI 2), decubitus ulcer (PSI 3), and failure to rescue (PSI 4), but they had the lowest rates for postoperative hemorrhage or hematoma (PSI 8) and postoperative derangements (PSI 9).

American Indians had the highest rates for the most PSIs (six PSIs), whereas Asian Americans had the lowest rates for the most PSIs (six PSIs). However, the rates for these latter two groups may be less meaningful given the small number of hospitalizations for some of the PSIs in these racial groups. We also looked at PSIs by dividing them into postsurgical PSIs (PSIs 8 to 14) and medical/surgical PSIs (PSIs 1 to 7, 15), but we were not able to discern any pattern by race, with the exception of Latinos seeming to have a higher probability of experiencing the medical/surgical PSIs.

Table 2a. PSI counts and PSI rates by race

PSIs	Overall				White				African American			
	At risk[a]	#PSI[b]	Obs rate[c]	RA rate[d]	At risk	#PSI	Obs rate	RA rate	At risk	#PSI	Obs rate	RA rate
(1) Complications of anesthesia	498,290	370	0.74	0.73	377,382	302	0.80	0.77	77,407	39	0.50	0.52
(2) Death in low mortality DRGs	319,674	905	2.83		234,398	638	2.72		59,983	163	2.72	
(3) Decubitus ulcer	1,008,677	15,331	15.20	16.71	733,735	10,399	14.17	15.92	193,263	3,307	17.11	17.78
(4) Failure to rescue	117,598	16,132	137.18	138.9	80,413	10,776	134.01	137.60	26,726	3,227	120.74	124.02
(5) Foreign body left during procedure	2,281,183	269	0.12		1,664,415	200	0.12		432,700	42	0.10	
(6) Iatrogenic pneumothorax	2,149,966	1,838	0.85	1.08	1,561,928	1,407	0.90	1.13	415,555	298	0.72	0.95
(7) Selected infections due to care	1,673,511	3,255	1.95	1.56	1,244,513	2,402	1.93	1.57	296,214	574	1.94	1.46
(8) Postoperative hip fracture	358,940	140	0.39	0.52	272,075	109	0.40	0.53	56,011	19	0.34	0.46
(9) Postop hemorrhage or hematoma	495,450	1,580	3.19	2.72	375,342	1,199	3.19	2.71	76,829	275	3.58	3.12
(10) Postoperative derangements	240,093	499	2.08	1.84	185,094	391	2.11	1.90	33,599	61	1.82	1.49
(11) Postop respiratory failure	180,072	2,405	13.36	10.26	136,776	1,863	13.62	10.28	26,789	327	12.21	10.01
(12) Postop PE/DVT	494,321	5,580	11.29	9.55	374,634	4,082	10.90	9.40	76,512	1,029	13.45	10.30
(13) Postop sepsis	93,488	617	6.60	6.36	73,133	501	6.85	6.60	12,376	66	5.33	5.23
(14) Postop wound dehiscence	99,095	641	6.47	3.39	73,795	527	7.14	3.61	15,924	68	4.27	2.55
(15) Accidental puncture or laceration	2,280,482	6,749	2.96	4.43	1,663,879	5,222	3.14	4.53	432,607	887	2.05	3.74

a = Number of hospitalizations at risk (denominator); b = Number of hospitalizations at risk with PSI (numerator); c = Observed rate of PSI per 1,000 hospitalizations.; d = Risk-adjusted rate of PSI per 1,000 hospitalizations (AHRQ PSI software does not generate risk-adjusted rates PSIs 2 and 5).

Table 2b. PSI counts and PSI rates by race

PSIs	Latino				Asian/Pacific Islander				American Indian/Alaskan Native			
	At risk[a]	#PSI[b]	Obs rate[c]	RA rate[d]	At risk	#PSI	Obs rate	RA rate	At risk	#PSI	Obs rate	RA rate
(1) Complications of anesthesia	15,853	8	0.50	0.53	4,068	7	1.72	1.69	2,483	1	0.40	0.41
(2) Death in low mortality DRGs	9,999	34	3.40		2,447	3	1.23		1,971	4	2.03	
(3) Decubitus ulcer	33,348	725	21.74	22.63	7,226	95	13.15	14.00	4,952	65	13.13	15.28
(4) Failure to rescue	4,215	803	190.51	174.45	816	93	113.97	129.93	590	70	118.64	125.34
(5) Foreign body left during procedure	72,724	13	0.18		17,050	5	0.29		11,684	2	0.17	
(6) Iatrogenic pneumothorax	68,928	41	0.59	0.85	16,048	13	0.81	1.05	11,074	5	0.45	0.63
(7) Selected infections due to care	54,211	107	1.97	1.57	12,328	17	1.38	1.12	8,875	22	2.48	1.99
(8) Postoperative hip fracture	11,684	5	0.43	0.62	2,972	0	0.00	0.00	1,673	2	1.20	1.97
(9) Postop hemorrhage or hematoma	15,766	36	2.28	1.97	4,042	12	2.97	2.52	2,472	8	3.24	3.00
(10) Postoperative derangements	7,028	10	1.42	1.32	2,060	5	2.43	1.83	1,169	5	4.28	3.44
(11) Postop respiratory failure	5,498	71	12.91	11.07	1,514	18	11.89	9.57	922	18	19.52	16.38
(12) Postop PE/DVT	15,736	148	9.41	8.35	4,043	45	11.13	9.67	2,474	18	7.28	6.46
(13) Postop sepsis	2,653	14	5.28	5.14	767	1	1.30	1.26	525	2	3.81	3.79
(14) Postop wound dehiscence	3,267	15	4.59	2.71	775	5	6.45	3.61	507	5	9.86	5.06
(15) Accidental puncture or laceration	72,712	208	2.86	4.49	17,041	55	3.23	4.56	11,678	34	2.91	4.62

a = Number of hospitalizations at risk (denominator); b = Number of hospitalizations at risk with PSI (numerator); c = Observed rate of PSI per 1,000 hospitalizations.;
d = Risk-adjusted rate of PSI per 1,000 hospitalizations (AHRQ PSI software does not generate risk-adjusted rates PSIs 2 and 5).

Table 3. Odds of PSI for minority vs. white veterans

PSI	Odds ratios			
	African American vs. white	Latino vs. white	Asian American / PI vs. white	American Indian vs. white
(1) Complications of anesthesia	0.63*	0.65	2.19	0.55
(2) Death in low mortality DRGs	1.18	1.32	0.44	0.94
(3) Decubitus ulcer	1.35**	1.60*	0.90	1.02
(4) Failure to rescue	0.98	1.55	0.92	0.91
(5) Foreign body left during procedure	0.84	1.53	2.49	1.46
(6) Iatrogenic pneumothorax	0.88	0.75	0.95	0.56
(7) Selected infections due to care	1.02	1.03	0.73	1.22
(8) Postop hip fracture	0.82	1.09	NA***	3.23
(9) Postop hemorrhage/hematoma	1.13	0.73*	0.93	1.05
(10) Postop derangements	0.76	0.63	0.99	1.89
(11) Postop respiratory failure	1.00	1.05	0.92	1.53
(12) Postop PE/DVT	1.23**	0.89	1.03	0.69
(13) Postop sepsis	0.94	0.83	0.20	0.58
(14) Postop wound dehiscence	0.71*	0.72	0.99	1.46
(15) Accidental puncture or laceration	0.69**	0.94	1.05	0.97

* Significant at $\alpha = 0.05$ level.

** Significant after Bonferroni adjustment for multiple comparisons , *P* <0.00083.

*** No Asian American patients had a PSI for postoperative hip fracture.

Table 3 summarizes the results of our logistic regressions, showing the odds of a minority veteran having a PSI compared to the odds of a white veteran having the same PSI. Most of the odds ratios were not significantly different from one. However, compared to white veterans, African Americans were significantly more likely to have a PSI for decubitus ulcer (OR = 1.35, $P < 0.0001$) and for postoperative PE/DVT (OR = 1.23, $P < 0.0001$). On the contrary, they were significantly less likely to have a PSI for accidental puncture or laceration (OR = 0.69, $P = 0.0003$), complications of anesthesia (OR = 0.63, $P = 0.0144$), and postoperative wound dehiscence (OR = 0.71, $P = 0.0298$). Compared to white veterans, Latino veterans were also significantly more likely to have a PSI for decubitus ulcer (OR = 1.60, $P = 0.041$) but significantly less likely to have a PSI for postoperative hemorrhage or hematoma (OR = 0.73, $P = 0.0311$). With a Bonferroni adjustment for multiple comparisons, only those ORs with *P*-values below $\alpha = 0.00083$ were considered significant, which meant that only the first three

differences above were significantly different from those of white veterans. Figure 1 shows these same results but in a graphical format to provide a more visual perspective of the confidence intervals (CIs) for each OR. ORs were significantly different from one another when their CIs

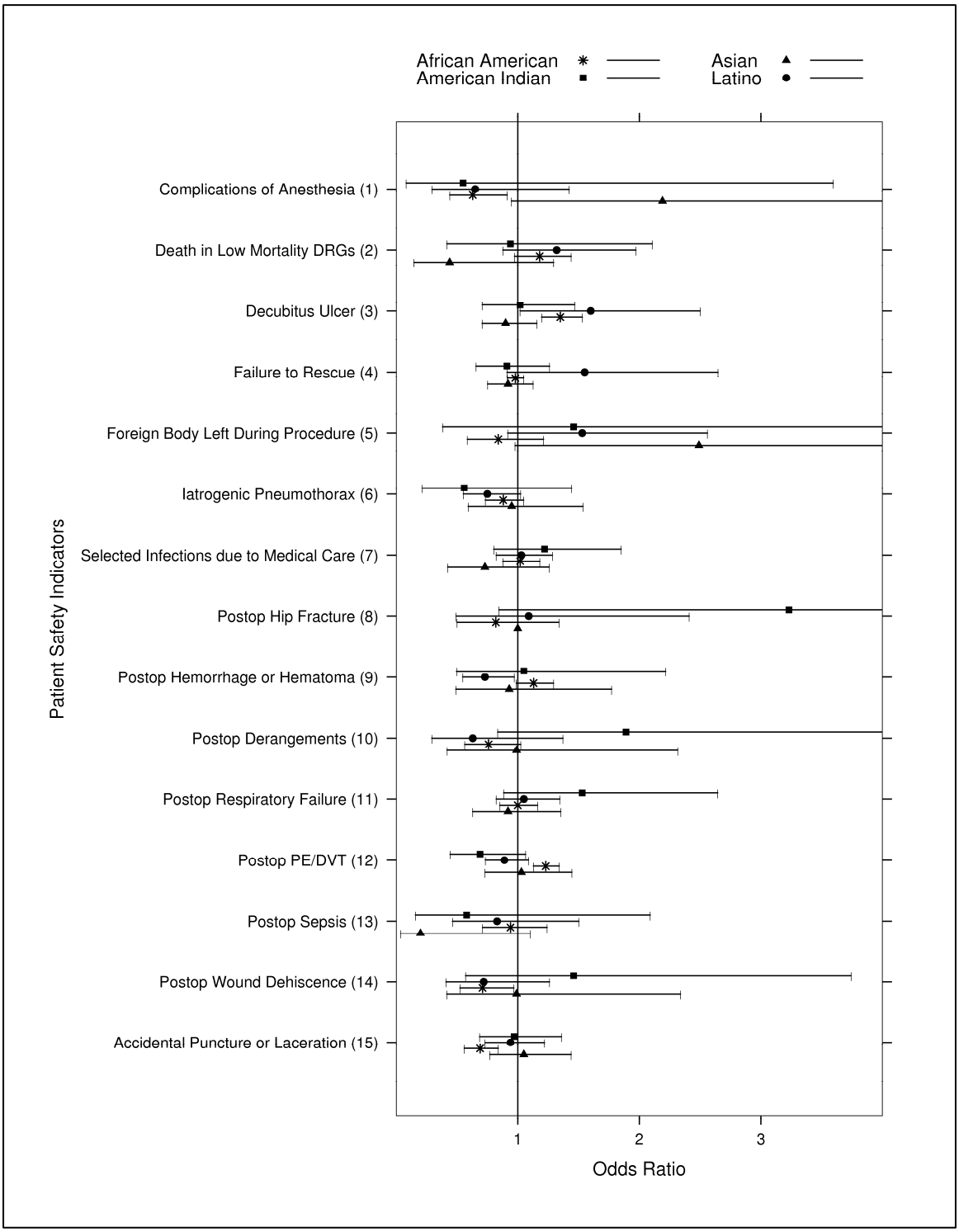

Figure 1. Odds of having a PSI for minority vs. white veterans.

(the horizontal bars) did not overlap with each other and significantly different from 1.0 when the CIs did not overlap with the vertical line representing OR = 1.0. In most instances, the CIs were very wide, overlapping both with the CIs of other racial groups and with OR = 1.0.

Discussion

Our goal was to examine whether patient safety events varied across different races in the VHA. We used PSIs to explore whether the odds of experiencing an AE varied by patient race. We hypothesized that there might be fewer racial disparities in patient safety events due to previous research showing fewer racial disparities in the quality of care and health outcomes in the VHA.[11, 12, 13] As expected, we found fewer disparities between whites and minorities in the VHA than did previous non-VHA researchers.[2, 6] Only 7 of 60 ORs comparing the odds of a minority having a given PSI to similar odds for whites were significant at the $\alpha = 0.05$ level. After Bonferroni adjustment for multiple comparisons, only three of these ORs were significant. When we compared PSI rates across groups, no racial groups had consistently higher or lower rates compared to other groups. All racial groups had some of the highest rates and all minority groups had some of the lowest rates. Looking at the PSIs by dividing them into postsurgical and medical/surgical PSIs did not reveal any noteworthy patterns.

It is possible that had our minority subsamples been larger, we might have been able to distinguish clearer patterns in PSI rates and/or more significant differences in the odds of experiencing PSIs. For example, the odds of postoperative hip fracture for American Indians was over three times that for white veterans, but this difference was only marginally significant (OR = 3.23, $P = 0.087$) in the logistic regression analysis. A larger sample of American Indians at risk for this PSI would likely have narrowed the CI for the OR.

One possible explanation for fewer disparities within VHA is that it is more of an equal access system than the hospitals that make up the data set (HCUP-SID) used in prior studies of PSIs in non-VHA hospitals. The VHA is the Nation's largest, fully integrated health care delivery system, as opposed to the community hospitals represented in the HCUP-SID data. The VHA underwent rapid and significant transformation in the late 1990s, including changes in organization, financing, eligibility, and new emphases on performance management and quality improvement (QI).[27] Veterans with service-connected disabilities and those who meet VHA means testing criteria are eligible to receive services and prescription drugs for very low or no copayments and, thus, are most likely to rely on VHA care.[28] Because of these criteria, those who exclusively utilize VHA services tend to be minority veterans, those with lower incomes or lower levels of education, and homeless veterans.[27, 28, 29] Veterans receiving their care at the VHA are therefore more socioeconomically homogenous than patients in other settings. Because there are fewer financial barriers to access within VHA, there are likely to be fewer racial disparities in access to care.[15]

Coffey, et al.,[2] also found that after controlling for income, many of the disparities in PSI rates disappeared for Latinos and Asian Americans but remained for African Americans. Interestingly, all three of the ORs that remained significant in our analysis after Bonferroni adjustment ($\alpha = 0.00083$) compared the odds of an African American having a PSI vs. whites. These results are consistent with what might be expected in a more socioeconomically homogeneous population.

However, these results might be due to the small number of veterans in some minority groups. Future work should assess why African American patients might experience significant disparities when other groups do not.

The PSIs for which minorities have significantly higher rates—decubitus ulcer (PSI 3) and postoperative PE/DVT (PSI 12)—tend to be higher frequency PSIs, whereas those for which whites have significantly higher rates—iatrogenic pneumothorax (PSI 6) and postoperative sepsis (PSI 13)—are lower frequency PSIs. The influence of patient safety events primarily depends on the frequency of the event and the potential long-term impact. For example, if the risk-adjusted rate of the PSI for decubitus ulcer in white patients (15.92 per 1,000 hospitalizations) had applied to the African American and Latino hospitalizations, there would have been approximately 360 fewer PSIs for decubitus ulcer among African Americans and 224 fewer among Latinos during the 5-year period. Because African American patients have higher mortality rates from decubitus ulcer than other racial groups,[30] and because they are more likely to exclusively rely on VHA for their care,[28] preventing these cases takes on added importance.

It might not be possible, however, to lower decubitus ulcer rates to the same level as for white patients. There may be race-related differences in underlying reasons for differences in PSI rates. For example, African American and Latino veterans are at higher risk of decubitus ulcers than whites.[31] Stage I decubitus ulcers, typically identified by locating nonblanchable erythema of intact skin, can be difficult to identify in patients with dark skin pigmentation[32] for whom the blanch response might not be present; other indicators—such as skin darkening or discoloration, warmth, edema, or induration—might be identified instead. If caregivers are not trained to recognize those signs in darker pigmented patients, or if they fail to take the additional time to look for them, then such patients are more likely to have ulcers that progress to stage II (skin breakdown) and beyond and are less likely to have a pre-existing stage I decubitus ulcer documented at the time of admission.[31] Also, because administrative data cannot completely account for risk factors—such as smoking, body weight, and malnutrition—differences in risk due to racial differences in the distribution of underlying risk factors will appear to constitute a racial difference in preventable AEs. Nonetheless, because of the increased treatment costs, unnecessary suffering, and increased mortality associated with pressure ulcers, in addition to continuing efforts to lower decubitus ulcer rates overall, it is important for the VHA to eliminate racial disparities in pressure ulcer rates.

A few limitations should be noted, including some that are relevant to most studies using the PSIs or administrative data. First, we are in the process of fully validating the PSIs in VHA and do not yet have data on the likelihood that a given PSI has accurately flagged all related preventable AEs that occurred during the index hospitalization. Also, we cannot eliminate the possibility that a patient was admitted with an undocumented condition, such as a stage I decubitus ulcer, present on admission, which would artificially inflate the rate of preventable AEs. Recent research suggests that certain PSIs (such as decubitus ulcer, hip fracture, and PE/DVT) are frequently present on admission.[33] Although we expect that PSIs under- or overestimate AE rates evenly across racial groups, differences in observed PSI rates could arise if there were racial differences in documentation, data coding, or in the frequency or severity of a particular procedure or diagnosis code more often associated with AEs that were not actually preventable.

Second, as mentioned earlier, despite our attempt to create large subgroups by using 5 years of data, the percentage of our sample in the Latino, Asian American, and American Indian groups was very small. Therefore, there were too few cases in the numerator of many PSIs to provide stable estimates of the ORs comparing the odds of experiencing a PSI in these groups to that of white patients.

Third, because we bridged newer self-reported race data with the older observed data that did not provide information on multiple races, the race groups could have varied slightly in size and membership based on the bridging method used. It is possible that the bridging technique we used to merge self-reported race and ethnicity with pre-2003 VHA race data might have influenced our findings. The racial breakdown of our sample differs somewhat from previously reported distributions from a survey of veterans showing the respective distributions to be 79.7 percent white, 13.2 percent African American, 5.2 percent Latino, 0.8 percent Asian American, and 1.1 percent American Indian.[34] Our numbers are, however, more similar to the distribution of 78 percent, 18 percent, 5.8 percent, 1.4 percent, and 0.4 percent, respectively, reported by Sohn, et al.,[25] when examining race data for all VHA users in 2004, including both self-reported and observed race data.

Fourth, because our analyses were restricted to veterans who were hospitalized within VHA during a 5-year period, differences in race distribution might also reflect racial differences in veterans having access to outside sources of health care, such as private insurance or hospitals reimbursed by Medicare. For example, African American veterans are more likely to rely on VHA as their only source of care,[28] and they made up a slightly higher percentage of our sample than would be expected based on prior research.[25, 34]

Finally, because the VHA system and its patient population differ significantly from the general population, these findings might not be generalizable outside the VHA. VHA patients not only have lower socioeconomic status, they also tend to have greater disease burden, including a higher prevalence of mental health disorders.[35, 36] Because of the small percentage of veterans who are women of childbearing age, we also were unable to look at disparities in the PSIs related to childbirth.

Conclusion

To summarize, we found fewer racial disparities in PSI rates in the VHA than have been reported outside the VHA. The VHA has invested much energy into improving care and has expended significant resources to improve quality and patient safety through efforts such as the VHA Quality Enhancement Research Initiative (QUERI) program[37] and the creation of a VHA National Center for Patient Safety.[38] Previous research has shown that minorities receive as good or better treatment with better outcomes for a number of health conditions in the VHA.[13, 15] Although a number of possible alternate explanations have been presented above, the low number of significant racial differences in PSI rates might very well be another example of more equal treatment and outcomes within VHA. Nevertheless, any differences that suggest patient race might influence the risk of experiencing a patient safety event must be investigated to better understand the underlying reasons for any differences before the differences can be eliminated.

Do these differences arise from unmeasured patient characteristics or disparate treatment within hospitals, or are they the result of segregated health care, which research suggests could result in worse outcomes for black patients?[39, 40] Future research should delve further into the disparities found, beginning with those PSIs occurring most frequently, identifying their causes and correlates, such as patient risk factors or the organizational characteristics of hospitals that might affect quality of care. Only by doing so will we be able to appropriately target future QI efforts.

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Author Affiliations

Center for Health Quality, Outcomes, and Economic Research (CHQOER), Bedford VAMC, Bedford, MA (Dr. Shimada, Dr. Montez-Rath, Ms. Loveland, Ms. Zhao, Dr. Rosen); Boston University School of Public Health, Department of Health Policy and Management (Dr. Shimada, Ms. Loveland, Dr. Rosen); Boston University School of Public Health, Department of Biostatistics (Dr. Montez-Rath); Boston University School of Medicine, Section of General Internal Medicine (Dr. Kressin).

Address correspondence to: Stephanie Shimada, PhD, CHQOER, 200 Springs Road (152), Bedford, MA 01730. e-mail: stephanie.shimada@va.gov.

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