Racial and insurance disparities in the utilization of supportive care after inpatient admission for proximal humerus fracture

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Abstract

Background: Post-discharge supportive services such as home health assistance and rehabilitation or skilled nursing facilities are often utilized after inpatient care for fracture of the proximal humerus. It is unclear whether sociodemographic disparities exist in the utilization of post-hospital supportive care. The present study aimed to evaluate the individual and combined effects of race and insurance status on the utilization of supportive services after hospital admission for fracture of the proximal humerus.

Methods: Among the more than 40,000 patients with a proximal humerus fracture identified in the Nationwide Inpatient Sample (2008 to 2011), 85% were white, 7.7% were Hispanic and 7.0% were black. More black patients (19%) and Hispanic patients (15%) were uninsured compared to white patients (8.7%). Multivariable logistic regression was performed to determine the effect of race/ethnicity and insurance status on the utilization of post-hospital supportive care.

Results: Sixty-nine percent of patients were discharged home, 13% went to home health care and 15% went to rehabilitation or skilled nursing facilities. Compared to white patients, Hispanic patients [odds ratio (OR) = 0.71; 95% confidence interval (CI) = 0.64 to 0.79] and black patients (OR = 0.79; 95% CI = 0.71 to 0.88) exhibited lower odds for the utilization of specialized post-hospital supportive services. Uninsured patients were significantly less likely to use post-discharge supportive services (OR = 0.38; 95% CI = 0.33 to 0.42) compared to privately insured patients. Even when insured at levels comparable to whites, Hispanic and black patients tended to experience decreased rates of discharge to post-acute supportive care.

Conclusions: The utilization of post-hospital supportive services varies by race, ethnicity and insurance status after an inpatient admission for proximal humerus fracture.

Keywords

Discharge disposition, disparities, insurance, proximal humerus fracture, race, rehabilitation, supportive care

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Introduction

Fractures of the proximal humerus are common and many patients are admitted to the hospital after injury.^{1–4} Patients may benefit from supportive services such as home health assistance, a rehabilitation hospital or a skilled nursing facility after they are discharged from the hospital.^{2,5,6} Studies have demonstrated that racial and ethnic minorities (e.g. Hispanics and non-Hispanic blacks) and patients who lack insurance are more likely to be discharged directly home

and less likely to use supportive services following hip fracture.^{7–11} We were interested in determining

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whether there were similar patterns in the utilization of post-hospital supportive services after an inpatient admission for fracture of the proximal humerus.

Using nationally representative data, we tested the primary null hypothesis that there would be no racial disparities in the utilization of supportive services after hospital admission for fracture of the proximal humerus. Our secondary null hypothesis was that there would be no insurance-based differences in the use of post-discharge supportive care. Additionally, we evaluated the combined effect of race and insurance status on discharge disposition.

Materials and methods

We performed a retrospective cross-sectional analysis of 2008 to 2011 discharge information obtained from the Healthcare Cost and Utilization Project–Nationwide Inpatient Sample (HCUP-NIS) database, an initiative first sponsored by the Agency for Healthcare Research and Quality in 1988.^{12,13} The HCUP-NIS is the largest publicly available all-payer inpatient discharge database in the USA.¹⁴ Each dataset year contains records on approximately 8 million discharges from over 1000 nonfederal hospitals, reflecting a 20% stratified sample of all discharges from randomly selected institutions in participating states.¹⁵ Sample data provided by the HCUP-NIS were subsequently weighted to produce statistically valid national estimates. A maximum number of 25 medical diagnoses and 15 procedures were identified with the use of the International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM) codes. Patient demographic data, provider characteristics and inpatient outcomes, such as length of stay and discharge disposition, were also collected. The study was deemed to be exempt from Institutional Review Board approval as a result of prior data de-identification.

The study population consisted of patients aged 18 years to 64 years with an ICD-9-CM primary diagnosis code of closed (812.00 to 812.03, 812.09) or open (812.10 to 812.13, 812.19) proximal humerus fracture. Consistent with previous research, we opted to exclude paediatric (<18 years) and geriatric (≥ 65 years) patients because of the high percentage of public insurance and low percentage of uninsured among these populations.^{4,9} An estimated 40,222 patients with a proximal humerus fracture were extracted from a database containing more than 150 million patients for 2008 to 2011.

Patients were stratified according to race/ethnicity, modelled as an independent three-way categorical variable: non-Hispanic white, non-Hispanic black and Hispanic. We used the definition terms provided by the HCUP-NIS database to categorize race/ethnicity in the present study. Other racial minorities, such as

Asians and Native Americans, were excluded from analysis as a result of relatively low numbers.¹⁶

Tables 1 and 2 portray a detailed analysis of patient demographic and health care system-related characteristics of the entire cohort, as well as of three different racial/ethnic subgroups. Explanatory variables consisted of age (both continuous and categorized into the age groups: 18 years to 24 years, 25 years to 34 years, 35 years to 44 years, 45 years to 54 years and 55 years to 64 years), sex, comorbidity burden (quantified with the Elixhauser comorbidity index),^{18,19} insurance status (private insurance, public insurance and no insurance), household income based on postal zip code analysis (\$1 to \$38,999, \$39,000 to \$47,999, \$48,000 to \$62,999 and $\geq \$63,000$), fracture type (closed and open), treatment type (non-operative and operative), trauma type (single trauma and polytrauma), hospital length of stay, discharge disposition (home, home health care, rehabilitation/skilled nursing facility, hospital transfer and other), hospital size (small, medium and large), hospital geographical region (Northeast, Midwest, South and West), hospital location (urban and rural) and hospital teaching status (nonteaching and teaching). The study population had a mean (SD) age of 52 (11) years, was mostly female (60%) and white (85%), and had a private insurance plan (62%).

Assuming normal distribution of the data based on the large weighted sample size, Pearson's chi-squared test was used to analyze categorical variables and analysis of variance was employed for continuous variables. Discharge to supportive care (rehabilitation/skilled nursing facility or home health assistance) was the primary response variable. To determine the independent effect of race/ethnicity and insurance status on the utilization of post-hospital supportive care, multi-variable binary logistic regression analyses were performed. The effect of race/ethnicity and insurance status was first examined individually. Nine variables combining race and insurance status were then created to evaluate the interplay of these characteristics. All regression models were adjusted for known patient and provider-related confounding variables. $p < 0.05$ was considered statistically significant.

Results

Hispanic and black patients were discharged directly home slightly but significantly more often (76% and 72%, respectively) than their white counterparts (69%; $p < 0.001$). Fewer Hispanics and blacks were transferred to rehabilitation or skilled nursing facilities (11% and 15%, respectively) compared to white patients (16%; $p < 0.001$). Similarly, Hispanics and blacks were less likely to be discharged to home health care (11% and 10%, respectively) than whites

Table 1. Demographic and discharge data of proximal humerus fracture hospitalizations by race/ethnicity (n = 40,222).

Parameter	All patients	Race/ethnicity groups			P
		Non-Hispanic white	Non-Hispanic black	Hispanic	
Total (%)	100	85	7.0	7.7	
Sex (%)					
Female	60	63	39	49	<0.001
Male	40	37	61	51	
Age (years), mean (SD)	52 (11)	53 (10)	45 (13)	49 (13)	<0.001
Age group (years) (%)					
18 to 24	3.2	2.4	9.4	5.9	<0.001
25 to 34	6.4	5.0	18	11	
35 to 44	10	9.5	14	14	
45 to 54	27	27	28	24	
55 to 64	53	56	31	46	
Elixhauser comorbidity score, mean (SD)	2.0 (1.8)	2.0 (1.8)	1.9 (1.8)	1.9 (1.8)	<0.001
Insurance status (%)					
Private insurance	62	65	44	53	<0.001
Public insurance	28	27	37	33	
Uninsured	9.9	8.7	19	15	
Median household income (%)					
\$1 to \$38,999	26	23	52	35	<0.001
\$39,000 to \$47,999	26	26	21	24	
\$48,000 to \$62,999	24	25	15	23	
≥\$63,000	24	25	10	15	
Missing	1.2	1.0	1.7	2.8	
Fracture type (%)					
Closed	97	98	87	94	<0.001
Open	3.5	2.5	13	6.1	
Treatment type (%)					
Non-operative	35	33	49	42	<0.001

(continued)

Table 1. Continued.

Parameter	All patients	Race/ethnicity groups			P
		Non-Hispanic white	Non-Hispanic black	Hispanic	
Operative	65	67	51	58	
Surgery within 2 days of admission	84	84	79	81	<0.001
Trauma type (%)					
Single trauma	73	74	65	72	<0.001
Polytrauma	27	26	35	28	
Length of stay (days), mean (SD)	3.8 (4.6)	3.7 (4.3)	5.1 (6.9)	4.0 (5.1)	<0.001
Discharge disposition (%)					
Home	69	69	72	76	<0.001
Home health care	13	14	10	11	
Rehabilitation/skilled nursing facility	15	16	15	11	
Hospital transfer	1.5	1.4	1.2	1.9	
Other	0.90	0.90	1.4	0.50	

(14%; $p < 0.001$). After accounting for potential confounding factors, including insurance status, multivariable logistic regression analysis exhibited lower odds for the utilization of specialized post-hospital supportive services in Hispanic patients [odds ratio (OR)=0.71; 95% confidence interval (CI)=0.64 to 0.79; $p < 0.001$] and black patients (OR=0.79; 95% CI=0.71 to 0.88; $p < 0.001$) compared to white patients (Table 3).

In adjusted analysis, uninsured patients were significantly less likely to receive post-discharge supportive services (OR=0.38; 95% CI=0.33 to 0.42; $p < 0.001$) compared to the privately insured. By contrast, publicly insured patients had higher odds of being discharged to supportive care (OR=2.2; 95% CI=2.1 to 2.3; $p < 0.001$) (Table 3).

More black patients (19%) and Hispanic patients (15%) were uninsured compared to white patients (8.7%; $p < 0.001$). Although almost two-thirds of white patients (65%) had private insurance, only 53% of Hispanics and 44% of blacks were privately insured ($p < 0.001$). The combined effect of race and insurance was further examined using multivariable logistic regression analysis. Compared to white patients with private insurance, Hispanics experienced lower rates of discharge to supportive care whether privately

insured (OR=0.82; 95% CI=0.72 to 0.95; $p < 0.001$) or uninsured (OR=0.52; 95% CI=0.37 to 0.73; $p < 0.001$). Similarly, black patients exhibited lower odds of discharge to supportive services than privately insured white patients, whether they had private insurance (OR=0.83; 95% CI=0.70 to 0.98; $p = 0.024$) or were uninsured (OR=0.54, 95% CI=0.40 to 0.73; $p < 0.001$). Publicly insured patients, albeit black (OR=1.5, 95% CI=1.3 to 1.7; $p < 0.001$) or white (OR=2.3, 95% CI=2.2 to 2.4; $p < 0.001$), were more likely to be discharged to supportive care than whites with private insurance. Finally, the odds of publicly insured Hispanic patients receiving post-hospital supportive services were no different than those of privately insured white patients (OR=1.2, 95% CI=1.0 to 1.4; $p = 0.050$) (Table 3).

Discussion

Some patients may benefit from post-hospital support from home health and other inpatient facilities after an acute care hospital admission involving a fracture of the proximal humerus.²⁰ There are racial, ethnic and insurance status disparities in the utilization of this type of care after hip fracture, traumatic brain injury, general trauma and acute coronary event.^{7,8,16,17,21–23}

Table 2. Provider characteristics of proximal humerus fracture hospitalizations by race/ethnicity ($n = 40,222$).

		Race/ethnicity groups			
Parameter	All patients	Non-Hispanic white	Non-Hispanic black	Hispanic	<i>p</i>
Geographical region					
Northeast	20	20	24	16	<0.001
South	41	40	48	39	
West	24	23	13	41	
Midwest	15	16	15	4.6	
Hospital location					
Urban	89	88	96	95	<0.001
Rural	10	12	2.9	4.4	
Missing	0.60	0.60	0.8	1.1	
Hospital teaching status					
Teaching	48	46	65	56	<0.001
Nonteaching	51	54	34	43	
Missing	0.60	0.60	0.8	1.1	
Hospital size					
Small	12	13	4.9	7.2	<0.001
Medium	24	24	24	19	
Large	64	63	70	73	
Missing	0.60	0.60	0.8	1.1	

Hence, the present study aimed to examine existing sociodemographic differences in discharge to supportive care after an inpatient stay related to fracture of the proximal humerus. Specifically, we evaluated the individual and combined effects of race and insurance status on discharge disposition, taking other factors such as age and comorbidity into account.

The results of the present study should be interpreted in light of several factors. Despite access to large numbers and associated power, administrative databases have several well-known limitations.^{24,25} First, the HCUP-NIS database is based on billing data from ICD-9-CM codes, some of which is likely miscoded; however, the level of miscoding is felt to be acceptably low and unlikely to affect the analysis.²⁶ Our primary response variable is discrete and difficult to miscode. Second, the HCUP-NIS does not include data regarding the severity and mechanism of injury,

both representing known risk factors for post-hospital supportive care after proximal humerus fracture.^{27,28} Third, we were unable to evaluate functional outcomes or to measure patient-reported outcomes in the study population. Moreover, we could not assess patient preferences that might have influenced decisions about discharge disposition; differences might vary by race.²⁹ Fourth, we can only study association, not causation. Fifth, the HCUP-NIS is limited to inpatient data only; thus, patients with proximal humerus fractures managed as outpatients were not included in the analysis. It could be argued that inpatients with proximal humerus fractures may be sicker and more medically compromised than outpatients; adjusting for comorbidities in our regression models should account for some of these differences. Finally, the ORs calculated by binary logistic regression should be interpreted with the notion that they may overestimate the true effect if the outcome of

Table 3. Risk-adjusted odds ratio of post-hospitalization care by (1) race/ethnicity, (2) insurance status and (3) race and insurance status combined.

Parameter	OR (95% CI)	p
Race (reference: white)		
Black	0.79 (0.71 to 0.88)	<0.001
Hispanic	0.71 (0.64 to 0.79)	<0.001
Insurance status (reference: private insurance)		
Public insurance	2.2 (2.1 to 2.3)	<0.001
No insurance	0.38 (0.33 to 0.42)	<0.001
Insurance status and race (reference: privately insured white patient)		
Privately insured black patient	0.83 (0.70 to 0.98)	0.024
Privately insured hispanic patient	0.82 (0.72 to 0.95)	<0.001
Publicly insured white patient	2.3 (2.2 to 2.4)	<0.001
Publicly insured black patient	1.5 (1.3 to 1.7)	<0.001
Publicly insured hispanic patient	1.2 (1.0 to 1.4)	0.050
Uninsured white patient	0.32 (0.27 to 0.36)	<0.001
Uninsured black patient	0.54 (0.40 to 0.73)	<0.001
Uninsured hispanic patient	0.52 (0.37 to 0.73)	<0.001

Odds ratio (OR) adjusted for age, sex, Elixhauser comorbidity score, insurance status or race, household income, fracture type, treatment type, trauma type, length of stay, geographical region, and hospital location, teaching status and size. CI, confidence interval.

interest is relatively common (> 10%), as in discharge to post-acute care.

Our results appear to reflect a general bias towards discharging Hispanic and black patients from the hospital directly to home after proximal humerus fractures. Analogously, Asemota et al. reported that, among patients with traumatic brain injury, Hispanics and blacks were less likely to be discharged to supportive care compared to whites.²² In the realm of orthopaedic trauma, a recent study by Nguyen-Oghalai et al. found that racial minorities were more likely to be discharged home to self-care after hip fracture.¹¹ The reasons for the lower utilization of supportive services among historically disadvantaged populations remain largely unexplored and warrant further study. It is our opinion that factors such as language barriers between patients and healthcare providers, fear of the medical system or of legal repercussions as a result of immigration status, as well as different family structures and cultural perceptions, could account for some of the observed variability in discharge location among racial minorities. Hispanics and blacks tend to have larger immediate

families with more potential caregivers.³⁰ Moreover, minority patients are more likely to be distrustful of their healthcare providers and thus to decline recommended care.^{31,32} On the physician side, preconceived notions about minorities and inadequate cultural competency might affect care.^{33,34}

Compared to privately insured patients, those who lack insurance were 62% less likely to receive post-discharge supportive care following proximal humerus fractures. This finding is consistent with previous studies reporting restricted access to supportive services for uninsured patients after traumatic brain injury and aneurysmal subarachnoid haemorrhage.^{22,35} The disproportionate allocation of supportive services to insured patients might place uninsured individuals at higher risk of permanent disability.³⁶ On the other hand, it is possible that more care does not increase health and this issue needs to be studied for each specific condition.

It is well known that racial and ethnic minorities are less likely to be insured than whites, in part because their incomes are lower.^{37,38} We found that, even

when insured at levels comparable to whites, Hispanic and black patients tended to experience a decreased utilization of supportive care. There may be important factors beyond insurance status and income that are yet unaccounted for with respect to access to healthcare among these populations.

In conclusion, historically disadvantaged populations have a lower utilization of post-hospital supportive services after an inpatient admission for proximal humerus fracture. More data are needed to understand the optimal use of such services, to interpret and account for patient preferences, and to eliminate undesirable racial, ethnic and insurance disparities in the utilization of supportive care after fracture of the proximal humerus.

Declaration of conflicting interests

None declared.

Level of evidence

II–Prognostic study.

Ethical permission

No Institutional Review Board approval is mandatory for the present study. The data are de-identified and commercially available for use. The study has been performed in accordance with the ethical standards in the 1964 Declaration of Helsinki and has been carried out in accordance with relevant regulations of the US Health Insurance Portability and Accountability Act.

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