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Health care disparities in surgical treatment of rotator cuff disease

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Background: Health care disparities have been well-documented in literature to affect care and recovery after surgery. Insurance type is regularly cited by orthopedic surgeons to play a role in the incongruities faced by patients in the perioperative period. Recent trends highlight an increased reluctance by some insurance companies to approve indicated surgery. Our primary objective was to assess insurance type and how it affects approval rates for rotator cuff débridement and rotator cuff repair.

Methods: A retrospective review of 999 patients who underwent arthroscopic rotator cuff débridement or repair was conducted. Data abstraction included demographics, prior surgical or nonsurgical interventions, radiologic imaging, insurance type, and denial of insurance coverage. Patients were grouped by insurance type—Medicaid, Medicare, workers' compensation, and private insurance. Univariable and multivariable logistic regression models were developed to estimate odds ratios (ORs) for insurance type associated with the denial of insurance coverage.

Results: Nine hundred ninety-seven patients were included in our final analysis. Those with private insurance were more likely to be non-Hispanic white (71%), whereas the proportion of Hispanics was highest among those with workers' compensation (27%) and Medicaid (20%). There were no significant differences by insurance type for prior nonsurgical interventions and radiologic imaging. For previous surgical interventions (13%), however, rates were higher for Medicaid (18%) and workers' compensation (17%) than those for Medicare (12%) and private insurance (9%) ($P = .003$). Compared with private insurance, the odds of insurance denial were significantly higher for those with Medicaid at 54% (OR: 7.91, 95% confidence interval: 5.27–11.88, $P < .001$) and workers' compensation at 19% (OR: 1.71, 95% confidence interval: 1.04–2.81, $P = .04$).

Discussion: One in 2 patients with Medicaid coverage faces insurance denial compared with any other insurance type. Workers' compensation follows with the second highest rates. Almost half the Hispanic population are insured by either Medicaid or workers' compensation and may face barriers to care that can negatively impact outcomes and complication rates.

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The current United States' health care system has numerous access barriers to quality musculoskeletal care. These hurdles are often complicated and likely multifactorial including geographic distance, transportation, financial, medical complexity, and health insurance status. Within the field of orthopedic surgery, multiple studies have linked race, socioeconomic status, insurance status, and gender to disparities in access to timely musculoskeletal care.^{4,8,14,17} However, what is not well understood or agreed on is when these hurdles lead to health care disparities. In a survey of orthopedic surgeons, 68% acknowledged evidence of disparities in

orthopedics, 12% of respondents believed that patients receive different health care based on race and ethnicity, and 51% believed that lack of insurance was the primary driver of disparities and access.¹ There may exist a misconception among both health care providers and the general public that having health care insurance guarantees patients access to quality and timely orthopedic care. The purpose of this study is to evaluate how insurance type and patient demographics affect approval or denial rates for the surgical treatment of rotator cuff disease. We hypothesized that the type of the health insurance plan would be an independent risk factor for denial of surgical treatment for patients with rotator cuff pathology.

Materials and methods

After institutional review board approval, we performed a retrospective review from January 2015 through December 2020.

The Loyola University Chicago Health Science Division Institutional Review Board determined this study to be exempt from IRB review (LU number 213307).

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Table 1
Patient demographics including age, sex, race and ethnicity, language proficiency, and medical comorbidities.

Variable	Overall N = 997	Medicaid N = 232	Medicare N = 185	Workers' compensation N = 172	Private N = 408	P value
Age, mean (SD)	55.5 (10.5)	51.4 (9.7)	66.1 (8.2)	53.0 (8.1)	54.1 (9.6)	<.001
Female, n (%)	458 (45.9)	119 (51.3)	95 (51.4)	51 (29.7)	193 (47.3)	<.001
Race and ethnicity, n (%)						
Non-Hispanic white	620 (62.2)	121 (52.2)	113 (61.1)	96 (55.8)	290 (71.3)	<.001
Non-Hispanic black	151 (15.2)	38 (16.4)	46 (24.9)	26 (15.1)	41 (10.1)	
Hispanic	174 (17.5)	47 (20.3)	23 (12.4)	47 (27.3)	57 (14.0)	
Other	51 (5.1)	26 (11.2)	3 (1.6)	3 (1.7)	19 (4.7)	
English as the second language, n (%)	94 (9.4)	31 (13.4)	15 (8.1)	28 (16.3)	20 (4.9)	<.001
Comorbidities, n (%)						
Hypertension	364 (36.5)	71 (30.6)	107 (57.8)	40 (23.3)	146 (35.8)	<.001
Diabetes	181 (18.2)	47 (20.3)	50 (27.0)	22 (12.8)	62 (15.2)	.001
Hyperlipidemia	98 (9.8)	21 (9.1)	23 (12.4)	8 (4.7)	46 (11.3)	.05
Coronary artery disease	33 (3.3)	7 (3.0)	16 (8.6)	2 (1.2)	8 (2.0)	<.001
OSA	86 (8.6)	16 (6.9)	23 (12.4)	7 (4.1)	40 (9.8)	.02
COPD	21 (2.1)	8 (3.4)	5 (2.7)	2 (1.2)	6 (1.5)	.28
Asthma	92 (9.2)	31 (13.4)	21 (11.4)	10 (5.8)	30 (7.4)	.02
Obesity	90 (9.0)	22 (9.5)	21 (11.4)	10 (5.8)	37 (9.1)	.33
Smoking	237 (23.8)	61 (26.3)	47 (25.4)	39 (22.7)	90 (22.1)	.6

COPD, chronic obstructive pulmonary disease; OSA, obstructive sleep apnea; SD, standard deviation.

All patients arthroscopically treated with débridement or total rotator cuff repair were included, and those <18 years old, pregnant, or immunocompromised were excluded. The demographic data collected for analysis included age, gender, race and ethnic background, zip code of residence, history of medical comorbidities, and tobacco usage. Nonoperative interventions before surgery were recorded and included injections (both corticosteroid and viscosupplementation), oral steroid medications, oral nonsteroidal medications, and physical therapy. We also assessed rates of approval or denial in patients with and without prior receipt of cortisone injection, a common justification for denial by insurance providers. The radiographic and advanced imaging workup of the affected shoulder for each patient was recorded. For patients who met inclusion criteria, the health care insurance status and the type of the plan were recorded. Insurance plans were grouped into four categories: federally backed Medicare plans, state-backed Medicaid programs, private insurance (Preferred Provider Organization, Health Maintenance Organization, etc.), and workers' compensation insurance. Using the electronic medical and billing records, we cross-linked patients who underwent arthroscopic rotator cuff surgery (Current Procedural Terminology code 29827 or rotator cuff débridement and or extensive débridement Current Procedural Terminology codes 29822 and 29823) to insurance denials and subsequently analyzed the different insurance types.

Statistical methods

Patient demographics, clinical characteristics, and prior treatment characteristics were summarized overall and by the primary payer. Differences by the payer were assessed for statistical significance using one-way analysis of variance for age and chi-square or Fisher's exact test for all other comparisons. Univariable and multivariable logistic regression models were developed to estimate adjusted odds ratios (ORs) for payer type associated with the denial of insurance coverage. Analyses were performed using SAS, version 9.4 (SAS Institute, Cary, NC, USA).

Results

Between January 2015 and February 2020, 999 patients underwent procedures for rotator cuff débridement and or extensive débridement and total rotator cuff repair. Two patients were uninsured and were excluded from the final analyses. The mean age

was 56 ± 10 years with just under half female (n = 458, 45.9%) and majority non-Hispanic white (n = 620, 62.2%). The most common comorbidities included hypertension (n = 364, 36.5%), diabetes (n = 181, 18.2%), and hyperlipidemia (n = 98, 9.8%), with nearly one-quarter past or current smokers (n = 237, 23.8%). Patients with Medicare were older than all other payer categories (66 ± 8 years). Those with workers' compensation were predominantly male (70.3%, n = 121). Those with private insurance were more likely to be non-Hispanic white (71.3%), whereas the proportion Hispanic was higher among those with workers' compensation (27.3%) and Medicaid (20.3%). Comorbidities were generally more prevalent in those with Medicare (Table 1).

Nearly all patients received prior magnetic resonance imaging (n = 962, 96.7%) and an x-ray (n = 940, 94.3%). Over two-thirds received treatments including corticosteroid injection (n = 666, 66.9%), physical therapy (n = 697, 70.0%), and an oral nonsteroidal anti-inflammatory or cyclooxygenase-2 inhibitor (n = 710, 71.3%). There were no significant differences by the payer among these prior treatment characteristics except for receipt of a previous surgical intervention (n = 132, 13.3%), where rates were higher for Medicaid (n = 42, 18.2%) and workers' compensation (n = 30, 17.4%) than those for Medicare (n = 23, 12.4%) and private (n = 37, 9.1%) insurance (P = .003) (Table II).

The rates of denials were similar for those who previously received corticosteroid injections (22.1%, 147/666) compared with those who did not (23.9%, 79/330) (P = .50). Furthermore, the addition of previous corticosteroid injections to the multivariable models did not substantially modify the association between the insurance type and the odds of denial.

Those with Medicaid were most likely to have denial of insurance coverage (n = 125, 54.3%), followed by workers' compensation (n = 33, 19.2%), private insurance (n = 51, 12.5%), and Medicare (n = 17, 9.2%). Compared with private insurance and adjusting for age, sex, race, number of comorbidities, and prior treatments, the odds of insurance denial were significantly higher for those with Medicaid (OR: 7.91, 95% confidence interval [CI]: 5.27-11.88) and workers' compensation (OR: 1.71, 95% CI: 1.04-2.81) (Table III).

Discussion

When do differences in orthopedic surgery access become disparities in care? Whitehead et al defined a disparity as a difference

Table II
Prior treatment characteristics including nonoperative (corticosteroid injection and physical therapy) and operative management as well as radiographic modalities.

Treatment	Overall N = 997	Medicaid N = 232	Medicare N = 185	Workers' compensation N = 172	Private N = 408	P value
Previous corticosteroid injection, n (%)	666 (66.9)	147 (63.6)	130 (70.3)	110 (64.0)	279 (68.4)	.37
Previous formal physical therapy, n (%)	697 (70.0)	158 (68.4)	128 (69.2)	129 (75.0)	282 (69.1)	.47
Received oral NSAID or COX2 inhibitor, n (%)	710 (71.3)	168 (72.4)	120 (64.9)	118 (68.6)	304 (74.7)	.08
MRI performed, n (%)	962 (96.7)	226 (97.8)	176 (95.1)	168 (97.7)	392 (96.3)	.39
X-ray performed, n (%)	940 (94.3)	218 (94.0)	173 (93.5)	160 (93.0)	389 (95.3)	.66
Previous surgical intervention, n (%)	132 (13.3)	42 (18.2)	23 (12.4)	30 (17.4)	37 (9.1)	.003

COX2, cyclooxygenase-2; MRI, magnetic resonance imaging; NSAID, nonsteroidal anti-inflammatory drugs.

Table III
Odds ratios for private, Medicaid, Medicare, and workers' compensation associated with denial of coverage.

Payer	N (%) initially denied	Odds ratio	P value	Odds ratio	P value	Odds ratio	P value
		(95% CI)		(95% CI)		(95% CI)	
		Unadjusted		Model 1		Model 2	
Primary payer			<.001		<.001		<.001
Private	51 (12.5)	1 (reference)		1 (reference)		1 (reference)	
Medicaid	126 (54.3)	8.32 (5.63-12.30)	<.001	7.96 (5.33-11.88)	<.001	7.91 (5.27-11.88)	<.001
Medicare	17 (9.2)	0.71 (0.40-1.26)	.24	0.61 (0.33-1.15)	.12	0.62 (0.33-1.15)	.13
Workers' compensation	33 (19.2)	1.66 (1.03-2.69)	.04	1.70 (1.04-2.79)	.03	1.71 (1.04-2.81)	.04

CI, confidence interval.

Model 1 adjusts for: age, sex, race, and number of comorbidities.

Model 2 adjusts for model 1 variables plus previous corticosteroid injection, previous formal physical therapy, receipt of oral NSAID or COX2 inhibitors, MRI performed, x-ray performed, and previous surgical intervention.

that is inequitable, unjust, or unacceptable.^{12,19} In 2003, Braveman et al added that a detailed understanding of the nature and etiology of a difference is required.⁵ The Institute of Medicine defines disparities as “racial or ethnic differences in the quality of health care that are not due to access-related factors or clinical needs, preferences, and appropriateness of intervention”.¹⁶ However, there is no consensus definition of health care disparity because it relies heavily on “who is deciding what is avoidable and unjust and how it is decided.”⁷

Our study highlights the fact that simply possessing health care insurance does not eliminate hurdles to timely, quality, and accessible orthopedic care when it comes to a common diagnosis such as rotator cuff pathology. Patients with state-backed Medicaid insurance plans were most likely to have denial of surgical treatment of their rotator cuff disease (n = 125, 54.3%), followed by workers' compensation (n = 33, 19.2%), private insurance (n = 51, 12.5%), and Medicare (n = 17, 9.2%). Compared with private insurance and adjusting for age, sex, race, number of comorbidities, and prior treatments, the odds of insurance denial were significantly higher for those with Medicaid (OR: 7.91, 95% CI: 5.27-11.88) and workers' compensation (OR: 1.71, 95% CI: 1.04-2.81) (Table III). Thus, in spite of exhaustive nonoperative treatment and documentation of on-going debilitating pain, patients had a statistically significant difference in denial rates for surgical intervention for their rotator cuff disease depending solely on the insurance type.

Several recent reports have documented substantial revenue increases for the five for-profit insurance companies that run the Medicaid programs in our state.¹¹ Those insurance carriers are believed to have collected hundreds of millions of dollars in extra profits during the COVID-19 pandemic, in large part for services never provided to patients.¹¹ An analysis of the quarterly and yearly financial reporting of the five Medicaid insurance carriers in our state demonstrated unprecedented surge in recent profits. Three of the Medicaid companies (Meridian, IlliniCare, and Molina) reported a combined increase of nearly 300 million dollars during the nine-month stretch of the height of the pandemic compared with the same time period of the prior year.¹¹

Insurance denials require substantial time, energy, effort, and resources from both providers and health care organizations to appeal and overturn. The reality is that some providers and organizations do not have the time, incentive, or resources to advocate for and overturn treatment denials on behalf of their patients. These appeal processes and “peer reviews” are disruptive to the health care providers' practices and patient care activities. In addition, they often require substantial administrative support and resources.

Despite varied practice models, this issue affects all of us individually, and the societal responsibility should be borne by us collectively. The American Academy of Orthopaedic Surgeons Principles of Medical Ethics and Professionalism in Orthopaedic Surgery state that “an orthopedic surgeon has a responsibility not only to the individual patient, to colleagues, and orthopedic surgeons in training, but also to society as a whole. Activities that have the purpose of improving the health and well-being of the patient and or the community in a cost-effective way deserve the interest, support, and participation of the orthopedic surgeon.”¹⁸

In spite of this guidance, patients with state-funded insurance plans encounter substantial disparities in their access to musculoskeletal care.^{3,6} As per the most recent report from the Centers for Medicare and Medicaid Services, Medicaid or Medicare insures more than 70.5 million Americans.² A 2017 survey found that less than 50% of orthopedic surgery practices surveyed accepted Medicaid insurance, and in 9 major US cities, acceptance rates were below 50% (Atlanta = 25%, Dallas = 20%, Denver = 35%, Detroit = 45%, Houston = 45%, Los Angeles = 15%, Miami = 15%, New York = 20%, and Washington DC = 30%).¹⁰ Reasons among surgeons given for not accepting Medicaid included low reimbursement rates, administrative burdens, patients' nonmedical needs, challenges keeping appointments, and compliance with treatment plans.

In a nationwide orthopedic survey, Labrum et al found that adult patients with Medicaid insurance had limited access to care in 32% of orthopedic practices: 37% of private and 13% of academic practices.¹³ In addition, patients with Medicaid were less likely to be offered an appointment within 2 weeks (36% vs. 89%).¹³ Patterson

et al had similar findings in a regional study where they found that a patient with Medicaid insurance was offered an appointment within two weeks 59% of the time compared with the same patient with private insurance 79% of the time.¹⁵

In a recent study investigating outcomes after rotator cuff surgery, Fu et al demonstrated that patients who experienced a delay in arthroscopic rotator cuff repair had an increased risk of a revision cuff surgery.⁹ On the basis of time from diagnosis to repair, patients were stratified into an early repair group (<6 weeks), a routine repair group (between 6 weeks and 12 months), or a delayed repair group (>12 months). A total of 2759 patients were included, with 1510 (54.7%) undergoing early repair, 1104 (40.0%) undergoing routine repair, and 145 (5.3%) having delayed repair. The overall revision rate at 5-year follow-up was 9.6%. The revision rate was higher in the delayed group (15.2%) relative to the early (9.9%) and routine (8.3%) groups. Delayed rotator cuff repair was associated with an increased risk of undergoing subsequent revision rotator cuff repair while controlling for age and medical comorbidities.

In our study, we found that Hispanic patients represented only 17.5% of the overall cohort, but made up 47.3% of the patients with either Medicaid or workers' compensation insurance. In addition, 94 of the 999 (9.4%) patients required an interpreter for language translation or reported nonfluent proficiency with the English language. In the patients with a substantial language barrier, 63% had either Medicaid or workers' compensation insurance. In our population, under-represented ethnic minority patients may represent a subgroup that is especially vulnerable to insurance denials. The increased denial rates by insurance carriers, in spite of appropriate nonoperative treatment failures, increase the fiscal or administrative burden on health care providers and health care systems but more importantly may negatively impact patient outcomes and quality of life.

Our study has several limitations and drawbacks. First, because Medicaid and workers' compensation insurance programs vary from state to state, our findings may be specific to the state in which we practice and, thus, not adaptable to all state models. In addition, our practice model is an academic tertiary referral practice, which may bias both the type of insurance and the type of patients seen in our practice compared with different practice models. Furthermore, the patient population treated at our institution does not equivocally translate, especially when assessing differences in urban vs. rural communities. Finally, our cohort includes only patients who ultimately underwent surgical treatment of their rotator cuff disease and, thus, patients whose insurance denials were ultimately appealed and overturned. Consequently, this cohort does not capture patients who were lost to follow-up after initial insurance denial or patients who ultimately decided against surgical intervention for their rotator cuff disease. These limitations necessitate future work to highlight potential differences and help improve our overall understanding.

Conclusion

Our study found that the type of health care insurance was a statistically significant independent risk factor for insurance denial for arthroscopic rotator cuff surgery. Ethnic minorities were disproportionately represented among the insurance carriers most likely to deny services and, thus, may face barriers to care that can negatively impact patient outcomes and complication rates. The main goal of the United States' health care system should be to provide quality and timely care to patients who are in need, regardless of their insurance type. Orthopedic surgeons should

actively confront barriers to more equitable musculoskeletal care. Through advocacy, policy changes, workforce diversification, and practice changes, we can develop solutions that improve access, quality, and cost-effectiveness for our respective communities.

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