Brief Communication of Original Research

CJIM | **Research**

Examining Differential Rotator Cuff Pathology Management Based on Socio-Demographic Factors of Race, Sex, and Insurance Status in Western North Carolina

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Statement of Significance

The purpose of this study was to investigate disparities in the treatment of rotator cuff pathology by sex, race, and insurance status. Our findings suggested disadvantaged groups did not receive fewer interventions within the clinic of interest. The study was limited by a small sample size in a single clinic in rural North Carolina. Future studies are needed to make the findings generalizable across different clinic settings.

Background: Rotator cuff pathology (RCP) affects a significant portion of the global population and can cause notable pain and reduction in function. Many treatment options exist for RCP, including physical therapy, injections, and surgery. Literature indicates management disparities exist between demographic groups, such as racial self-identity, gender, and socioeconomic status. Studies suggest women, non-white patients, and those of low socioeconomic status are less likely to receive definitive surgical treatment and experience increased time from presentation to surgery.

Methods: We conducted a retrospective chart review to determine if race, gender, or socioeconomic status affected treatment decisions for RCP at a sports medicine clinic in western North Carolina. Data from patients with clinically suspected RCP from January 2018–April 2020 were assessed for associations between demographic factors and differences in the management. Management options included MRI, physical therapy, injection, or referral to orthopedic surgery.

Results: 178 patients were included in the study. There was not a statistically significant difference in treatments between genders, although females showed a trend towards more referrals to orthopaedic surgery ($p=0.06$). Non-white patients were found to receive MRI at a higher rate ($p<0.05$), but race and insurance status otherwise exhibited no significant differences in management.

Conclusions: Our data did not observe management disparities based on sex, race, or insurance status, which was used as a surrogate for socioeconomic status, in the sample population.

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Rotator cuff pathology (RCP) affects a significant portion of the population and causes notable pain and reduction in function in many patients.[1] RCP disproportionately occurs in older patients and it is reasonable to assume the burden of RCP will rise in the United States as the population of older adults continues to increase. While multiple imaging modalities can evaluate RCP, MRI is the most common, sensitive, and specific diagnostic modality.[2] Treatment options for RCP include physical therapy, injections, and surgery.[3–10] These modalities may be used concurrently or patients may progress along the treatment scale depending on clinical response. Physical therapy is the most common initial treatment. Refractory disease may be managed by injections and referral to orthopedic surgery.[11] Common surgical procedures include rotator cuff reconstruction, debridement of damaged or inflamed structures, and subacromial decompression.

Contemporary literature indicates disparities among racial groups, genders, and individuals of differing socioeconomic status in all areas of medicine. This phenomenon also holds true in the treatment orthopaedic injuries. A study of 17,156 trauma patients with calcaneal fractures demonstrated statistically significant differences in treatment modality selection between sexes, races, and types of insurance status.[12] Multiple studies further demonstrated female patients, non-white patients, and patients of low socioeconomic status are less likely to receive definitive surgical treatment and experience significantly longer wait times between presentation and surgery in the treatment of rotator cuff tears.[13–16] Prior studies evaluating social determinants of health utilized insurance status as a proxy for socioeconomic status and identified management disparities based on patients' insurance.[17,18] The purpose of this study was to evaluate disparities in the treatment of rotator cuff tendinopathy based on sex, race, and insurance status in an outpatient rural clinic. We hypothesized fewer definitive interventions would be offered to patient groups previously associated with health disparities, including female patients, patients who do not identify as white, and patients with non-private insurance.

Methods

Data Query

A retrospective chart review queried patients with rotator cuff tendinopathy from January 2018 through April 2020 at Mountain Area Health Education Center (MAHEC) Sports Medicine and Family Medicine Residency Clinic in Asheville, North Carolina. The query identified patients via the electronic medical record Epic (Epic Systems, Madison, WI) aged 18 to 75 years with a diagnosis of RCP, as identified via ICD-10 codes for rotator cuff tear, shoulder impingement or subacromial bursitis (M75.1, M75.4, M75.50). Exclusion criteria removed patients with comorbid osteoarthritis of the glenohumeral or acromioclavicular joints. Patients meeting these criteria were automatically excluded via the initial query. Vulnerable populations, including pregnant patients and incarcerated patients, were not excluded. All data were reviewed by four authors and were stored in Microsoft Excel 2019 (Microsoft Corporation).

Patient Demographics and Outcome Measures

Sex, race, and insurance status as reported in the electronic medical record were recorded for the sample population following application of inclusion and exclusion criteria. Procedure and referral codes were utilized to identify outcome measures (treatment or diagnostic orders). Outcomes were recorded as: physical therapy, steroid injection, MRI, or referral to orthopaedic surgery.

Statistical Analysis

Following data coding, all patient demographics and outcome measures were summed and condensed into pivot tables using Microsoft Excel 2019. Chi-squared and Fisher exact tests were used to compare the four outcome measures across the demographic variables of interest to determine if a significant difference existed among groups. Insurance status was compared between two cohorts: private vs non-private (Medicaid, Medicare, and uninsured). Statistical significance was set at $\alpha = 0.05$.

Study Approval

This project was granted Category 4 exemption by the Mission Health Institutional Review Board (20-12-2001). All research was conducted in compliance with Mission Health policies and procedures on human subject research.

Results

A total 191 patients met inclusion criteria, of whom 13 were excluded for a final sample set of 178 patients. The population demonstrated a roughly even distribution of male (47.2%, n = 84) and female (52.8%, n = 94) patients. Patients identified as white represented a majority of the sample set (78.7%, n = 140). Of non-white patients, 15 were coded as other/unknown and excluded. Patients included in the remaining non-white cohort (n = 23) were identified as African American (56.5%, n = 13), Latinx (30.4%, n = 7), Asian American (8.07%, n = 2), and Native American (4.35%, n = 1). Most patients were privately insured (48.3%, n = 86), followed by Medicare (38.2%, n = 68), Medicaid (10.1%, n = 18), and uninsured (3.37%, n = 6). In the combined comparison, all 92 patients without private insurance were aggregated within the 'non-private insurance' group (Table 1).

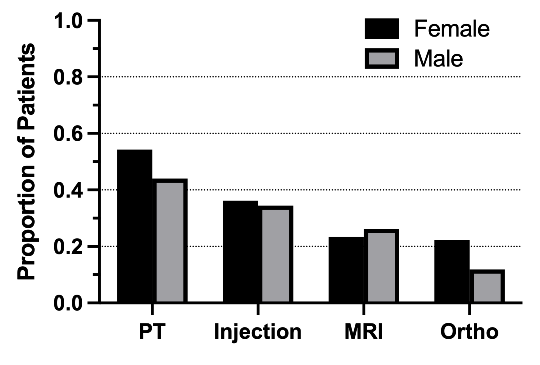

Figure 1. Proportion of male and female patients who received physical therapy (PT), injections, MRI, or referral to surgery (ortho) for RCP.

Female patients demonstrated a higher rate of referral to orthopedic surgery when compared to male counterparts, but not to a level of statistical significance (22.3% vs 11.9%; p = 0.06). There were no further differences among the sexes, with rate of physical therapy, injections, and MRI being very similar between males and females (Figure 1). Non-white patients had a statistically significant higher rate of MRI with 43.5% of patients receiving imaging compared to 23.6% in white patients ($p < 0.05$). There were no additional differences to report among identified race for other interventions (Figure 2).

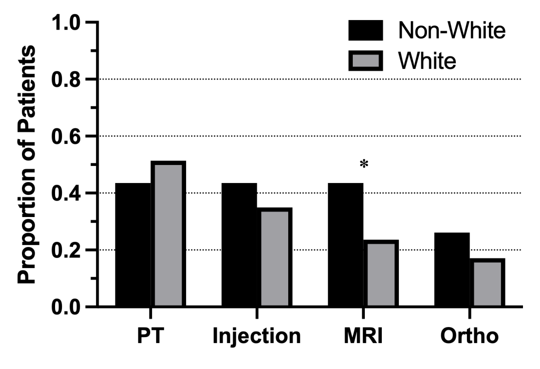

Figure 2. Proportion of white and non-white patients who received physical therapy (PT), injections, MRI, or referral to surgery (ortho) for RCP. (*p> 0.05)

Patients with private insurance were less likely to receive any of the interventions of interest, but the relationship was not found to demonstrate statistical significance (Figure 3).

Discussion

Contrary to prior studies, our data did not suggest statistically significant differences between groups of interest in the majority of our comparisons, with the exception of non-white patients receiving more MRIs than white patients. The absence of statistically significant differences could represent a type II error secondary to inadequate statistical power inherent to small sample sizes. To minimize the influence of random error, future studies should utilize larger sample sets within this population. Extraneous variables such as occupation or severity of injury likely contributed to treatment decisions and controlling for such factors

Table 1. Incidence of management choice stratified by demographic variables.

	PT	Injection	MRI	Ortho	Total
Sex					
Male	37 (44.0%)	29 (34.5%)	22 (26.2%)	10 (11.9%)	84 (47.2%)
Female	51 (54.3 %)	34 (36.2%)	22 (23.4%)	21 (22.3%)	94 (52.8%)
Race					
White	72 (51.4%)	49 (35.0%)	33 (23.6%)	24 (17.1%)	140 (85.9%)
Non-white	10 (43.5%)	10 (43.5%)	10 (43.5%)	6 (26.1%)	23 (14.1%)
Insurance Status					
Private	38 (44.2%)	29 (33.7%)	19 (22.1%)	11 (12.8%)	86 (48.3%)
Non-Private	50 (54.3%)	34 (37.0%)	25 (27.2%)	20 (21.7%)	92 (51.7%)
Total	88 (49.4%)	63 (35.4%)	44 (24.7%)	31 (17.4%)	178 (100%)

in additional studies might elucidate differences not revealed by our initial analysis. Nevertheless, our findings do not align with the hypothesis that RCP management disparities would exist among demographic cohorts. We expected to see fewer interventions for demographic cohorts classically associated with health disparities including female patients, non-white patients, and patients with non-private insurance.

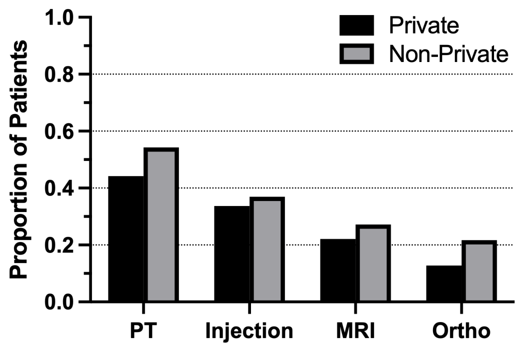

Figure 3. Proportion of patients with private and non-private insurance who received physical therapy (PT), injections, MRI, or referral to surgery (ortho) for RCP.

While these data are reassuring, disparities are well-established in existing literature.[11–15] Despite study limitations, our data seem to suggest the clinic of interest in rural North Carolina has been successful at identifying and seeking to eliminate these disparities. Further studies investigating why certain clinics outperform others regarding demographic disparities would provide an avenue to assess the primary drivers of these disparities and ultimately create change.

Chart review represents a practical way to take a clinical pulse of your practice and one of the first steps to assessing equitable care. The Robert Wood Johnson Foundation suggests using such investigations as a baseline followed by root cause analysis to find solutions for individual clinics.[19] This approach, though used for sports medicine conditions here, can be applied to all care provided in specialty and primary care clinics.

Conclusion

Ultimately, our data did not support the initial hypothesis. Sex, race, and insurance status did not appear to impact rates of physical therapy, injections, MRIs, or referrals to orthopaedic surgery—other than the observation that non-white patients received MRIs at a higher rate than white patients. Additional studies and interventions are needed to further investigate disparities, not only in the treatment of rotator cuff tendinopathy, but also in the treatments and therapeutic procedures provided for a broader range of conditions in other areas of medicine.

Limitations Statement

There are multiple limitations to our study. First, we utilized a relatively small sample size with a disproportionate distribution of patients identifying as white. However, the small sample size does limit any conclusions we may draw about equitable care at this clinic. Additionally, these data come from a small clinic in rural North Carolina and are not generalizable to the entire population. A multicenter study or additional studies with a more urban population would be an important step to take to further study the topic of disparities in rotator cuff treatment. Also, variables such as age, BMI, and medical comorbidities were not controlled for in the study. Finally, we pulled three different ICD-10 codes for shoulder impingement, rotator cuff tear, and rotator cuff injury and these were aggregated into one RCP group. A larger sample would allow stratification by each of these diagnoses.

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