Contribution of Area Deprivation Index and Preoperative Demographics to PROMIS Outcomes following Arthroscopic Rotator Cuff Repair

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INTRODUCTION:

Patients who undergo arthroscopic rotator cuff repair (ARCR) require a strenuous rehabilitation process that may strain their mental and physical well-being. As a result, factors such as one's socioeconomic background may exasperate poor surgical outcomes. To objectively quantify one's socioeconomic background; metrics such as the Area Deprivation Index (ADI) have been formed. ADI incorporates 17 variables attributed to socioeconomic status such as "Education status, Household income, Automobile access, Neighborhood violence, etc" normalized into single quantifiable metric ranging from 0-100: with higher ADI values representing increase levels of socioeconomic deprivation. ADI, therefore, may have the potential to serve as an alternative for surgical risk assessment when compared to other demographic variables such as race or gender. The purpose of the study was to assess if there would be a significant difference in Patient Reported Outcomes Measurement Information System (PROMIS) outcomes when comparing patients from the highest level to the lowest level of ADI quartile

METHODS:

1382 patients who underwent ARCR from 6 fellowship trained board-certified orthopaedic surgeons were retrospectively identified. After inclusion and exclusions criteria were applied a total of 740 patients were included for final analysis. ADI value was given based upon a patient's zip code census block. The national mean for ADI has been set at a value of 50.0. Patients were then separated into 4 quartiles. Bivariate and multi linear regression analysis was performed on the lowest vs most deprived ADI quartiles for PROMIS Depression, Physical Function (PF) and Pain Interference (PI). Furthermore, bivariate analysis was performed to assess if one's ADI value was affiliated with pre and post operative shoulder forward flexion (FF) and external rotation (ER). PROMIS values and ROM were collected and recorded prior to the subject's surgery and at 2 years follow up. Multi-logistic Regression analysis was used to assess for differences in descriptive variables between the least and most deprived ADI cohorts. Multi-linear regression analysis was performed to account for the influence of other demographic on PROMIS outcomes. (Table 1) Significance was set at a P value of 0.05.

RESULTS:

The mean ADI value of our entire cohort was 57.0 with a standard deviation of 19.0. The least deprived ADI quartile had a value of 32.4 and most deprived a value of 82.7. A county level map around our primary surgical center was created to illustrate the majority ADI quartile per county. (Figure 1) It was found that a higher percentage of patients who resided in the major city where our center was located were within the most deprived ADI quartile.

Multivariate logistic regression assessing for differences in demographic data when comparing the two quartiles illustrated that patients in the most ADI deprived group had increased odds for: increased BMI (OR:1.4, 95CI; 1.4-1.9), tobacco use (OR: 4.13,95CI: 1.40-13.5), and identifying as "Black" for race (OR:8.05, 95CI: 2.16-40.7) when compared to the least deprived ADI quartile. Bivariate analysis demonstrated significant differences between the most and least ADI deprived quartiles in Pre, Post-Operative and Delta PROMIS Depression, PF and PI ($p<0.001$) (Table 2). Furthermore, patients who were within the most deprived quartile had lower preoperative Forward Flexion when compared to the least deprived ($p<0.01$) (Table 3). However, there was no significant difference in forward flexion measurements in post-operative follow up ($P=0.80$). Multivariate linear regression analysis demonstrated significant differences in Pre- and Post-Operative PROMIS PF ($p<0.05$), ($p<0.05$) respectively between the highest and lowest ADI quartile. (Table 1) Moreover, Race was determined to be a nonsignificant contributor for pre- and post-operative PROMIS PF. Finally, ADI and Race were non-significant for pre – and post-operative PROMIS Depression and PI scores.

DISCUSSION AND CONCLUSION:

Patients who were in higher socioeconomically deprived areas had significantly worse preoperative PROMIS PF and shoulder FF ROM followed by worse postoperative PROMIS PF when compared to their counterpart. Patients who are in higher deprived areas may be influenced by a variety of physiological and psychological variables that may contribute to worse outcomes following arthroscopic rotator cuff repair. As certain demographic factors may be influenced by subjective interpretation, quantitative metrics such as ADI may provide for an alternate solution when identifying risk factors for poor surgical outcomes.

Variables	*Q1 (n=176)*		*Q4(n=175)*		*P-Value*
ADI					
Mean (STD)	32.4	9.36	82.7	9.00	p<0.001
Physical Function, Preop					
Mean (STD)	42.89	7.86	42.84	7.87	p<0.001
Physical Function, Postop					
Mean (STD)	42.17	8.73	43.25	8.76	p<0.001
Physical Function, Delta					
Mean (STD)	-0.72	8.53	0.41	8.56	p<0.001
Pain Interference, Preop					
Mean (STD)	58.45	9.45	58.16	9.84	p<0.001
Pain Interference Postop					
Mean (STD)	58.00	8.43	56.71	9.70	p<0.001
Pain Interference Delta					
Mean (STD)	-0.45	10.19	-1.45	10.92	p<0.001
Depression Preop					
Mean (STD)	44.84	12.18	46.30	10.77	p<0.001
Depression, Postop					
Mean (STD)	46.30	10.73	45.65	10.40	p<0.001
Depression, Delta					
Mean (STD)	1.462	11.18	-0.63	9.80	p<0.001