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JSES International

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## Preoperative factors associated with patient satisfaction 2 years after elective shoulder surgery



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### ARTICLE INFO

#### Keywords:

Orthopedic  
Shoulder  
Satisfaction  
Outcomes  
PROMIS  
PROs  
Patient perspective

Level of evidence: Level II; Retrospective  
Multivariable Analysis; Prognostic Study

**Background Purpose:** Patient satisfaction has become an increasingly important component of quality measures for both hospital reimbursement and quality assessment. Additionally, patient satisfaction influences patient behavior and patient follow-up. The purpose of this study was to identify preoperative factors associated with patient satisfaction 2 years after shoulder surgery.

**Methods:** Electronic surveys were used to collect patient information including demographic, surgical, and social history, as well as outcome data. Satisfaction was measured 2 years after surgery using the Surgical Satisfaction Questionnaire.

**Results:** Multivariable linear regression identified preoperative Patient-Reported Outcomes Measurement Information System Pain Interference, annual income, and American Society of Anesthesiologists score as independent predictors of lower patient satisfaction, while total shoulder arthroplasty was an independent predictor of greater patient satisfaction. The model accounted for 15% of the variance in satisfaction scores ( $R^2 = 0.15$ ).

**Conclusion:** Patient satisfaction 2 years after shoulder surgery is associated with preoperative patient-reported outcome scores. Lower patient satisfaction is independently predicted by greater preoperative PROMIS PI, income less than \$70,000, and ASA score >1, while higher patient satisfaction is predicted by total shoulder arthroplasty.

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Patient satisfaction has become an increasingly important component of quality measures for both hospital reimbursement and quality assessment.<sup>8,26,27,29,36</sup> Under the Centers for Medicare & Medicaid Services Quality Payment Program, health-care providers and practices are now financially incentivized to report patient satisfaction metrics. Additionally, patient satisfaction influences patient behavior, as patients who are more satisfied are more likely to comply with treatment regimens and attend follow-up appointments.<sup>1,10,14</sup> Consequently, it is important for clinicians to understand the factors influencing patient satisfaction.

Among patients undergoing shoulder surgery, the reasons for outcome dissatisfaction can vary.<sup>11,17</sup> Measuring patient satisfaction can provide important information about patient treatment perception.<sup>24</sup> Several studies have shown an association between

shoulder surgery satisfaction and postoperative patient-reported outcome measures.<sup>2,3,5,13,19,20,23,30</sup> However, studies that have assessed the relationship between patient satisfaction and preoperative factors have been less clear.<sup>2,5,13,15,19–21,25,30</sup> This is in part because patient satisfaction is multidimensional and difficult to define, which has led to the use of inconsistent methodologies and unvalidated assessment tools in the prior literature.<sup>8</sup> A comprehensive understanding of the preoperative factors influencing patient satisfaction after shoulder surgery could provide surgeons with information to optimize outcomes and minimize dissatisfaction.

The purpose of this study was to identify the preoperative factors associated with patient satisfaction 2 years after shoulder surgery. We hypothesized that greater satisfaction would be associated with increased age, lack of a workers' compensation claim, and better preoperative pain, function, and general health.

### Methods

A cohort of 389 patients who underwent elective shoulder surgery between June 2015 and May 2018 was identified

This study was approved by the University of Maryland, Baltimore Institutional Review Board, HP-00062261-6.

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<https://doi.org/10.1016/j.jseint.2022.04.008>

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**Table 1**  
Top 10 CPT codes by mean SSQ-8 scores.

CPT code	Count	Procedure description	Mean SSQ-8 score	SD
29827	59	Arthroscopic rotator cuff repair	79.8	19.9
23472	56	Arthroplasty, glenohumeral joint; total shoulder (glenoid and proximal humeral replacement)	83.3	17.7
29806	39	Arthroscopic capsulorrhaphy	77.4	22.6
29825	24	Arthroscopic lysis and resection of adhesions, with or without manipulation	77.3	23.8
29823	13	Arthroscopic debridement, extensive	77.4	22.3
29807	11	Arthroscopic repair of SLAP lesion	79.0	14.6
23462	12	Capsulorrhaphy, anterior, any type; with coracoid process transfer	84.6	28.7
23515	9	Open treatment of clavicular fracture, includes internal fixation, when performed	92.7	10.7
29826	8	Arthroscopic decompression of subacromial space with partial acromioplasty, with coracoacromial ligament (ie, arch) release, when performed	92.6	12.2
29828	7	Arthroscopic biceps tenodesis	61.2	23.5

CPT, Common Procedural Terminology Code; SSQ-8, Surgical Satisfaction Questionnaire-8; SD, standard deviation; ANOVA, analysis of variance; SLAP, superior labrum anterior posterior.

Mean SSQ-8, score was analyzed against CPT code using ANOVA. There was a significant difference in mean SSQ-8 score between CPT codes ( $P = .021$ ).

SLAP, superior labrum anterior posterior

retrospectively. All surgeries were performed at a single urban institution, and data were collected using an institutional review board-approved orthopedic registry.<sup>12</sup> Patients enrolled in the registry were given an electronic survey within 1 week of surgery and 2 years after surgery. Of the 389 patients enrolled within the study timeframe, 288 (74%) patients completed the follow-up survey and were included in the final analysis.

Demographic and surgical history was self-reported, while medical records were queried for relevant information including body mass index, number of comorbidities, preoperative opioid use, American Society of Anesthesiologists (ASA) score, and Current Procedural Terminology (CPT) code(s). Preoperative opioid use was defined as any patient with an active narcotic prescription up to 6 weeks before surgery. Self-reported demographics included gender, race, ethnicity, marital status, caretaker status, employment status, insurance type, legal claim related to surgery, smoking status, weekly alcohol consumption, and recreational drug use. To determine caretaker status, patients were asked the following questions: 1) “Do you live with someone who could take care of you if you were unable to care for yourself?” and 2) “Do you have family or friends who could take care of you if you were unable to care for yourself?”

Patients completed Patient-Reported Outcomes Measurement Information System (PROMIS; HealthMeasures, NIH Grant U2C CA186878, Chicago, IL, USA) computer-adaptive testing in 6 domains: Physical Function (PF) v1.2, Pain Interference (PI) v1.1, Fatigue v1.0, Social Satisfaction v1.0, Anxiety v1.0, and Depression v1.0. Patients also completed several other questionnaires that assessed function, pain, and activity levels. Shoulder function was assessed using the American Shoulder and Elbow Surgeons (ASES) shoulder assessment form.<sup>18</sup> Pain was assessed using numerical pain scales (NPS) for shoulder pain and pain in the rest of the body.<sup>7</sup> Patient activity levels were measured using the Tegner Activity Scale,<sup>31</sup> the International Physical Activity Questionnaire,<sup>6</sup> and the Marx Shoulder Activity Rating Scale (MARS).<sup>4</sup> Patients’ preoperative expectations of surgery, and the degree to which these preoperative expectations were met, was measured using the Musculoskeletal Outcomes Data Evaluation and Management System.<sup>30,35</sup> The MARS and Musculoskeletal Outcomes Data Evaluation and Management System scores were normalized from 0 to 100, with 100 representing the highest level of function and expectations, respectively.

Patient satisfaction, the primary outcome of this study, was measured using the Surgical Satisfaction Questionnaire-8 (SSQ-8) (Supplementary Appendix S1).<sup>9</sup> The SSQ-8 captures multiple domains of patient satisfaction including pain control, recovery time, and surgical results. Overall satisfaction with surgical results was

assessed by asking the following questions: “Would you recommend this surgery to someone else?” and “[Would you] do it all over again?”. Responses to each item are rated on a 5-point Likert-type scale (1 = very satisfied; 5 = very unsatisfied). The raw SSQ-8 score was normalized from 0 to 100, where 100 represents the highest level of satisfaction.

Mean and standard deviation were used to describe continuous variables, while frequency and percentage were used to describe categorical variables. Spearman’s correlation coefficient ( $r$ ) was used to assess the relationship between mean satisfaction scores and continuous variables. A Wilcoxon rank-sum test (2-group comparisons) or Kruskal-Wallis test (comparisons between more than 2 groups) was used to compare means of categorical variables. A backward stepwise multivariable regression was performed using Bayesian information criteria to identify predictors of patient satisfaction scores. Several variables, including age, gender, race, ethnicity, and workers’ compensation, were chosen *a priori* based on clinical relevance. Preoperative variables with a  $P$  value  $\leq .1$  in the bivariate analyses were also added to the model *a posteriori*. Statistical tests used were 2-sided with an alpha level of 0.05 to determine statistical significance. JMP Pro, Version 13, software was used for all calculations (JMP, Version 13; SAS Institute Inc., Cary, NC, USA).

**Results**

The median satisfaction score for the overall cohort at follow-up was 84.4 (interquartile range, 69.5–96.9), and ceiling effects were observed in 71 (24.6%) patients. There was a significant difference in satisfaction scores between shoulder procedures ( $P = .021$ ) (Table 1).

**Table 2**  
Continuous patient characteristics by 2-year SSQ-8 scores.

Variable	Mean	SD	$r^*$	$P$ value <sup>†</sup>
Age (yr)	49.1	16.6	0.01	.81
BMI	30.2	6.6	−0.11	.06
No. comorbidities	1.5	1.4	−0.16	<b>.006</b>
No. prior surgeries on operative shoulder	0.3	0.8	−0.05	.37
No. prior orthopaedic surgeries	1.8	2.6	0.05	.41
Total no. prior surgeries	4.3	4.9	−0.06	.31

SSQ-8, Surgical Satisfaction Questionnaire-8; SD, standard deviation; BMI, body mass index; no., number.

Bold values indicate statistical significance ( $P < .05$ ).

\* $r$  = Spearman’s correlation coefficient.

†Significance determined at  $P < .05$  (Wilcoxon rank-sum).

**Table III**  
Categorical patient characteristics by 2-year SSQ-8 scores.

Variable	No. of patients	%	Mean SSQ-8 score	SD	P value*
Sex					.19
Female	126	43.8	78.30	21.9	
Male	162	56.3	81.56	19.6	
Race					.07
White	198	70.5	81.94	19.6	
Black	61	21.7	74.51	23.9	
Other	22	7.8	77.27	19.2	
Ethnicity					.07
Hispanic or Latino	12	4.2	86.72	24.1	
Not Hispanic or Latino	271	95.8	79.84	20.5	
Marital status					.58
Single	124	50.0	80.19	20.5	
Married	124	50.0	81.21	20.6	
Living with caretaker					.08
No	48	19.2	85.37	18.4	
Yes	202	80.8	79.62	20.9	
Family/Friend caretaker					.36
No	12	4.8	79.43	15.2	
Yes	236	95.2	80.68	20.8	
Education					.05
Did not complete high school	10	4.0	74.69	22.8	
High school graduate	120	48.4	77.74	22.1	
College graduate	118	47.6	84.43	17.9	
Employment					.17
Unemployed	100	39.8	77.71	23.4	
Employed	125	49.8	81.81	18.7	
Student	26	10.4	87.38	14.8	
Income					<.001
<\$70,000	95	46.8	73.42	23.2	
>\$70,000	108	53.2	86.65	15.9	
Insurance					.96
None	1	0.4	84.38	-	
Government	72	27.7	81.04	20.2	
Private	187	71.9	80.03	21.2	
Legal claim related to surgery					.15
Yes	26	10.6	73.64	26.1	
No	219	89.4	81.64	19.3	
Workers' compensation					.14
Yes	18	7.4	71.43	26.1	
No	225	92.6	81.44	19.6	
Smoking					.018
Never	161	64.1	83.20	18.6	
Current or former smoker	90	35.9	76.37	22.9	
Alcohol					.40
Never drink	78	31.2	78.24	22.2	
Less than 4 times per week	156	62.4	82.08	19.7	
Greater than 4 times per week	16	6.4	79.69	19.9	
Recreational drug use					.027
No	233	95.5	81.36	20.0	
Yes	11	4.5	67.45	21.7	
Preoperative opioid use					.024
No	196	68.8	82.09	19.4	
Yes	89	31.2	76.07	22.8	
ASA score					.010
1	81	28.1	86.16	16.2	
2	176	61.1	78.24	21.3	
3	30	10.4	76.57	23.3	
4	1	0.3	31.25	-	
Laterality					.86
Right	176	61.1	79.84	21.5	
Left	112	38.9	80.60	19.2	
Injury led to surgery					.42
No	90	36.3	79.41	20.3	
Yes	158	63.7	81.41	20.8	

SSQ-8, Surgical Satisfaction Questionnaire-8; no., number; SD, standard deviation; ASA, American Society of Anesthesiologists.

Bold values indicate statistical significance ( $P < .05$ ).

\*Significance determined at  $P < .05$  (Wilcoxon rank-sum test for 2-group comparisons, Kruskal-Wallis test for comparisons between more than 2 groups).

Worse 2-year SSQ-8 score was significantly correlated with greater number of comorbidities ( $r = -0.16, P = .006$ ) (Table II). Lower satisfaction scores were also associated with income less than \$70,000 ( $P < .001$ ), smoking ( $P = .018$ ), recreational drug use

( $P = .027$ ), preoperative opioid use ( $P = .024$ ), and a higher ASA score ( $P = .010$ ) (Table III). No significant relationship was found between satisfaction and gender, marital status, workers' compensation status, or employment status (Table III).

**Table IV**  
Correlations between patient-reported outcome measures and postoperative SSQ-8 scores.

Patient-reported outcome measure	Preoperative				Two yr postoperatively				Change			
	Mean	SD	r*	P value <sup>†</sup>	Mean	SD	r*	P value <sup>†</sup>	Mean	SD	r*	P value <sup>†</sup>
PROMIS Physical Function	42.9	8.9	0.19	<b>.002</b>	51.5	11.2	0.50	<b>&lt;.001</b>	<b>8.8</b>	11.0	0.33	<b>&lt;.001</b>
PROMIS Pain Interference	61.4	7.3	-0.27	<b>&lt;.001</b>	50.9	10.3	-0.57	<b>&lt;.001</b>	<b>-10.7</b>	9.4	-0.43	<b>&lt;.001</b>
PROMIS Fatigue	53.1	10.6	-0.23	<b>&lt;.001</b>	47.6	11.6	-0.51	<b>&lt;.001</b>	<b>-5.7</b>	10.6	-0.28	<b>&lt;.001</b>
PROMIS Social Satisfaction	41.7	9.7	0.22	<b>&lt;.001</b>	51.5	12.0	0.51	<b>&lt;.001</b>	<b>9.9</b>	12.9	0.27	<b>&lt;.001</b>
PROMIS Anxiety	54.9	8.8	-0.22	<b>&lt;.001</b>	49.2	10.9	-0.43	<b>&lt;.001</b>	<b>-5.9</b>	10.3	-0.24	<b>&lt;.001</b>
PROMIS Depression	49.1	9.4	-0.18	<b>&lt;.001</b>	47.1	9.6	-0.40	<b>&lt;.001</b>	<b>-2.2</b>	9.3	-0.19	<b>.002</b>
ASES	43.0	21.5	0.20	<b>&lt;.001</b>	76.7	24.3	0.62	<b>&lt;.001</b>	<b>35.2</b>	24.6	0.37	<b>&lt;.001</b>
NPS Shoulder	5.2	2.8	-0.16	<b>.012</b>	2.1	2.6	-0.56	<b>&lt;.001</b>	<b>-3.2</b>	3.2	-0.31	<b>&lt;.001</b>
NPS Body	1.7	2.3	-0.16	<b>.011</b>	2.4	2.6	-0.28	<b>&lt;.001</b>	<b>0.7</b>	2.3	-0.11	.09
IPAQ (MET-min/week)	4658	5019	0.14	<b>.048</b>	8431	10331	0.10	.13	<b>3411</b>	11036	-0.03	.69
Tegner Activity Scale	2.4	2.1	0.17	<b>.007</b>	4.1	2.7	0.40	<b>&lt;.001</b>	<b>1.9</b>	2.7	0.22	<b>&lt;.001</b>
MARS Shoulder	62.8	25.7	0.08	.23	58.8	23.5	0.31	<b>&lt;.001</b>	<b>-3.7</b>	25.6	0.19	<b>.004</b>

SSQ-8, Surgical Satisfaction Questionnaire-8; SD, standard deviation; PROMIS, Patient-Reported Outcomes Measurement Information System; ASES, American Shoulder and Elbow Surgeons; NPS, numerical pain scale; IPAQ, International Physical Activity Questionnaire; MET, metabolic equivalent time; MARS, Marx Activity Rating Scale. Bolded mean change scores: Statistically significant difference between preoperative and postoperative scores ( $P < .05$ ).

\*r = Spearman's correlation coefficient.

<sup>†</sup>Significance determined at  $P < .05$  (Wilcoxon rank-sum).

Better scores on all preoperative measures except MARS were significantly associated with better patient satisfaction. Preoperative PROMIS PI ( $r = -0.27$ ) and PROMIS Social Satisfaction ( $r = 0.22$ ) showed the strongest associations to worse and better patient satisfaction, respectively. Similar associations were observed among 2-year postoperative patient-reported outcome measures; however, postoperative International Physical Activity Questionnaire was not significantly associated with satisfaction ( $P = .13$ ), whereas the postoperative MARS was ( $r = 0.31, P < .001$ ). Postoperative PROMIS PI ( $r = -0.57$ ) and ASES ( $r = 0.62$ ) showed the strongest associations to worse and better patient satisfaction, respectively (Table IV).

The relationship between change in patient-reported outcome score, defined as the difference between the postoperative and preoperative scores, and satisfaction is shown in Table VI. Mean change scores on all patient-reported outcome measures except NPS Body and MARS, which both worsened significantly, matched with significant improvements relative to baseline. Higher postoperative PROMIS PF, PROMIS Social Satisfaction, ASES, Tegner Activity Scale, and MARS scores relative to baseline were significantly associated with better patient satisfaction ( $P < .05$ ). Additionally, greater postoperative improvement in PROMIS PI, PROMIS Fatigue, PROMIS Anxiety, PROMIS Depression, and NPS Shoulder Pain was significantly associated with better patient satisfaction ( $P < .05$ ). The change in ASES score ( $r = 0.37, P < .0001$ ) and PROMIS PI ( $r = -0.43, P < .0001$ ) showed the strongest correlation with better satisfaction. Greater preoperative expectations and greater met expectations were significantly associated with greater satisfaction 2 years after surgery ( $r = 0.68, P < .001$ ;  $r = 0.14, P = .03$ , respectively) (Table V).

Multivariable linear regression indicated that greater preoperative PROMIS PI ( $P = .019$ ), income less than \$70,000 ( $P < .001$ ), and

**Table V**  
MODEMS expectations and 2-yr SSQ-8 scores.

Variable	Mean	SD	r*	P value <sup>†</sup>
Preop expectations	86.6	17.7	0.14	<b>.030</b>
Met expectations	72.7	30.6	0.68	<b>&lt;.001</b>

MODEMS, Musculoskeletal Outcomes Data Evaluation and Management System; SSQ-8, Surgical Satisfaction Questionnaire; Preop, preoperative.

Bold values indicate statistical significance ( $P < .05$ ).

\*r = Spearman's correlation coefficient.

<sup>†</sup>Significance determined at  $P < .05$  (Wilcoxon rank-sum).

ASA score  $>1$  ( $P = .015$ ) were independent predictors of lower patient satisfaction, while total shoulder arthroplasty (CPT 24372) was predictive of higher patient satisfaction (Table VI). There was minimal collinearity among the variables included in the final model, and the model accounted for 15% of the variance ( $R^2 = 0.15$ ).

### Discussion

Patient satisfaction is a multidimensional and patient-centered outcome measure that has influenced hospital and health-care provider reimbursement and quality assessment.<sup>8,26,27,29,36</sup> Despite its clinical value, an understanding of the preoperative factors associated with patient satisfaction 2 years after shoulder surgery is incomplete. The results of this study demonstrated that multiple factors are associated with lower patient satisfaction 2 years after shoulder surgery and that lower satisfaction is independently predicted by greater preoperative PROMIS PI, annual income less than \$70,000, and ASA score  $>1$  total shoulder arthroplasty (CPT 24372) was an independent predictor of higher satisfaction.

This study included a diverse cohort of shoulder procedures, but total shoulder arthroplasty (CPT 24372) was the only procedure predictive of higher patient satisfaction. In comparison to other procedures in this study, arthroplasty patients may experience a more dramatic relief from pain and disability and ultimately report greater patient satisfaction. This potentially reflects the "curative" nature of successful arthroplasty surgery. However, it is important to note that total shoulder arthroplasty was the second most common primary CPT code in our study, and it demonstrated a relatively high SSQ-8 average and low standard deviation. Future studies should further investigate the relationship between procedure type and postoperative patient satisfaction.

Multiple studies have investigated patient satisfaction in the orthopedic shoulder literature; however, few studies have utilized the National Institutes of Health PROMIS in this setting. A comprehensive systematic review reported that patient satisfaction is generally high after total shoulder arthroplasty and that preoperative predictors of postoperative satisfaction include age, workers' compensation, depression, opioid use, and visual analog pain scale.<sup>22</sup> We also found that worse NPS and PROMIS PI scores both correlate with worse satisfaction but that PROMIS PI is an independent predictor of satisfaction. Although PROMIS PI and traditional pain scales attempt to quantify pain, PROMIS PI provides

**Table VI**  
Multivariate analysis of 2-yr SSQ-8 scores.

Variable	Estimate	Standard error	t Ratio	P value	Adjusted R <sup>2</sup>
Preoperative PROMIS PI	−0.44	0.18	−2.33	<b>.019</b>	0.15
Income <\$70,000	−5.47	1.39	−3.92	<b>&lt;.001</b>	
ASA score >1	−3.77	1.52	−2.48	<b>.015</b>	
CPT 24372	4.17	1.79	2.33	<b>.021</b>	

SSQ-8, Surgical Satisfaction Questionnaire; PROMIS PI, Patient-Reported Outcomes Measurement Information System, Pain Interference; ASA, American Society of Anesthesiologists; CPT, Common Procedural Terminology; ASES, American Shoulder and Elbow Surgeons.

Bold values indicate statistical significance ( $P < .05$ ).

A backward stepwise multivariable regression was performed using Bayesian information criteria to identify predictors of satisfaction scores. Negative values for the estimate and t Ratio indicate that the variable reduces satisfaction, while positive values indicate that the variable increases satisfaction. The final model accounted for 15% of the variance in satisfaction scores among the study cohort. The following variables were included in the model *a priori*: age, gender, race, ethnicity, and worker's compensation status. The following variables were included in the model *a posteriori*: body mass index, education, income, smoking, recreational drug use, preoperative opioid use, ASA score, number of comorbidities, living with a caretaker, as well as preoperative PROMIS, physical function; PROMIS, pain interference; PROMIS, fatigue; PROMIS, social satisfaction; PROMIS, anxiety; PROMIS, depression; ASES score; NPS, Shoulder; NPS, Body, Tegner Activity Scale, preop expectations; and CPT, 29827, CPT, 23472, CPT, 29806, CPT, 29825, CPT, 29823, CPT, 29807, CPT, 23462, CPT, 23515, CPT, 29826, CPT, 29828.

greater context as it measures the degree to which pain interferes with activities of daily living, and this may make it more useful as a predictor for postoperative patient satisfaction. In addition to PROMIS PI, Tyser et al reported that PROMIS PF and PROMIS Anxiety were also predictive of worse Press Ganey satisfaction survey scores in a cohort of nonshoulder upper extremity patients.<sup>32</sup> Our study showed that worse PROMIS PF and PROMIS Anxiety were associated with worse satisfaction scores; however, these were not predictive of satisfaction scores in the multivariate analysis. It is important to note that our study uniquely controlled for a broad range of sociodemographic variables in a diverse urban population, which may account for differences in predictors of patient satisfaction.

Previous studies have not examined income level in respect to patient satisfaction after shoulder surgery, but active employment has been associated with higher satisfaction.<sup>2,15,30</sup> In contrast, patients on workers' compensation have been shown to report lower levels of satisfaction after shoulder surgery.<sup>2,5,15,34</sup> Our study found no relationship between workers' compensation or employment status and satisfaction, but annual income less than \$70,000 was predictive of worse satisfaction. The inclusion of all shoulder operations, a low sample size in the workers' compensation group ( $n = 18$ ), and a different satisfaction measurement tool could have contributed to these divergent results.

Our finding that an ASA score >1 predicts worse satisfaction contradicts the findings of Petri et al, who found no association between ASA score and satisfaction.<sup>21</sup> Of note, they compared patients with an ASA score of 1 or 2 to patients with an ASA score of 3 in a smaller cohort ( $n = 75$ ), while we compared ASA score of 1 with ASA score >1. Additionally, only 5 patients in their study (6.7%) had an ASA score of 3, compared to 30 (10.4%) in our study. Study grouping, differences in sample size, and differences in ASA score distribution could potentially explain the differences between these results.

The multivariable analysis identified independent predictors of satisfaction that may help better understand preoperative factors influencing postoperative satisfaction. Prior studies have attempted to improve outcomes by identifying and manipulating modifiable preoperative variables. Lawrence et al had patients undergoing shoulder surgery meet with fellowship-trained surgeons prior to surgery in an attempt to maximize patient expectations; however, this was not successful.<sup>16</sup> Sims et al had patients view educational videos regarding their shoulder procedure before surgery but found no difference in satisfaction at 3 months postoperatively.<sup>28</sup> Similarly, Valencia et al found no difference in pain and disability scores in patients undergoing shoulder arthroscopy who received preoperative physical therapy.<sup>33</sup> Our study contributes to the

general understanding of preoperative factors affecting postoperative satisfaction. Importantly, our findings suggest that these factors, particularly procedure type, income, and ASA score, may not be easily modifiable.

This study has several notable limitations. First, this is a retrospective analysis of prospectively acquired data, and all the limitations associated with such a study design pertain to this study. Second, although the SSQ-8 is a validated measure of surgical satisfaction,<sup>9</sup> it has not yet been validated for use within the orthopedic shoulder surgery population. However, the SSQ-8 is the best tool to answer our research question as it captures the process and outcome of surgical care, unlike other satisfaction surveys like the Computer Assessment of Healthcare Providers and Systems or Press Ganey Ambulatory Surgical Survey. Third, there may be preoperative factors that were not included in our study that may explain some of the variances in patient satisfaction. Fourth, there was a 26% loss to follow-up. Survey responders may be inherently more satisfied with their procedures and more willing to complete 2-year follow-up. This may lead to a general overestimation of patient satisfaction. Finally, our study was performed at a single urban academic center, and the results may not be generalizable to other settings. Despite these limitations, this study represents a comprehensive evaluation of preoperative factors in a diverse patient population with >70% completing a 2-year follow-up.

## Conclusion

Patient satisfaction is an important measure for assessing the outcome of shoulder surgery and is influenced by both patient characteristics and preoperative patient-reported outcome measures. Lower patient satisfaction 2 years after shoulder surgery is independently predicted by greater preoperative PROMIS PI, income less than \$70,000, and ASA score >1, while higher patient satisfaction is predicted by total shoulder arthroplasty. Given the relationship between patient satisfaction and preoperative patient-reported outcome measures, a comprehensive understanding of all the factors that ultimately influence patient satisfaction is important for identifying new areas of intervention to optimize outcomes and minimize dissatisfaction.

## Acknowledgment

The authors thank J. Kathleen Tracy, PhD; Ali Aneizi, MD; Andrew G. Dubina, MD; Julio J. Jauregui, MD; Vidushan Nadarajah, MD; Patrick M. J. Sajak, MD; Joshua M. Abzug, MD; Ngozi M. Akabudike, MD; Craig H. Bennett, MD; W. Andrew Eglseder, MD; Jonathan D. Packer, MD; Ebrahim Paryavi, MD; Raymond A. Pency,

MD; Cameran I. Burt, BS; Shaun H. Medina, MS; Keyan Shasti, BS; Alexander J. Wahl, BS; and Michael P. Smuda, MS for their assistance with data collection.

### Disclaimers:

**Funding:** Funding for this project was provided in the form of research staff employment by The James Lawrence Kernan Hospital Endowment Fund, Incorporated. Grant number: BL1941007WS.

**Conflicts of interest:** The authors, their immediate families, and any research foundation with which they are affiliated have not received any financial payments or other benefits from any commercial entity related to the subject of this article.

### Supplementary Data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.jseint.2022.04.008>.

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