



## Early patient satisfaction following orthopaedic surgery

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### ABSTRACT

**Background:** The healthcare industry is shifting its focus from traditional clinical outcome measures to patient satisfaction metrics. This change has caused orthopaedic surgeons to become increasingly interested in factors influencing patient satisfaction, which would allow them to potentially modify these factors in an effort to increase postoperative satisfaction. The objective of this study was to identify factors associated with patient satisfaction two weeks following extremity orthopaedic surgery.

**Methods:** Patients completed questionnaires preoperatively to assess demographics, activity, pain, expectations, and Patient-Reported Outcomes Measurement Information System (PROMIS) computer adaptive testing for Physical Function, Pain Interference, Social Satisfaction, Depression, Anxiety, and Fatigue. Two weeks after their operation, patients completed the same questionnaires in addition to an Improvement Survey and Met Expectations. Satisfaction was assessed with the Surgical Satisfaction Questionnaire.

**Results:** Greater surgical satisfaction two weeks following orthopaedic surgery was associated with higher education, alcohol use, better scores on all PROMIS domains at baseline and two weeks, greater activity levels at baseline and two weeks, less bodily pain at baseline and two weeks, less pain in the surgical site at two weeks, greater met expectations, and greater improvement ( $p < 0.05$ ).

**Conclusion:** This study provides important information about patient satisfaction two weeks after orthopaedic surgery.

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## 1. Introduction

The number of musculoskeletal procedures performed in the U.S. has been increasing.<sup>1</sup> Additionally, there has recently been increased consideration for linkage between reimbursement rates and patient outcomes. In order to maintain eligibility for full reimbursement from the Centers for Medicare and Medicaid Services (CMS), acute care hospitals are required to submit patient satisfaction data. Patient satisfaction metrics are also being used by health-care facilities for self-assessment and accreditation requirements.<sup>2</sup> This highlights that the focus of health care is expanding from traditional clinical outcome measures, such as

mortality and complication rates, to patient experience.<sup>3</sup> The American Academy of Orthopaedic Surgeons (AAOS) defines patient-centered care as “safe, effective and timely care achieved through cooperation among the orthopaedic surgeon, an informed and respected patient (and family), and a coordinated health-care team.”<sup>4</sup> However, staffing shortages, increased paperwork, high operating costs, and access issues are challenges in the health-care environment, making patient-centered care difficult to achieve.<sup>5</sup> Furthermore, patient satisfaction is a subjective measurement influenced by many variables and may be difficult to interpret.

With a shifted focus toward the patient experience, clinicians are becoming increasingly interested in determining factors which influence patient satisfaction in order to improve quality of care. Patient satisfaction has been associated with demographics such as age, education, race, religion, mental-health status, and comorbidities.<sup>6–13</sup> Higher postoperative satisfaction scores have been seen in patients who had realistic preoperative expectations

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and believed the physician spent adequate time with them.<sup>14,15</sup> Patients with higher pain scores and functional limitations are among those with lower satisfaction scores.<sup>6,14,15</sup> Patients who are dissatisfied with their surgical outcome are less likely to attend follow-up appointments, while their satisfied counterparts are more likely to adhere to treatment regimens.<sup>11,16,17</sup> Identifying factors associated with postoperative patient satisfaction would allow for potential modification of patient counseling to optimize treatment, outcomes, and satisfaction.

The main objective of this analysis was to determine factors associated with two-week patient satisfaction following extremity orthopaedic surgery. We hypothesized higher satisfaction would be associated with older age, better mental health, better function, and less pain.

## 2. Methods

### 2.1. Patients and data collection

Prospectively-collected patient data from a single institution were obtained from the Maryland Orthopaedic Registry (MOR). This is a retrospective analysis of prospective data. Patients who underwent extremity orthopaedic surgery between August 2016 and March 2018 were included. Patients provided informed consent to participate and were excluded if they were 17 or younger at the time of consent, unable to read or write English, a ward of the state, incarcerated, or failed to complete both a baseline and a two-week follow-up assessment. A total of 435 patients met the inclusion criteria.

Participants completed an electronic baseline assessment consisting of a series of questionnaires including a Numeric Pain Scale (NPS) for operative joint and body pain, Expectations Domain of the Musculoskeletal Outcomes Data Evaluation and Management System (MODEMS), and the National Institutes of Health (NIH) Patient-Reported Outcomes Measurement Information System (PROMIS®) computer-adaptive testing (CAT). The following six domains of PROMIS CAT were included: Physical Function, Pain Interference, Fatigue, Social Satisfaction, Anxiety, and Depression. Patient activity level was determined using the Tegner Activity Scale and the International Physical Activity Questionnaire (IPAQ) to determine metabolic equivalent minutes (MET-minutes) per week. In addition, patient medical records were reviewed to include any relevant surgical and patient factors, including their American Society of Anesthesiologists (ASA) score, surgical history, and preoperative opioid use. The surgical procedures were quantified by Common Procedural Terminology (CPT) code, which were confirmed to be accurate by chart review.

Two weeks after their operation, patients completed all six PROMIS CAT domains, NPS for operative joint and body, Met Expectations Domain of MODEMS, IPAQ, and Tegner Activity Scale in addition to the Improvement Survey and Surgical Satisfaction Questionnaire (SSQ).<sup>18</sup> The SSQ includes eight questions about pain control, performing daily activities, returning to work, exercising, surgical results, likelihood to make the same treatment decision again, and likelihood to recommend the surgery to someone else. Patients answered each question on the SSQ on a Likert scale from 1 to 5, where 1 represents “Very satisfied” and 5 represents “Very unsatisfied.”<sup>19</sup> The raw score was normalized to a 0–100 point score, with a score of 0 corresponding with lowest level of surgical satisfaction and a score of 100 corresponding to highest level of surgical satisfaction.

### 2.2. Statistical analysis

The SSQ score was the outcome measure. We compared mean

SSQ score among categorical variables by analysis of variance (ANOVA). The relationships between SSQ score and continuous variables were assessed using Spearman's correlation coefficient. We considered both the questionnaire scores at baseline and two-week follow-up. All statistical tests used were two-sided, and  $p < 0.05$  was used to indicate statistical significance.

## 3. Results

Demographic characteristics and mean surgical satisfaction scores are outlined in Table 1. Patients who completed some college or below had lower surgical satisfaction ( $p = 0.04$ ) compared to those with a college or graduate degree. Patients who do not consume alcohol had significantly lower surgical satisfaction ( $p = 0.03$ ). Correlations of surgical satisfaction score with continuous demographic variables are presented in Table 2, and we did not observe any significant relationships.

Patient-reported measures and surgical satisfaction scores both at baseline and two weeks postoperatively are depicted in Table 3. Lower baseline scores on PROMIS Pain Interference, Fatigue, Anxiety, and Depression were associated with higher surgical satisfaction ( $p < 0.05$ ). Furthermore, less overall bodily pain at baseline, a higher baseline score on PROMIS Physical Function and PROMIS Social Satisfaction were associated with increased surgical satisfaction ( $p < 0.05$ ). Patients who were more physically active preoperatively, indicated by higher baseline IPAQ MET-minutes/week and current Tegner Activity Score, were also more satisfied with their surgery ( $p < 0.05$ ). However, all of the correlation coefficients for the preoperative measures were weak ( $\rho < 0.2$ ).

Two weeks after surgery (Table 3), there were stronger correlations with satisfaction compared to baseline for most patient-reported outcome measures. Higher satisfaction was correlated with better scores on all six PROMIS domains, greater activity level, less joint pain, and less bodily pain ( $\rho = 0.19–0.38$ ,  $p < 0.05$ ). Furthermore, patients who had greater met expectations and improvement by two weeks after surgery were more satisfied ( $\rho = 0.40$ ,  $p < 0.0001$  for both). Satisfaction was analyzed by procedure and there was no significant difference overall ( $p = 0.32$ ), as well as for the upper extremity (Table 4) and the lower extremity (Table 5).

## 4. Discussion

As the number of orthopaedic procedures increases around the country each year, there is increasing emphasis on patient satisfaction to determine surgical success.<sup>1,2</sup> Insurance companies and treatment centers have variably incorporated this metric for reimbursement rates, self-assessment, and accreditation requirements.<sup>2</sup> Therefore, determining factors which are associated with postoperative satisfaction is increasingly important. Despite the increased importance of patient satisfaction, there is limited data comparing surgical satisfaction in the general orthopaedic population to a large range of demographic characteristics and responses from validated self-reported assessments. To our knowledge, there are no studies examining postoperative satisfaction two weeks after surgery. Consequently, we used the literature regarding surgical satisfaction beyond two weeks to generate our hypothesis and compare our results.

There are several studies which support our findings regarding variables with respect to mental health. Katz et al. found that patients who had greater functional limitations and decreased mental health status before undergoing carpal tunnel release were less satisfied afterwards.<sup>6</sup> Multiple studies have linked higher preoperative depression levels to lower patient satisfaction in various orthopaedic settings.<sup>6,12,20,21</sup> While a diagnosis of depression or

**Table 1**  
Associations between categorical demographic variables and mean surgical satisfaction score.

Variable	No. (%) of Patients*	Mean Score ± Standard Deviation	P Value
<b>Sex</b>			
Female	203 (46.7%)	67.70 ± 15.89	0.08
Male	232 (53.3%)	70.39 ± 16.01	
<b>Race</b>			
Black	95 (22.1%)	66.84 ± 15.74	0.18
White	298 (69.3%)	70.09 ± 15.94	
Other	37 (8.6%)	67.35 ± 17.40	
<b>Ethnicity</b>			
Not Hispanic or Latino	400 (92.0%)	69.31 ± 16.27	0.50
Hispanic or Latino	35 (8.0%)	67.19 ± 13.49	
<b>Education</b>			
Some college or below	206 (47.9%)	67.42 ± 16.30	<b>0.04</b>
Obtained college or graduate degree	224 (52.1%)	70.54 ± 15.66	
<b>Employment status</b>			
Employed	277 (63.7%)	69.44 ± 15.20	0.05
Not currently employed	91 (20.9%)	66.04 ± 18.04	
Student	67 (15.4%)	72.16 ± 15.76	
<b>Income</b>			
Less than \$70,000	174 (41.9%)	66.72 ± 16.92	0.07
More than \$70,000	241 (58.1%)	70.72 ± 14.87	
Opted not to disclose	20 (4.8%)	66.72 ± 19.19	
<b>Marital status</b>			
Single (never married), Divorced, Separated, or Widowed	232 (54.1%)	68.72 ± 16.13	0.65
Married or domestic partnership	197 (45.9%)	69.43 ± 15.91	
<b>Caregiver</b>			
Yes	423 (97.9%)	69.02 ± 16.07	0.69
No	9 (2.1%)	71.18 ± 13.60	
<b>Family/Friend Caregiver</b>			
Yes	412 (96.9%)	69.02 ± 16.03	0.48
No	13 (3.1%)	65.87 ± 15.54	
<b>Smoking status</b>			
Daily and Less than daily	43 (10.0%)	65.12 ± 15.82	0.19
Never smoked	307 (71.7%)	69.87 ± 16.25	
Quit smoking	78 (18.2%)	69.03 ± 14.84	
<b>Alcohol consumption</b>			
Never	123 (28.6%)	65.83 ± 17.62	<b>0.03</b>
1 or more drinks per week	307 (70.5%)	70.04 ± 15.36	
<b>Recreational drug use</b>			
No	404 (92.9%)	69.08 ± 16.00	0.77
Yes	31 (7.1%)	69.96 ± 16.17	
<b>Preoperative opioid use</b>			
No	320 (74.2%)	69.74 ± 15.95	0.14
Yes	111 (25.8%)	67.16 ± 15.81	
<b>ASA score</b>			
1	166 (39.1%)	70.12 ± 14.69	0.26
2	230 (54.1%)	68.44 ± 16.88	
3	29 (6.8%)	65.18 ± 15.02	
<b>Depression or anxiety</b>			
No	382 (88.0%)	69.65 ± 16.05	0.08
Yes	52 (12.0%)	65.44 ± 15.36	
<b>Prior operation on operative joint</b>			
No	339 (78.3%)	69.53 ± 15.55	0.34
Yes	94 (21.7%)	67.75 ± 17.43	
<b>Injury led to surgery</b>			
No	153 (35.2%)	69.10 ± 15.93	0.97
Yes	282 (64.8%)	69.16 ± 16.05	
<b>Workers' Compensation</b>			
No	420 (96.6%)	69.30 ± 15.86	0.26
Yes	15 (3.4%)	64.58 ± 19.47	

\*The percentages are of the number of patients who responded to each question.

**Table 2**  
Relationships between continuous demographic variables and mean surgical satisfaction score.

Variable	Mean ± Standard Deviation	Spearman's $\rho^a$	P Value
Age (years)	41.09 ± 15.68	-0.03	0.60
BMI (kg/m <sup>2</sup> )	29.39 ± 6.66	-0.02	0.76
Charlson Comorbidity Index	2.08 ± 1.39	-0.11	0.09
Number of prior operations on operative joint	0.35 ± 0.87	-0.07	0.15
Number of orthopaedic surgeries	1.38 ± 2.33	0.0008	0.99

<sup>a</sup>  $\rho$ , Spearman's rank correlation coefficient.

**Table 3**  
Relationships between patient-reported outcome (PRO) measures and mean surgical satisfaction scores at baseline and two weeks after orthopaedic surgery.

PRO Measure	Mean Score $\pm$ Standard Deviation	Spearman's $\rho^*$	P Value
<b>PROMIS Physical Function</b>			
Baseline	42.06 $\pm$ 8.83	0.15	<b>0.002</b>
2 Week	35.53 $\pm$ 8.90	0.27	<b>&lt;0.0001</b>
<b>PROMIS Pain Interference</b>			
Baseline	60.07 $\pm$ 7.04	-0.14	<b>0.003</b>
2 Week	61.68 $\pm$ 7.63	-0.37	<b>&lt;0.0001</b>
<b>PROMIS Fatigue</b>			
Baseline	51.52 $\pm$ 10.36	-0.14	<b>0.005</b>
2 Week	54.42 $\pm$ 10.02	-0.28	<b>&lt;0.0001</b>
<b>PROMIS Social Satisfaction</b>			
Baseline	42.38 $\pm$ 9.29	0.12	<b>0.01</b>
2 Week	38.99 $\pm$ 8.07	0.37	<b>&lt;0.0001</b>
<b>PROMIS Anxiety</b>			
Baseline	54.90 $\pm$ 8.74	-0.15	<b>0.001</b>
2 Week	53.63 $\pm$ 9.55	-0.27	<b>&lt;0.0001</b>
<b>PROMIS Depression</b>			
Baseline	48.70 $\pm$ 9.36	-0.15	<b>0.002</b>
2 Week	49.43 $\pm$ 10.49	-0.19	<b>&lt;0.0001</b>
<b>NPS Joint</b>			
Baseline	4.86 $\pm$ 2.78	-0.03	0.48
2 Week	4.09 $\pm$ 2.38	-0.38	<b>&lt;0.0001</b>
<b>NPS Body</b>			
Baseline	1.34 $\pm$ 1.98	-0.14	<b>0.003</b>
2 Week	1.68 $\pm$ 2.15	-0.21	<b>&lt;0.0001</b>
<b>Expectations</b>			
Baseline	86.95 $\pm$ 16.59	0.08	0.09
2 Week Met Expectations	55.02 $\pm$ 27.63	0.40	<b>&lt;0.0001</b>
<b>IPAQ MET-Minutes/Week</b>			
Baseline	7269 $\pm$ 6025	0.12	<b>0.02</b>
2 Week	3854 $\pm$ 3707	0.10	0.13
<b>Tegner Activity Score, Current</b>			
Baseline	2.24 $\pm$ 1.87	0.12	<b>0.01</b>
2 Week	1.15 $\pm$ 1.35	0.22	<b>&lt;0.0001</b>
<b>Improvement, 2 Week</b>	56.01 $\pm$ 24.75	0.40	<b>&lt;0.0001</b>

\* $\rho$ , Spearman's rank correlation coefficient.

**Table 4**  
Top ten upper extremity orthopaedic surgical procedures versus mean surgical satisfaction score.

CPT Code	Number of Procedures Performed	Procedure Description	Mean Score $\pm$ Standard Deviation
29826	38	Arthroscopy, shoulder, surgical; decompression of subacromial space with partial acromioplasty, with coracoacromial ligament (i.e. arch) release, when performed	72.0 $\pm$ 14.6
23430	23	Arthroscopy, shoulder, surgical; decompression of subacromial space with partial acromioplasty, with coracoacromial ligament (i.e. arch) release, when performed	64.9 $\pm$ 18.9
29806	22	Arthroscopy, shoulder, surgical; decompression of subacromial space with partial acromioplasty, with coracoacromial ligament (i.e. arch) release, when performed	70.6 $\pm$ 14.7
29825	21	Arthroscopy, shoulder, surgical; with lysis and resection of adhesions, with or without manipulation	74.1 $\pm$ 20.7
29823	20	Arthroscopy, shoulder, surgical; debridement, extensive	68.8 $\pm$ 12.7
23472	17	Arthroplasty, glenohumeral joint; total shoulder (glenoid and proximal humeral replacement (e.g. total shoulder)	59.2 $\pm$ 25.5
29827	16	Arthroscopy, shoulder, surgical; with rotator cuff repair	69.1 $\pm$ 14.1
64721	14	Neuroplasty and/or transposition; median nerve at carpal tunnel	75.2 $\pm$ 18.1
26055	11	Tendon sheath incision (e.g. for trigger finger)	69.0 $\pm$ 17.6
29824	10	Arthroscopy, shoulder, surgical; distal claviclectomy including distal articular surface (Mumford procedure)	80.3 $\pm$ 11.4

Mean Surgical Satisfaction Questionnaire score was analyzed against CPT code using ANOVA. There was no significant difference in Surgical Satisfaction between CPT codes ( $p = 0.09$ ).

anxiety was not associated with satisfaction in our study, we did find that worse preoperative and postoperative mental health symptoms as measured by PROMIS Depression, Anxiety, and Fatigue were associated with worse surgical satisfaction. In addition, there was a stronger correlation noted two weeks following surgery compared to baseline, which can be attributed to patients being concerned about their present state of being when they are assessing their satisfaction with the surgery.

Our finding that better preoperative physical function is associated with greater postoperative satisfaction is consistent with

previous literature. Walker et al. showed patients with better preoperative functional scores before undergoing a total knee arthroplasty were more satisfied after surgery.<sup>21</sup> Correlations between satisfaction and preoperative function have also been described in patients receiving hand surgery.<sup>6,15</sup>

Less pain has been associated with greater satisfaction after orthopaedic surgery in multiple studies.<sup>22</sup> We found greater preoperative pain in the entire body and pain interference were associated with lower satisfaction. There was an even stronger association with postoperative pain scores. This suggests

**Table 5**

Top ten lower extremity orthopaedic surgical procedures versus mean surgical satisfaction score.

CPT Code	Number of Procedures Performed	Procedure Description	Mean Score ± Standard Deviation
29888	65	Arthroscopically aided anterior cruciate ligament repair/augmentation or reconstruction	67.7 ± 16.0
29881	60	Arthroscopy, knee, surgical; with meniscectomy (medial OR lateral, including any meniscal shaving) including debridement/shaving of articular cartilage (chondroplasty), same or separate compartment(s), when performed	69.6 ± 16.9
29876	49	Arthroscopy, knee, surgical; synovectomy, major, 2 or more compartments (e.g. medial or lateral)	70.2 ± 16.3
29882	30	Arthroscopy, knee, surgical; with meniscus repair (medial or lateral)	69.0 ± 16.4
29879	28	Arthroscopy, knee, surgical; abrasion arthroplasty (includes chondroplasty where necessary) or multiple drilling or microfracture	66.2 ± 15.8
29877	22	Arthroscopy, knee, surgical; debridement/shaving of articular cartilage (chondroplasty)	72.9 ± 13.4
29914	16	Arthroscopy, hip, surgical; with femoroplasty (i.e. treatment of cam lesion)	67.4 ± 13.7
29916	15	Arthroscopy, hip, surgical; with labral repair	67.1 ± 14.1
29874	13	Arthroscopy, knee, surgical; for removal of loose body or foreign body (e.g. osteochondritis dissecans fragmentation, chondral fragmentation)	71.4 ± 16.2
27130	12	Arthroplasty, acetabular and proximal femoral prosthetic replacement (total hip arthroplasty), with or without autograft or allograft	68.2 ± 15.7

Mean Surgical Satisfaction Questionnaire score was analyzed against CPT code using ANOVA. There was no significant difference in Surgical Satisfaction between CPT codes ( $p = 0.93$ ).

optimizing the management of acute postoperative pain is a potential opportunity to optimize satisfaction.

Other studies have found characteristics associated with patient satisfaction which differ from our results. In contrast to our finding that age was not significantly associated with patient satisfaction, other studies have determined older patients are more satisfied with their treatment than younger patients.<sup>7,8,11,13,20</sup> We did not find associations between race, income, and satisfaction. However, one study identified white race and higher income as predictors of greater patient satisfaction with their medical care in general, though this study was not orthopaedic-specific.<sup>11</sup>

Our study found patients who never consume alcohol had lower surgical satisfaction compared to patients who did drink. In contrast, patients undergoing carpal tunnel release who use alcohol had lower satisfaction.<sup>6</sup> It should be noted our study assessed satisfaction after orthopaedic surgery of all joints while the latter study investigated specifically carpal tunnel release. Patients who had higher PROMIS Social Satisfaction scores were more likely to have higher surgical satisfaction. These patients could have been more socially active, which may be linked with increased alcohol consumption. Studies have also identified various characteristics associated with satisfaction which we did not investigate, such as time spent in clinic,<sup>2,14,23</sup> physician-patient communication,<sup>2</sup> attorney involvement,<sup>6</sup> and time spent commuting to the treatment center.<sup>13</sup>

We found greater improvement and met expectations were the two factors most strongly correlated with higher satisfaction. One study of patients greater than two years after rotator cuff repair also found met expectations were associated with greater satisfaction. Additionally, that study found satisfaction was associated with better postoperative scores on most patient-reported outcomes, similar to our study.<sup>24</sup> A follow-up study in the same rotator cuff repair patient population showed greater improvement was correlated with higher satisfaction.<sup>25</sup> However, it is important to note the correlation was only 0.4 in our study, which suggests satisfaction is only moderately correlated with improvement and met expectations.

Despite the robust sample size and the variety of parameters investigated in this study, there were limitations. First, every surgery included in this study was performed at an urban academic orthopaedic hospital and therefore may not be indicative of all settings and may limit the generalizability of our results. Second, this study investigated various types of orthopaedic surgeries, mostly shoulder and knee cases, and was not joint- or operation-specific, so the data may not be applicable to specific joints.

Thirdly, due to the nature of self-reporting assessments, our data could be skewed by response bias. In comparing patients who completed both the baseline and two-week surveys in the MOR, factors such as race, income, and education all impact response rate.<sup>18</sup> While we identified many factors that were significantly associated with satisfaction, none of those factors were strongly correlated, which reflects the complexity of satisfaction. Reported satisfaction is further complicated by the nature of the overall patient care episode, which we did not specifically assess. Although there are limitations, the results of this study provide the first data regarding patient satisfaction looking at the orthopaedic surgical population as a whole two weeks after extremity surgery. Additionally, the diverse nature of the patient population is a strength of the MOR and provides information about patients who have been historically under-represented in the orthopaedic literature. Finally, the questionnaires were administered electronically, which minimizes any assessor bias during data collection.

## 5. Conclusions

Greater surgical satisfaction two weeks following extremity orthopaedic surgery is associated with higher education, alcohol use, better scores on all six PROMIS domains, greater activity levels, less pain, greater improvement, and greater met expectations. Further studies are needed to address the limitations of this study and to further characterize postoperative patient satisfaction at various intervals following orthopaedic surgery.

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## Declarations of competing interest

None.

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