

# Greater preoperative expectations predict improvement in pain and function two years after knee surgery

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## INTRODUCTION:

Preoperative patient expectations across several orthopaedic subspecialties correlate with better postoperative outcomes and patient satisfaction. Yet, there is limited literature examining the association between preoperative expectations and two-year Patient-Reported Outcome (PRO) metrics in knee surgery patients. We hypothesized that greater preoperative expectations would be predictive of better patient-reported outcomes after knee surgery.

## METHODS:

697 patients undergoing knee surgery between June 2015 and April 2018 at one institution were prospectively enrolled in this study. Patient's charts were reviewed for relevant demographic information and medical history. 488 (70.0% follow-up) patients completed both baseline and two-year follow-up questionnaires, which consisted of PROMIS computer adaptive testing in six domains, International Knee Documentation Committee (IKDC) score, knee and whole body Numeric Pain Scales (NPS), Tegner Activity Scale (TAS), International Physical Activity Questionnaire (IPAQ) and the Marx Knee Activity Rating Scale (MARS). Preoperative expectations were measured using the Musculoskeletal Outcomes and Data Evaluation Management System (MODEMS) preoperative expectations domain, and satisfaction was measured via the Surgical Satisfaction Questionnaire (SSQ-8). Bivariate testing was used to determine associations between preoperative expectations scores and PRO two year scores and change from baseline scores. Multivariable analysis of significant variables was then used to account for potential confounding variables for two year PRO scores and changes from baseline.

## RESULTS:

The mean preoperative expectations score was  $91.0 \pm 17.9$ . Greater preoperative expectations were associated with various demographic factors as well as baseline PROMIS Social Satisfaction, whole body NPS, and MARS lower body scores (Table 1). Greater preoperative expectations were associated with significantly greater two-year scores and improvements in PROMIS Physical Function, PROMIS Pain Interference and IKDC. Greater preoperative expectations were associated with significantly better two-year scores for PROMIS Fatigue, PROMIS Anxiety, whole body NPS, Met Expectations and improvement in PROMIS Social Satisfaction (Tables 2 & 3). Multivariable analyses found that greater preoperative expectations score was independently predictive of improvements in PROMIS Pain Interference and IKDC scores.

## DISCUSSION AND CONCLUSION:

Greater preoperative expectations are associated with better function and decreased pain two years following surgery. After controlling for confounding variables, greater preoperative expectations were independent predictors for greater improvement in PROMIS Pain Interference and IKDC scores.

Table 1. Association between continuous variables and preoperative expectations scores

|                                     | Mean (sD)        | Median | Spearman's (ρ) Correlation Coefficient | P-value          |
|-------------------------------------|------------------|--------|--|------------------|
| Age (years)                         | 44.1 (±17.2)     | 42.4   | -0.05                                  | 0.60             |
| BMI (kg/m <sup>2</sup> )            | 28.0 (±6.2)      | 26.3   | -0.02                                  | 0.64             |
| CCI                                 | 1.2 (±1.5)       | 1      | -0.12                                  | <b>0.013</b>     |
| No. of all prior surgeries          | 2.7 (±1.8)       | 2      | -0.07                                  | 0.10             |
| No. of prior knee surgeries         | 0.5 (±0.9)       | 0      | -0.17                                  | <b>&lt;0.001</b> |
| No. of prior arthroscopic surgeries | 1.3 (±2.1)       | 1      | -0.12                                  | <b>0.013</b>     |
| No. of anesthesia events            | 3.2 (±3.9)       | 2      | -0.09                                  | <b>0.046</b>     |
| PROMIS Physical Function (Preop)    | 41.5 (±8.3)      | 41.2   | -0.05                                  | 0.33             |
| PROMIS Social Satisfaction (Preop)  | 43.3 (±8.9)      | 43.4   | -0.10                                  | <b>0.023</b>     |
| PROMIS Pain Interference (Preop)    | 38.0 (±7.4)      | 38.6   | 0.07                                   | 0.11             |
| PROMIS Fatigue (Preop)              | 51.4 (±12.3)     | 52.8   | -0.07                                  | 0.36             |
| PROMIS Anxiety (Preop)              | 55.1 (±8.9)      | 55.9   | -0.05                                  | 0.27             |
| PROMIS Depression (Preop)           | 40.3 (±8.0)      | 40.4   | -0.08                                  | 0.10             |
| TAS (Preop)                         | 3.2 (±2.1)       | 3      | -0.01                                  | 0.85             |
| Marx knee (Knee preop)              | 44.3 (±29.8)     | 42     | 0.04                                   | 0.41             |
| Marx knee (Whole body preop)        | 13.7 (±22.4)     | 0      | -0.10                                  | <b>0.010</b>     |
| IKDC (Preop)                        | 41.4 (±16.7)     | 40.4   | -0.06                                  | 0.24             |
| MARS Lower (Preop)                  | 45.6 (±10.5)     | 45     | 0.11                                   | <b>0.027</b>     |
| IPAQ (MET min/week, Preop)          | 2325.2 (±2251.7) | 1820   | 0.06                                   | 0.28             |

**Bolded values represent statistically significant correlation (p<0.05).**  
 CCI, Number of prior knee surgeries, number of prior arthroscopic surgeries, number of anesthesia events, PROMIS social satisfaction, Chronic pain (whole body preop), and MARS lower (whole body) were associated with preoperative expectations.  
 Abbreviations: BMI, body mass index; CCI, Chlamydia Complication Index; PROMIS, Patient-Reported Outcomes Measurement Information System; SD, standard deviation; TAS, Tegner Activity Scale; NPS, Numeric Pain Scale; SSQ8, Surgical Satisfaction Questionnaire 8; MARS, Marx activity rating scale upper extremity; IKDC, International Knee Documentation Committee; IPAQ, International Physical Activity Questionnaire; MET, Metabolic Equivalent of Task.

Table 2. Association between 2-year patient reported outcomes and preoperative expectations scores

| Outcome measurements (2 year follow up) | Mean (sD)        | Spearman's (ρ) Correlation Coefficient | P-value      |
|---|------------------|--|--------------|
| PROMIS PF                               | 51.2 (±10.7)     | 0.12                                   | <b>0.010</b> |
| PROMIS PI                               | 50.7 (±9.9)      | -0.11                                  | <b>0.020</b> |
| PROMIS Fatigue                          | 46.9 (±10.8)     | -0.11                                  | <b>0.024</b> |
| PROMIS SS                               | 53.1 (±11.6)     | 0.06                                   | 0.25         |
| PROMIS Anxiety                          | 49.8 (±10.6)     | -0.10                                  | <b>0.030</b> |
| PROMIS Depression                       | 46.8 (±9.5)      | -0.08                                  | 0.09         |
| IKDC                                    | 61.8 (±23.4)     | 0.13                                   | <b>0.006</b> |
| NPS (Knee)                              | 23.4 (±26.5)     | -0.09                                  | 0.07         |
| IPAQ                                    | 3724.2 (±2642.9) | 0.01                                   | 0.89         |
| TAS                                     | 4.9 (±2.7)       | 0.07                                   | 0.15         |
| NPS (Whole Body)                        | 20.9 (±24.7)     | -0.11                                  | <b>0.023</b> |
| SSQ8                                    | 71.7 (±21.2)     | 0.07                                   | 0.16         |
| MODEMS Met expectations                 | 73.6 (±29.4)     | 0.12                                   | <b>0.016</b> |
| MARS Lower                              | 37.3 (±33.3)     | 0.09                                   | 0.07         |

**Bolded values represent statistically significant correlation (p<0.05).**  
 Preoperative expectations were associated with PROMIS PF, PROMIS PI, PROMIS Fatigue, PROMIS Anxiety, IKDC, NPS (whole body), and MODEMS Met expectations.  
 Abbreviations: BMI, body mass index; CCI, Chlamydia Complication Index; PROMIS, Patient-Reported Outcomes Measurement Information System; PF, Physical Function; PI, Pain Interference; SS, Social Satisfaction; SD, standard deviation; TAS, Tegner Activity Scale; NPS, Numeric Pain Scale; SSQ8, Surgical Satisfaction Questionnaire 8; MARS, Marx activity rating scale upper extremity; IKDC, International Knee Documentation Committee; IPAQ, International Physical Activity Questionnaire; MET, Metabolic Equivalent Task.

Table 3. Association between patient reported outcome 2-year CHANGE and preoperative expectations scores

| Outcome measurements (2 year follow up change) | Mean (sD)        | Spearman's (ρ) Correlation Coefficient | P-value          |
|--|------------------|--|------------------|
| PROMIS PF                                      | 9.7 (±11.4)      | 0.13                                   | <b>0.005</b>     |
| PROMIS PI                                      | -9.1 (±9.5)      | -0.16                                  | <b>&lt;0.001</b> |
| PROMIS Fatigue                                 | -4.4 (±11.3)     | -0.07                                  | 0.15             |
| PROMIS SS                                      | 9.9 (±12.7)      | 0.11                                   | <b>0.017</b>     |
| PROMIS Anxiety                                 | -6.0 (±10.5)     | -0.01                                  | 0.81             |
| PROMIS Depression                              | -2.5 (±9.5)      | 0.04                                   | 0.46             |
| IKDC   | 26.4 (±22.5)     | 0.15                                   | <b>0.002</b>     |
| NPS (Op Site)                                  | -8.8 (±22.1)     | -0.05                                  | 0.35             |
| NPS (Whole Body)                               | 7.2 (±23.5)      | 0.03                                   | 0.59             |
| IPAQ   | 1305.2 (±3053.3) | -0.01                                  | 0.18             |
| TAS  | 2.6 (±2.8)       | 0.05                                   | 0.37             |
| MARS Lower                                     | -20.5 (±34.6)    | -0.05                                  | 0.28             |

**Bolded values represent statistically significant correlation (p<0.05).**  
 Preoperative expectations were associated with change in PROMIS PF, PROMIS PI, PROMIS SS, and IKDC.  
 Abbreviations: BMI, body mass index; CCI, Chlamydia Complication Index; PROMIS, Patient-Reported Outcomes Measurement Information System; PF, Physical Function; PI, Pain Interference; SS, Social Satisfaction; SD, standard deviation; TAS, Tegner Activity Scale; NPS, Numeric Pain Scale; MARS, Marx activity rating scale upper extremity; IKDC, International Knee Documentation Committee; IPAQ, International Physical Activity Questionnaire.