



Correlation Between Patient Reported Anxiety & Depression, and GAD-2 Scores on PROMs in the Total Joint Population

Introduction

Total Joint Replacements are an effective option for patients with advanced symptomatic arthritis. Due to advances in surgical techniques and prosthesis design, the majority of patients have optimal recovery results in regard to quality of life and functional outcomes postoperatively. However, there is still a small subset of patients who have less than optimal postoperative results. Recent literature has established that a preoperative diagnosis of anxiety and depression is associated with increased risk of postoperative complications and poor outcomes following total joint replacement. However, diagnoses are often not well documented in medical record systems. The purpose of this paper is to review our outcomes database of patient reported anxiety and depression comorbidities, as well as the generalized anxiety disorder two question (GAD2) outcome form and determine if there is any correlation with postoperative outcomes following total hip arthroplasty (THA) and total knee arthroplasty (TKA).

Methods

A retrospective cohort study of 537 patients that underwent total joint replacement (251 TKA, 286 THA) were included for analysis. Patients reported anxiety and depression comorbidities, as well as completed the Generalized Anxiety Disorder 2-item (GAD-2) form during the preoperative window (-90 to -1). Primary outcomes of interest are the HOOS Jr (Hip disability and Osteoarthritis Outcome Score short form), KOOS Jr (Knee injury and Osteoarthritis Outcome Score short form), and PROMIS Global-10 collected preoperatively, 12 weeks, 6 months, and 1 year postoperatively. Procedure satisfaction, as well as complications including ER and readmissions were captured at 90 days postoperative. Patients reported anxiety and depression comorbidities effects on outcomes were analyzed with post-hoc t-test for significance. A p-value of <0.01 was set as the threshold to establish statistical significance of the results. Linear correlations between GAD2 and postoperative PROMs were assessed using the Pearson's correlation coefficient. We considered the Pearson correlation to be high (strong) if it was >0.6, moderate if it was 0.3–0.6, and fair if it was < 0.3.

Table 1: Baseline Demographics

Baseline Demographics	N
Procedure	537
Total Hip Replacement	286 (53%)
Total Knee Replacement	251 (47%)
Gender	
Male	245 (46%)
Female	292 (54%)
Age	65.1 (31-98)
Comorbidities	
Anxiety	78
Depression	85
Anxiety and Depression	44

Results

Baseline demographics can be found in Table 1. Patients that reported anxiety and depression comorbidities had significantly worse KOOS Jr and Promis Global scores at preoperative baseline. Patients that reported anxiety and depression comorbidities had significantly worse Promis Global Overall Scores (31.53 vs 38.32, $p < 0.01$), Promis Global Physical Scores (43.94 vs 49.25, $p < 0.01$), and Promis Global Mental Scores (43.71 vs 53.80, $p < 0.01$) than those that reported not having anxiety at 12 weeks. This trend continued with Promis Global Overall, Physical, and Mental scores at 6 months, and 1 year ($p < 0.01$ at all timepoints). There was no significant difference in KOOS Jr, HOOS Jr., or procedure satisfaction scores at any time points.

Table 2: Differences in average patient outcome scores in patients that reported anxiety and depression and those who did not

Anxiety and Depression	No Anxiety + Depression	Anxiety + Depression	p value
KOOS Jr. Preop	49.72	43.15	0.01
HOOS Jr. Preop	49.95	47.84	0.53
PROMIS Global Overall Preop	32.86	25.26	$p < 0.01$
PROMIS Global Physical Preop	39.99	35.17	$p < 0.01$
PROMIS Global Mental Preop	50.02	38.71	$p < 0.01$
KOOS, JR. Score at 12 weeks	68.23	71.09	0.27
KOOS, JR. Score at 6 months	74.51	67.86	0.06
KOOS, JR. Score at 1 year	75.99	70.31	0.17
HOOS, JR. Score at 12 weeks	80.26	75.53	0.19
HOOS, JR. Score at 6 months	84.88	83.99	0.81
HOOS, JR. Score at 1 year	84.32	87.01	0.57
Procedure Satisfaction Score at 12 weeks	4.67	4.74	0.53
Promis Global Overall Score at 12 weeks	38.32	31.53	$p < 0.01$
Promis Global Physical Score at 12 weeks	49.25	43.93	$p < 0.01$
Promis Global Mental Score at 12 weeks	53.80	43.71	$p < 0.01$
Promis Global Overall Score at 6 months	39.03	32.35	$p < 0.01$
Promis Global Physical Score at 6 months	50.85	45.50	$p < 0.01$
Promis Global Mental Score at 6 months	53.81	43.98	$p < 0.01$
Promis Global Overall Score at 1 year	38.65	31.60	$p < 0.01$
Promis Global Physical Score at 1 year	50.49	44.77	$p < 0.01$
Promis Global Mental Score at 1 year	53.05	42.92	$p < 0.01$

Patients that reported anxiety comorbidities had significantly worse Promis Global scores at preoperative baseline. Patients that reported anxiety comorbidities had significantly worse Promis Global Overall Scores (32.48 v 37.92, $p<0.01$), Promis Global Physical Scores (44.21 v 49.03, $p<0.01$), and Promis Global Mental Scores (45.16 vs 53.20, $p<0.01$) than those that reported not having anxiety at 12 weeks. This trend continued with Promis Global Overall, Physical, and Mental scores at 6 months, and 1 year ($p<0.01$ at all timepoints). Patients that reported anxiety comorbidities had no differences 12 weeks postoperative ($p=0.83$), but significantly worse KOOS Jr. Scores at 6 months (67.45 vs 75.47, $p<0.01$) and 1 year (68.69 vs 78.91, $p=0.01$) than those without anxiety. There were no significant differences in HOOS Jr or Procedure Satisfaction at any time points.

Table 3: Differences in patient outcomes in patients that reported anxiety and those who did not

Anxiety	No Anxiety	Anxiety	p value
KOOS Jr. Preop	49.54	45.71	0.07
HOOS Jr. Preop	49.61	47.69	0.44
PROMIS Global Overall Preop	32.58	27.17	$p<0.01$
PROMIS Global Physical Preop	39.76	36.83	$p<0.01$
PROMIS Global Mental Preop	49.67	41.22	$p<0.01$
KOOS, JR. Score at 12 weeks	68.52	68.99	0.83
KOOS, JR. Score at 6 months	75.47	67.45	$p<0.01$
KOOS, JR. Score at 1 year	78.91	68.89	0.01
HOOS, JR. Score at 12 weeks	79.67	67.45	0.25
HOOS, JR. Score at 6 months	84.45	82.19	0.49
HOOS, JR. Score at 1 year	84.36	84.40	0.99
Procedure Satisfaction Score at 12 weeks	4.64	4.69	0.61
Promis Global Overall Score at 12 weeks	37.92	32.48	$p<0.01$
Promis Global Physical Score at 12 weeks	49.03	44.21	$p<0.01$
Promis Global Mental Score at 12 weeks	53.20	45.16	$p<0.01$
Promis Global Overall Score at 6 months	38.31	33.81	$p<0.01$
Promis Global Physical Score at 6 months	50.35	46.02	$p<0.01$
Promis Global Mental Score at 6 months	52.87	46.03	$p<0.01$
Promis Global Overall Score at 1 year	38.55	32.14	$p<0.01$
Promis Global Physical Score at 1 year	50.70	44.81	$p<0.01$
Promis Global Mental Score at 1 year	52.79	43.70	$p<0.01$

Patients that reported depression comorbidities had significantly worse Promis Global scores at preoperative baseline. Patients that reported depression comorbidities had significantly worse Promis Global Overall Scores (32.04 v 38.32, $p<0.01$), Promis Global Physical Scores (44.37 v 49.25, $p<0.01$), and Promis Global Mental Scores (44.49 vs 53.80, $p<0.01$) than those that reported not having depression at 12 weeks. This trend continued with Promis Global Overall, and Mental scores at 6 months, and 1 year ($p<0.01$ at all timepoints). Promis Global physical remained significant at 6 months (32.67 vs 39.03, $p<0.01$), and equilibrated by 1 year. (5 Patients that reported anxiety comorbidities had no differences 12 weeks postoperative ($p=0.83$), but significantly worse KOOS Jr. Scores at 6 months (67.45 vs 75.47, $p<0.01$) and 1 year (68.69 vs 78.91, $p=0.01$) than those without anxiety. There were no significant differences in HOOS Jr or Procedure Satisfaction at any time points.

Table 4: Differences in patient outcomes in patients that reported depression and those who did not

Depression	No Depression	Depression	p value
KOOS Jr. Preop	49.72	45.65	0.04
HOOS Jr. Preop	49.95	46.17	0.12
PROMIS Global Overall Preop	32.86	26.63	p<0.01
PROMIS Global Physical Preop	39.99	36.21	p<0.01
PROMIS Global Mental Preop	50.02	40.65	p<0.01
KOOS, JR. Score at 12 weeks	68.23	69.86	0.41
KOOS, JR. Score at 6 months	74.51	72.25	0.37
KOOS, JR. Score at 1 year	75.99	77.35	0.70
HOOS, JR. Score at 12 weeks	80.26	74.17	0.02
HOOS, JR. Score at 6 months	84.88	81.22	0.20
HOOS, JR. Score at 1 year	84.32	84.55	0.96
Procedure Satisfaction Score at 12 weeks	4.67	4.57	0.28
Promis Global Overall Score at 12 weeks	38.32	32.04	p<0.01
Promis Global Physical Score at 12 weeks	49.25	44.37	p<0.01
Promis Global Mental Score at 12 weeks	53.80	44.49	p<0.01
Promis Global Overall Score at 6 months	39.03	32.67	p<0.01
Promis Global Physical Score at 6 months	50.85	45.56	p<0.01
Promis Global Mental Score at 6 months	53.81	44.76	p<0.01
Promis Global Overall Score at 1 year	38.65	33.31	p<0.01
Promis Global Physical Score at 1 year	50.49	46.67	0.02
Promis Global Mental Score at 1 year	53.05	45.03	p<0.01

Correlations between GAD2 and postoperative PROMs are shown in Table 5. GAD2 was fairly negatively correlated with HOOS Jr at 12 weeks ($r = -0.24, p < 0.01$) and 6 months ($r = -0.2, p < 0.01$). GAD2 was moderately negatively correlated with PROMIS Global Overall at 12 weeks ($r = -0.3, p < 0.01$), 6 months ($r = -0.4, p < 0.01$), and 1 year ($r = -0.4, p < 0.01$). This trend continued with PROMIS Global Physical and Mental Scores being moderately negatively correlated at all time points. There was no correlation between GAD2 and KOOS Jr, HOOS Jr at 1 year, and only fairly negatively correlated with procedure satisfaction ($r = -0.1, p = 0.01$).

Table 5: Correlation between GAD2 and PROMs

	GAD2			GAD2	
KOOS Jr. 12 wk	r	-0.02	PROMIS Global Mental 12 wk	r	-0.33
	p	0.73		p	$p < 0.01$
	n	225		n	448
KOOS Jr. 6 mo	r	-0.15	PROMIS Global Overall 6 mo	r	-0.36
	p	0.04		p	$p < 0.01$
	n	171		n	351
KOOS Jr. 1 yr	r	-0.05	PROMIS Global Physical 6 mo	r	-0.30
	p	0.62		p	$p < 0.01$
	n	80		n	351
HOOS Jr. 12 wk	r	-0.24	PROMIS Global Mental 6 mo	r	-0.35
	p	$p < 0.01$		p	$p < 0.01$
	n	235		n	351
KOOS Jr. 6 mo	r	-0.25	PROMIS Global Overall 1 yr	r	-0.35
	p	$p < 0.01$		p	$p < 0.01$
	n	188		n	165
KOOS Jr. 1 yr	r	-0.05	PROMIS Global Physical 1 yr	r	-0.29
	p	0.66		p	$p < 0.01$
	n	88		n	165
PROMIS Global Overall 12 wk	r	-0.31	PROMIS Global Mental 1 yr	r	-0.33
	p	$p < 0.01$		p	$p < 0.01$
	n	448		n	165
PROMIS Global Physical 12 wk	r	-0.23	Procedure Satisfaction 12 weeks	r	-0.11
	p	$p < 0.01$		p	0.01
	n	448		n	430

Discussion

Results indicate that anxiety and depression, through patient reported comorbidities and validated outcome results, can impact recovery following total joint replacement. As orthopedics continue to shift toward same day discharge procedures, it is important to have an understanding into which patients will be able to recover on their own, and which patients may need additional assistance. Many physical factors such as heart disease and BMI as well as social support are often looked at as predictive factors. However, this study indicates that baseline mental health is just as important at predicting a successful recovery postoperatively. Further study is needed to assess if any impact can be made on outcomes with preoperative optimization, mental health counseling and preparation prior to surgery.

As with all retrospective studies, ours is not without limitations. Anxiety and depression comorbidities were patient reported, with no indication if these comorbidities were being treated at the time. Upon entering the engagement platform, patients are asked to answer several questions regarding their health profile. This includes a question regarding comorbidities. Patients can choose none, one, or multiple comorbidities from a predetermined list, including options of anxiety and depression. This has the potential to lead to user error. However, many medical systems do not accurately capture and document past medical history without an integration, leaving orthopedic practices with the same patient reported information.

Conclusion

Patients with comorbidities of anxiety and depression, as well as patients with high GAD2 scores, had inferior functional outcomes. In a time where orthopedics is seeing a large shift to less time spent with a provider in person, identifying patients with these comorbidities is essential. Further studies are needed to assess what action, if any, can assist in changing the course of these patients to optimize postoperative outcomes.

About Force

Founded in 2010, Force Therapeutics is a powerful, episode-based digital care platform and research network designed to help clinicians intelligently extend their reach. Our platform leverages video and digital connections to directly engage patients at every step of the care journey – from the point of surgery scheduling, to post-op recovery and beyond. Backed by the insights of more than 60 leading healthcare centers across the country, Force is proven to drive more effective recovery, lower costs, and achieve better patient outcomes.