

# **Worse Patient-Reported Outcomes and Higher Complication Rates in Patients Undergoing Anterior Cruciate Ligament Reconstruction Who Screen Positive for Depression: A Retrospective Review Utilizing Patient Health Questionnaire-2**

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## **INTRODUCTION:**

Mental health disorders, such as depression, are increasingly prevalent and may negatively influence postoperative outcomes in orthopaedic surgery. Patients sustaining anterior cruciate ligament (ACL) tears often report depressive symptoms around the time of injury and in their recovery process after surgery. However, the impact of preoperative depression screening, via Patient Health Questionnaire-2, on ACL reconstruction (ACLR) outcomes is not fully understood. The purpose of this study is to determine the influence of screening positive for depression (PHQ-2) preoperatively on patient-reported outcomes and complications after ACLR.

## **METHODS:**

This is a retrospective review of patients undergoing primary ACLR at one health system between May 2020 to September 2022 and had a PHQ-2 score recorded at least 6 months prior to their surgery. Patients were excluded if they were <13 years old, had previous ipsilateral knee surgery, had multi-ligament injury, and/or failed to follow up within 6 months postoperatively. The PHQ-2 is a validated screening tool for depression often used in primary care settings, with scores ranging from 0-2. Patients were categorized as either depressed (PHQ-2 = 2) or non-depressed (PHQ-2  $\leq$  1). Demographic characteristics were collected including race, employment, insurance, median household income (MHI), and Area Deprivation Index, with the lowest quartiles indicating lower MHI and more deprivation of resources for ADI. Preoperative and postoperative variables including Patient-Reported Outcome Information System (PROMIS) -Physical Function (PF), Pain Interference (PI), and Patient Acceptable Symptomatic State (PASS). Complications were collected, which included ED visits within 90 days of surgery, reoperation rate, and postoperative complications (arthrofibrosis, chronic pain, swelling, subjective instability, PE/DVT, and infection). Demographic characteristics and clinical outcomes were compared between the two cohorts.

## **RESULTS:**

A total of 132 patients undergoing primary ACLR were included, with 36 screening positive for depression who were matched to 96 non-depressed patients. The depressed cohort had a significantly higher proportion of patients in the lowest quartile for median household income (MHI) (44.4% vs. 16.7%;  $P < 0.001$ ). The depressed cohort demonstrated a significantly lower proportion of patients respond "yes" to Patient Acceptable Symptomatic State (PASS) preoperatively and 6-9 months, but no differences beyond 9 months. In terms of pain, the depressed cohort reported worse PROMIS-PI scores preoperatively ( $64.97 \pm 6.16$  vs.  $60.39 \pm 7.67$ ,  $p < 0.01$ ), 3-6 months ( $55.88 \pm 6.62$  vs.  $51.79 \pm 6.96$ ,  $p = 0.03$ ), and 6-9 months ( $55.24 \pm 9.00$  vs.  $48.93 \pm 7.63$ ,  $p < 0.01$ ). Similarly, the depressed group reported worse PROMIS-PF preoperatively ( $35.36 \pm 8.67$  vs.  $41.62 \pm 10.61$ ,  $p < 0.01$ ), at 6 months ( $44.41 \pm 5.87$  vs.  $50.79 \pm 9.13$ ,  $p < 0.01$ ), and approached significance at 9 months ( $45.31 \pm 4.91$  vs.  $50.14 \pm 8.11$ ,  $p = 0.08$ ). For complications, those screening positive for depression had a higher incidence of postoperative complications (30.6% vs. 11.5%;  $P = 0.009$ ) and reoperation rate (14.3% vs. 4.2%;  $P = 0.04$ ).

## **DISCUSSION AND CONCLUSION:**

Patients undergoing ACLR who screen positive for depression via PHQ2 exhibit lower PROMIS Physical Function and Pain Interference scores preoperatively and up to 9 months postoperatively. A higher rate of postoperative complications and reoperation rate was observed in those screening positive for depression. PHQ2 may serve as an important screening tool to identify patients with situational or clinical depression and potentially improve outcomes by treating these mental health disorders.

Table 1. Clinical Characteristics of ACLR cohorts.

Clinical Characteristics	Depressed† (n=36)	Non-Depressed† (n=96)	P Value
Age, mean ± SD	26.08 ± 11.10	29.82 ± 12.07	0.47
Male, n (%)	18 (50.0%)	42 (43.8%)	0.52
IBI, mean (SD)	26.91 ± 5.62	28.97 ± 6.18	0.08
Race, n (%)			0.22
White	22 (61.1%)	71 (74.0%)	
Black	4 (11.1%)	18 (18.8%)	
Asian	3 (8.3%)	3 (3.1%)	
Unknown	7 (19.4%)	4 (4.1%)	
Employment, n (%)			0.16
Unemployed	3 (8.3%)	13 (13.5%)	
Full-Time	12 (33.3%)	41 (44.8%)	
Student	10 (27.8%)	15 (15.6%)	
Retired	0 (0%)	1 (1.0%)	
Disabled	1 (2.8%)	0 (0%)	
Unknown	10 (27.8%)	26 (27.1%)	
Smoking Status, n (%)			0.63
Never	27 (75.0%)	77 (80.2%)	
Current	4 (11.1%)	11 (11.5%)	
Former	5 (13.9%)	8 (8.3%)	
Insurance, n (%)			0.54
Medicare	1 (2.8%)	4 (4.2%)	
Medicaid	7 (19.4%)	17 (17.7%)	
Private	27 (75.0%)	68 (70.8%)	
Self-Paid	1 (2.8%)	7 (7.2%)	
History of Anxiety or Depression	15 (41.7%)	19 (19.8%)	0.051
Laterality (% right-sided)	20 (55.6%)	44 (45.8%)	0.25
Grabb Type			0.73
IBI	18 (50.0%)	53 (55.2%)	
Hamstring	4 (11.1%)	16 (16.7%)	
Quad	4 (11.1%)	22 (22.9%)	
Other	2 (5.6%)	14 (14.6%)	
Income Measurements			0.09
MHI mean (SD)	561,573.11 ± \$20,394.88	572,717.06 ± \$26,621.34	
MHI Quartile, n (%)			<0.01*
1st-5th	16 (44.4%)	16 (16.7%)	
5th-10th	5 (13.9%)	28 (29.2%)	
10th-15th	12 (33.3%)	24 (25.0%)	
15th-19th	5 (13.9%)	26 (27.1%)	

†PHQ-2 positive defined as ≥2; PHQ-2 negative defined as <2.

Table 2. Postoperative outcomes of ACLR stratified by PHQ-2 screening

Outcome	PHQ-2 Negative† (n=96)	PHQ-2 Positive† (n=36)	P Value
<b>PASS, n (%)</b>			
Preoperative	24 (25%)	3 (8.6%)	<b>0.04*</b>
6 weeks postoperative	32 (47.9%)	13 (36%)	0.85
3 months	39 (60.9%)	11 (47.9%)	0.31
3 to 6 months	52 (62.7%)	13 (36%)	0.34
6 to 9 months	41 (71.9%)	9 (47.4%)	0.051
9 to 12 months	19 (70.4%)	4 (44.4%)	0.16
12 to 24 months	10 (58.8%)	3 (50%)	0.708
<b>PROMIS-PF, mean ± SD</b>			
Preoperative	68.40 ± 7.00	64.07 ± 6.16	<b>&lt;0.01*</b>
6 weeks postoperative	56.63 ± 9.51	59.23 ± 6.82	0.21
3 months	52.89 ± 7.59	55.96 ± 7.97	0.10
3 to 6 months	51.81 ± 7.18	55.88 ± 6.62	<b>0.01*</b>
6 to 9 months	48.93 ± 7.63	55.24 ± 9.00	<b>&lt;0.01*</b>
<b>PROMIS-PF, mean ± SD</b>			
Preoperative	40.90 ± 8.80	35.36 ± 8.67	<b>0.002*</b>
6 weeks postoperative	38.32 ± 8.18	36.00 ± 8.03	0.16
3 months	45.81 ± 6.65	42.82 ± 5.90	<b>0.03*</b>
6 months	49.51 ± 7.69	44.41 ± 5.87	<b>0.002*</b>
9 months	51.84 ± 8.96	45.31 ± 4.91	<b>0.01*</b>

\* indicates P value with significance (<0.05); PHQ-2 positive defined as ≥2; PHQ-2 negative defined as <2.

Table 3. Complications of ACLR stratified by PHQ-2 screening

Outcome, n (%)	PHQ-2 Positive † (n=36)	PHQ-2 Negative† (n=96)	P Value
IBI Visit within 90 Days	3 (8.3%)	1 (1.0%)	0.3603
Reoperation Rate	5 (13.9%)	4 (4.2%)	<b>0.04*</b>
Postoperative Complications	11 (30.6%)	11 (11.5%)	<b>&lt;0.01*</b>

\* indicates P value with significance (<0.05); PHQ-2 positive defined as ≥2; PHQ-2 negative defined as <2.