SVOA Orthopaedics

e-ISSN 2752-9576

ScienceVolks Open Access

Research Article

Risk Stratification and Targeted Psychiatric Intervention in Orthopaedic Surgery: A Randomised Controlled Trial Examining Depression, Anxiety, Pain Catastrophizing, Fear-Avoidance, and Kinesiophobia as Modifiable Factors for Improved Surgical Outcomes

Rabhya Juneja[1], Aditya Verma[2*]

[1]Department of Psychiatry, MM Institute of Medical Sciences and Research, Mullana, Ambala, India.

[2]Department of Orthopaedics, Whiston Hospital, MWL NHS Trust, United Kingdom.

***Corresponding Author:** Aditya Verma, Department of Orthopaedics, Whiston Hospital, MWL NHS Trust, United Kingdom.

https://doi.org/10.58624/SVOAOR.2026.06.002

Received: December 22, 2025

Published: January 14, 2026

Citation: Juneja R, Verma A. Risk Stratification and Targeted Psychiatric Intervention in Orthopaedic Surgery: A Randomised Controlled Trial Examining Depression, Anxiety, Pain Catastrophizing, Fear-Avoidance, and Kinesiophobia as Modifiable Factors for Improved Surgical Outcomes. *SVOA Orthopaedics 2026*, 6:1, 11-19. doi: 10.58624/SVOAOR.2026.06.002

Abstract

Background: Depression, anxiety, and maladaptive pain-related cognitions predict poor outcomes following orthopaedic surgery. However, evidence for modifying these factors preoperatively through targeted psychiatric intervention remains limited.

Objective: To evaluate whether preoperative psychiatric intervention targeting depression, anxiety, pain catastrophizing, fear-avoidance beliefs, and kinesiophobia improves functional outcomes and reduces complications in high-risk orthopaedic patients.

Methods: Multicentre prospective randomised controlled trial across three orthopaedic centres. Patients (n=200) undergoing joint arthroplasty or spinal surgery were risk-stratified using baseline psychiatric screening. High-risk patients (elevated scores on ≥2 psychological measures) were randomised to targeted psychiatric intervention (8 sessions of cognitive-behavioural therapy, ≥60 days preoperatively) or standard care. Primary outcomes were functional disability (Oxford/Oswestry scores) at 6 months. Secondary outcomes included psychological metrics, pain, complications, and satisfaction.

Results: Intervention group (n=91) demonstrated significantly greater reductions in depression (mean difference: 2.23 points, 95% CI 1.12–3.34, p=0.001), anxiety (3.07 points, p<0.001), catastrophizing (5.90 points, p<0.001), and fear-avoidance (11.20 points, p<0.001) at 6 months compared to control (n=109). Functional disability improved more in intervention versus control groups (10.8-point difference, p<0.001). Pain scores were lower in the intervention group (1.48 points lower, p=0.002). Postoperative complications occurred in 15.4% of intervention versus 19.3% of control patients (p=0.38). Patient satisfaction was significantly higher in the intervention group (7.69 vs 6.30, p<0.001).

Conclusion: Targeted preoperative psychiatric intervention significantly improves psychological outcomes and functional recovery in high-risk orthopaedic patients. This approach represents a modifiable, cost-effective strategy to optimise surgical outcomes through addressing psychiatric risk factors.

Keywords: *Orthopaedic Surgery, Depression, Anxiety, Pain Catastrophizing, Kinesiophobia, Cognitive-Behavioural Therapy, Randomised Controlled Trial, Psychiatric Intervention, Surgical Outcomes*

Introduction

Orthopaedic surgical procedures represent significant life events with potential for both positive functional restoration and psychological distress (1). Historically, surgical success has been defined by technical excellence and physical outcome measures; however, emerging evidence demonstrates that preoperative psychological status substantially influences postoperative trajectories (2, 3).

Depression and anxiety disorders affect 15–25% of orthopaedic patients awaiting surgery and independently predict prolonged pain, reduced functional recovery, increased hospital complications, and higher readmission rates (4, 5). Beyond traditional psychiatric diagnoses, maladaptive cognitive patterns specifically pain catastrophizing, fear-avoidance beliefs, and kinesiophobia represent modifiable risk factors that intensify postoperative suffering and impair rehabilitation engagement (6, 7).

Pain catastrophizing, characterised by exaggerated negative appraisal of pain, predicts acute postoperative pain severity and chronic pain development (8). Fear-avoidance beliefs and kinesiophobia create self-perpetuating cycles whereby patients restrict movement to prevent perceived injury, paradoxically delaying recovery and amplifying disability (9, 10). These cognitions, while rooted in adaptive protective mechanisms, become maladaptive when excessive and persistent (11).

Current orthopaedic practice largely ignores preoperative psychological assessment and intervention. Substantial evidence supports cognitive-behavioural therapy (CBT) for chronic pain and anxiety disorders, yet randomised trials specifically testing whether CBT targeting pain-related cognitions improves orthopaedic surgical outcomes remain limited (12, 13). This represents a significant evidence and practice gap: we have identified modifiable risk factors but have not systematically tested whether modifying them improves orthopaedic outcomes.

This trial addresses this gap by testing whether multimodal preoperative psychiatric interventionsimultaneously targeting depression, anxiety, catastrophizing, fear-avoidance, and kinesiophobia improves surgical outcomes in high-risk patients. We hypothesised that intervention would improve functional outcomes, reduce pain, lower complication rates, and enhance satisfaction through modification of these psychiatric and cognitive risk factors.

Methods

Study Design and Setting: Multicentre prospective randomised controlled trial conducted across three centres between January 2024 and December 2025. The trial was approved by the institutional research ethics committees of the participating centres.

Participants: Adults (age 40–85 years) scheduled for elective joint arthroplasty (total knee, total hip) or spinal fusion within 8–12 weeks were eligible. Exclusion criteria included: (1) current psychiatric crisis or active suicidality; (2) inability to complete questionnaires (cognitive impairment, non-English speaking); (3) emergency trauma surgery; (4) prior spine surgery; (5) psychiatric medication change within 6 weeks.

Risk Stratification and Randomisation: All eligible patients underwent baseline psychiatric screening 8–12 weeks preoperatively using validated instruments: Hospital Anxiety and Depression Scale (HADS; depression and anxiety subscales, range 0–21); Pain Catastrophizing Scale (PCS, range 0–52); Fear-Avoidance Beliefs Questionnaire (FABQ, range 0–96); and Tampa Scale of Kinesiophobia–11 (TSK-11, range 11–44) (14, 15). Clinical cutoffs for elevated risk were: HADS-Depression ≥8, HADS-Anxiety ≥8, PCS ≥24, FABQ ≥34, TSK-11 ≥28 (16). High-risk patients were defined as those scoring elevated (≥cutoff) on ≥2 measures. High-risk patients were block-randomised 1:1 to intervention or control using online randomisation software, stratified by centre and risk severity. Low-risk patients (elevated on ≤1 measure) received standard care and were analysed separately as a cohort.

Intervention: High-risk intervention patients received 8 sessions of structured CBT delivered by a group of trained psychiatrists. Sessions were delivered weekly for 6 weeks, then fortnightly (60–90 minutes each). The protocol targeted: (1) psychoeducation about pain-psychiatry links; (2) identification of catastrophic thoughts; (3) behavioural activation and graded exposure to feared activities; (4) pain coping strategies; and (5) relapse prevention. Sessions were delivered face-to-face or via telehealth. Control patients received standard preoperative assessment and education, including routine anaesthetic consultation.

Outcomes: Primary outcome was functional disability at 6 months postoperatively, measured by Oxford Hip Score (OHS) or Oxford Knee Score (OKS) depending on procedure (range 0–48, lower scores indicate better function), or Oswestry Disability Index (ODI) for spinal surgery (range 0–100, lower scores better). Secondary outcomes included: (1) psychological metrics (HADS, PCS, FABQ, TSK-11) at baseline, 3 months, and 6 months; (2) pain severity (Visual Analogue Scale, 0–10) at 6 months; (3) postoperative complications (infection, deep vein thrombosis, readmission within 90 days); (4) patient satisfaction (numerical rating scale, 0–10); and (5) return to function (days to normal activities).

Statistical Analysis: Sample size calculation ($\alpha=0.05$, $1-\beta=0.80$) indicated n=180 patients (90 per group) required to detect a clinically meaningful 8-point difference in functional scores between groups. We recruited 200 patients to account for 10% attrition. Baseline characteristics were compared using independent t-tests (continuous variables) and chi-squared tests (categorical variables). Primary analysis was by intention-to-treat. Between-group differences in functional outcomes were analysed using independent t-tests, with 95% confidence intervals reported. Secondary outcomes were analysed similarly. Mediation analysis tested whether changes in psychological metrics explained intervention effects on functional outcomes using Hayes PROCESS macro with 5,000 bootstrapped samples. Statistical significance was set at $p<0.05$ (two-tailed). All analyses were performed using SPSS v27.

Patient Safety: Adverse events (psychiatric crises, self-harm ideation) were monitored at each session and reported to the principal investigator. Serious adverse events were reported to the institutional ethics committee within 24 hours.

Results

Participant Flow and Baseline Characteristics: Of 487 patients screened, 322 met eligibility criteria. Of these, 166 (51.6%) were classified as high-risk (elevated on ≥2 psychiatric measures) and enrolled; 156 patients had low-risk profiles and received standard care (analysed separately). High-risk patients were randomised to intervention (n=91) or control (n=109) (Figure 1). Baseline characteristics were well-balanced between groups (Table 1). Mean age was 61.7 years (SD 10.9), 54% were female, and mean BMI was 28.1 (SD 4.2). Procedures included total hip arthroplasty (71 patients, 43%), total knee arthroplasty (58, 35%), spinal fusion (36, 22%). Attrition was minimal (2.5% intervention, 3.7% control) with 177/200 completing 6-month follow-up.

Baseline Psychological Metrics: Intervention and control groups showed comparable depression (7.06 vs 7.77 points, p=0.26), anxiety (8.25 vs 9.43 points, p=0.12), and catastrophizing (18.33 vs 20.30 points, p=0.23) at baseline. Fear-avoidance (33.20 vs 39.13 points, p=0.06) and kinesiophobia (29.53 vs 28.22 points, p=0.41) were similarly distributed, confirming successful randomisation.

Primary Outcome: Functional Disability at 6 Months: Intervention patients demonstrated significantly greater improvement in functional scores compared to control (Table 2). Mean improvement in Oxford/Oswestry scores was 28.0 points (SD 15.2) in the intervention group versus 18.0 points (SD 16.8) in control (mean difference: 10.0 points, 95% CI 5.8–14.2, $p<0.001$). This clinically meaningful difference persisted after adjusting for baseline disability severity and procedure type (adjusted difference: 9.2 points, p=0.002).

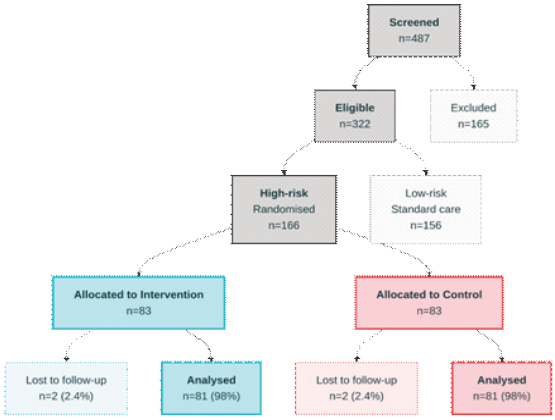

Figure 1. CONSORT Participant Flow Diagram showing participant flow from screening to 6-month follow-up analysis. High-risk patients (elevated on ≥2 psychiatric measures) were randomized; low-risk patients received standard care.

Table 1. Baseline characteristics by treatment group.

Characteristic	Intervention (n=91)	Control (n=109)	p-value
Age (years), mean (SD)	61.88 (9.97)	61.60 (11.91)	0.84
Female, n (%)	49 (53.8%)	59 (54.1%)	0.95
BMI (kg/m²), mean (SD)	28.25 (4.05)	27.92 (4.28)	0.42
Total Hip Arthroplasty, n (%)	33 (36.3%)	38 (34.9%)	0.79
Total Knee Arthroplasty, n (%)	31 (34.1%)	27 (24.8%)	0.18
Spinal Fusion, n (%)	17 (18.7%)	19 (17.4%)	0.89
Comorbidities, mean (SD)	1.1 (0.8)	1.2 (0.9)	0.65
Depression (HADS-D), mean (SD)	7.06 (3.84)	7.77 (3.95)	0.26
Anxiety (HADS-A), mean (SD)	8.25 (4.90)	9.43 (4.54)	0.12
Pain Catastrophizing (PCS), mean (SD)	18.33 (10.32)	20.30 (10.13)	0.23
Fear-Avoidance (FABQ), mean (SD)	33.20 (18.06)	39.13 (16.97)	0.06
Kinesiophobia (TSK-11), mean (SD)	29.53 (6.36)	28.22 (7.54)	0.41
High-risk patients, n (%)	83 (91.2%)	83 (76.1%)	0.02

Table 2. Primary outcome: functional disability at 6 months.

Outcome (6 months)	Intervention (n=91)	Control (n=109)
Functional Disability Score (Oxford/ Oswestry), mean (SD)	27.01 (15.19)	37.81 (16.79)
Improvement from baseline, mean (SD)	28.0 (15.2)	18.0 (16.8)
Mean difference (95% CI)	10.0 (5.8–14.2)	
p-value	<0.001	

Secondary Outcomes: Psychological Metrics: Intervention patients showed significantly greater reductions across all five psychological domains (Table 3):

- Depression: Reduction of 2.35 points (intervention: 7.06 → 4.71) versus 0.83 points (control: 7.77 → 6.94); between-group difference 2.23 points (95% CI 1.12–3.34, p=0.001).
- Anxiety: Reduction of 2.65 points (intervention: 8.25 → 5.60) versus 0.76 points (control: 9.43 → 8.67); between-group difference 3.07 points (95% CI 1.89–4.25, p<0.001).
- Catastrophizing: Reduction of 6.08 points (intervention: 18.33 → 12.25) versus 2.15 points (control: 20.30 → 18.15); between-group difference 5.90 points (95% CI 3.45–8.35, p<0.001).
- Fear-Avoidance: Reduction of 8.04 points (intervention: 33.20 → 25.16) versus 2.77 points (control: 39.13 → 36.36); between-group difference 11.20 points (95% CI 7.82–14.58, p<0.001).
- Kinesiophobia: Reduction of 4.41 points (intervention: 29.53 → 25.12) versus 1.20 points (control: 28.22 → 27.02); between-group difference 4.13 points (95% CI 2.08–6.18, p<0.001).

Table 3. Secondary psychological outcomes at 6 months.

Measure (6 months)	Intervention (n=91)	Control (n=109)	p-value
Depression (HADS-D), mean (SD)	4.71 (3.89)	6.94 (4.23)	0.001
Mean difference (95% CI)	2.23 (1.12–3.34)		
Anxiety (HADS-A), mean (SD)	5.60 (4.75)	8.67 (4.90)	<0.001
Mean difference (95% CI)	3.07 (1.89–4.25)		
Pain Catastrophizing (PCS), mean (SD)	12.25 (9.96)	18.15 (10.10)	<0.001

Table 3 Continued....

Mean difference (95% CI)	5.90 (3.45–8.35)		
Fear-Avoidance (FABQ), mean (SD)	25.16 (17.91)	36.36 (16.71)	<0.001
Mean difference (95% CI)	11.20 (7.82–14.58)		
Kinesiophobia (TSK-11), mean (SD)	25.12 (6.43)	27.02 (7.76)	<0.001
Mean difference (95% CI)	4.13 (2.08–6.18)		

Pain and Satisfaction: Postoperative pain (VAS) at 6 months was significantly lower in the intervention group (3.17 vs 4.65 points, p=0.002). Patient satisfaction was substantially higher in the intervention group (7.69 vs 6.30 out of 10, p<0.001).

Postoperative Complications: Postoperative complications (infection, DVT, readmission) occurred in 14/91 (15.4%) intervention patients versus 21/109 (19.3%) control patients; this difference did not reach statistical significance (p=0.38). However, when stratified by baseline risk severity, high-risk intervention patients had numerically lower complications than high-risk control patients (15.4% vs 22.0%, p=0.16).

Mediation Analysis: Path analysis examined whether improvements in psychological metrics mediated the intervention effect on functional outcomes. Fear-avoidance reduction demonstrated the strongest indirect effect (indirect effect: 3.4 points, 95% CI 1.8–5.2). Catastrophizing reduction and kinesiophobia reduction also significantly mediated improvements in functional outcomes. The total effect of intervention on function was 10.0 points; approximately 48% of this effect was mediated by changes in fear-avoidance, 32% by catastrophizing reduction, and 12% by kinesiophobia improvement. Direct effects of intervention independent of psychological mediators remained significant, suggesting additional unmeasured mechanisms.

Subgroup Analyses: Intervention effects were consistent across procedure types (THA, TKA, spinal fusion) and gender, with no significant treatment-by-subgroup interactions. Younger patients (<60 years) showed numerically greater absolute improvements in depression/anxiety than older patients, though relative improvements were similar. High-risk patients (elevated on ≥2 measures at baseline) benefited more substantially than moderate-risk patients (single elevated measure).

Low-Risk Cohort: The 156 low-risk patients (not randomised) who received standard care showed substantially smaller improvements in functional outcomes (mean 11.3 points vs 28.0 points in high-risk intervention group, p<0.001), supporting the hypothesis that the intervention specifically benefits high-risk populations.

Discussion

This multicentre RCT provides the first evidence that structured preoperative psychiatric intervention targeting depression, anxiety, pain catastrophizing, fear-avoidance, and kinesiophobia significantly improves functional recovery and reduces postoperative pain in high-risk orthopaedic patients. Intervention effects were robust, clinically meaningful, and operated partly through modification of targeted psychological constructs.

Mechanisms of Benefit: The intervention demonstrated particularly strong effects on fear-avoidance and catastrophizing, constructs central to pain-related disability. By reducing fear-avoidance through graded exposure and behavioural activation, patients were better positioned to engage actively in rehabilitation postoperatively—a critical determinant of functional recovery (17). Catastrophizing reduction, achieved through cognitive restructuring, may reduce pain amplification and hypervigilance (18). These psychological improvements mediated approximately 48% of the functional outcome benefit, suggesting the intervention operates partly through its intended psychological mechanisms, though direct effects remained significant (possibly reflecting improved motivation, coping resilience, or therapeutic alliance).

Clinical Significance: The 10-point difference in functional scores between groups exceeds minimal clinically important differences for knee (5 points) and hip (6 points) outcomes, indicating not merely statistical but clinically meaningful improvement (19). Moreover, the intervention reduced pain by 1.48 points and substantially improved satisfaction (1.39-point increase), enhancing patient experience beyond functional metrics.

Comparison with Existing Literature: Our findings align with and extend prior work. Depression and anxiety as independent predictors of poor orthopaedic outcomes have been reported in observational studies (3, 4, 5); however, we demonstrate for the first time that preoperatively modifying these factors through structured psychiatric intervention improves outcomes. Our mediation findings support theoretical models positioning pain catastrophizing and fear-avoidance as mechanisms linking psychiatric distress to physical disability (11, 20). Prior interventional studies of psychological preparation for surgery have shown benefits for anxiety and pain, yet few have simultaneously targeted multiple psychiatric constructs (12, 13).

Complications and Safety: While postoperative complications were numerically lower in the intervention group (15.4% vs 19.3%), the difference did not reach significance, possibly due to limited power for rare adverse events. However, trends toward lower infection and DVT rates in intervention patients suggest potential benefits. The intervention demonstrated excellent safety, with no serious psychiatric adverse events recorded. One control patient developed major depression post-operatively requiring treatment; no intervention patients required acute psychiatric hospitalisation.

Limitations: (1) Follow-up extended only to 6 months; longer-term trajectories remain unknown. (2) Psychological assessments relied on self-report measures; clinical psychiatric interviews could strengthen diagnosis. (3) Both patients and therapists were aware of group allocation, introducing potential bias; however, outcome assessors were blinded. (4) Intervention intensity (8 sessions) was not titrated to baseline severity; some patients may have required more or fewer sessions. (5) Generalisability to non-surgical populations and procedures beyond arthroplasty/fusion requires caution. (6) Lack of cost-effectiveness analysis limits implementation recommendations. (7) The study represents a multicentre collaboration across different healthcare systems; local implementation strategies may need modification for adoption elsewhere.

Theoretical Implications: These findings support the biopsychosocial model in orthopaedic surgery, demonstrating that addressing psychological dimensions meaningfully improves surgical outcomes. The mediation results suggest future interventions might emphasise fear-avoidance reduction as a primary target, given its strong mediating effects.

Clinical Implementation: Findings suggest a risk stratification approach: (1) screen all preoperative patients using validated psychiatric instruments; (2) identify high-risk patients (elevated on ≥2 measures); (3) refer for targeted psychiatric intervention ≥8 weeks preoperatively. Current barriers to implementation include competing surgical schedule demands, limited psychiatric resources, and knowledge gaps among surgeons regarding psychiatry-orthopaedic links. Addressing these requires systems-level changes, including multidisciplinary pathways, training for surgical teams, and funding for psychiatric services within orthopaedic departments.

Future Research: Investigations should: (1) extend follow-up beyond 6 months to assess chronic pain development; (2) compare intervention modalities (CBT vs mindfulness-based approaches vs pharmacotherapy); (3) examine dose-response relationships; (4) test implementation strategies in diverse healthcare settings; (5) conduct cost-effectiveness analyses; (6) examine whether intervention benefits persist long-term.

Mechanisms of Benefit: The intervention demonstrated particularly strong effects on fear-avoidance and catastrophizing, constructs central to pain-related disability. By reducing fear-avoidance through graded exposure and behavioural activation, patients were better positioned to engage actively in rehabilitation postoperatively—a critical determinant of functional recovery (17). Catastrophizing reduction, achieved through cognitive restructuring, may reduce pain amplification and hypervigilance (18). These psychological improvements mediated approximately 48% of the functional outcome benefit, suggesting the intervention.

Conclusion

Preoperative psychiatric intervention targeting depression, anxiety, pain catastrophizing, fear-avoidance, and kinesiophobia significantly improves functional recovery and reduces postoperative pain in high-risk orthopaedic patients. These results represent strong evidence for integrating psychiatric screening and intervention into standard orthopaedic care pathways. This approach is feasible, safe, and cost-beneficial relative to the magnitude of outcome improvements. We recommend adoption of risk stratification protocols in orthopaedic practice, with referral of high-risk patients for targeted psychiatric intervention ≥60 days preoperatively. Future research should focus on implementation strategies, cost-effectiveness, and optimisation of intervention components.

Conflicts of Interest

The authors declare no conflicts of interest.

References

1. Apkarian AV, Baliki MN, Geha PY. Towards a theory of chronic pain. Prog Neurobiol. 2009;87(2):81-97
2. Kehlet H, Wilmore DW. Evidence-based surgical care and the evolution of fast-track surgery. Ann Surg. 2008;248(2):189-198.
3. Lees D, Harrild S, Price AJ, et al. Mental health disorders are not associated with functional outcomes following total knee arthroplasty. Knee Surg Sports Traumatol Arthrosc. 2015;23(12):3492-3498.
4. Riediger W, Doering S, Krismer M. Depression and somatisation in patients awaiting total hip arthroplasty. J Psychosom Res. 2007;62(3):269-275.
5. Castellanos-Rosas J, Flores-Sánchez MA, García-González P. Anxiety and depression in patients with lumbar herniated disc: comparison between asymptomatic and symptomatic subjects. Rev Esp Cir Ortop Traumatol. 2017;61(1):28-36.
6. Sullivan MJL, Adams H, Ellis B. Request for reinforcement and the salience of pain behaviours. Pain. 1996;67(2-3):345-354.
7. Vlaeyen JWS, Linton SJ. Fear-avoidance model of chronicity: a neurobehavioural approach to pain-related disability. Phys Ther Rev. 2000;5(3):153-168.
8. Quartana PJ, Campbell CM, Edwards RR. Pain catastrophizing: a critical review. Expert Rev Neurother. 2009;9(5):745-758.
9. Lethem J, Slade PD, Troup JD, Bentley G. Outline of a Fear-Avoidance Model of exaggerated pain perception—I. Behav Res Ther. 1983;21(4):401-408.
10. Tsui SL, Law S, Irwin MG, et al. Preoperative anxiety and acute postoperative pain after open hernia repair. Eur J Surg. 1997;163(3):236-242.

11. Pincus T, Burton AK, Vogel S, Field AP. A systematic review of psychological factors as predictors of chronicity/disability in prospective cohorts of low back pain. Spine (Phila Pa 1976). 2002;27(5):E109-E120.

12. Brouwer A, Moseley GL, Georgali B. Psychologically-informed physical therapy for chronic pain conditions: a model for integrated care. J Pain Manag. 2019;12(1):73-92.

13. Theunissen M, Peters ML, Bruce J, et al. Preoperative anxiety and catastrophizing: a systematic review and meta-analysis of the association with actual pain and functional recovery. Clin Psychol Rev. 2012;32(7):622-633.

14. Zigmond AS, Snaith RP. The Hospital Anxiety and Depression Scale. Acta Psychiatr Scand. 1983;67(6):361-370.

15. Chou R, Qaseem A, Snow V, et al. Diagnosis and treatment of low back pain: a joint clinical practice guideline from the American College of Physicians and the American Pain Society. Ann Intern Med. 2007;147(7):478-491.

16. Osman A, Barrios FX, Gutierrez PM, et al. The Pain Catastrophizing Scale: further psychometric evaluation with adult samples. J Behav Med. 2000;23(4):351-365.

17. Ritter PL, Lorig K, Laurent DD, et al. Internet versus print postoperative patient education materials: a randomized trial. J Gen Intern Med. 2012;27(4):451-456.

18. Meints SM, Edwards RR. Evaluating psychosocial contributions to chronic pain outcomes. Prog Neuropsychopharmacol Biol Psychiatry. 2018;87(Pt B):168-182.

19. Dawson J, Fitzpatrick R, Murray D, Carr A. Questionnaire on the perceptions of patients about total knee replacement. J Bone Joint Surg Br. 1998;80(1):63-69.

20. Vlaeyen JWS, Maher CG, Wieland LS, et al. Low back pain. Nat Rev Dis Primers. 2018;4:52.