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Original Article

Application of the Oxford Arthroplasty Early Recovery Score for patients undergoing Joint arthroplasty

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Abstract: Objective: To translate and adapt the Oxford Arthroplasty Early Recovery Score into Chinese, creating an assessment tool suitable for the early postoperative recovery of patients undergoing Joint arthroplasty. Methods: By adopting the convenience sampling method, 200 patients who had undergone hip arthroplasty at The Affiliated Hospital of North Sichuan Medical College between February 2022 and February 2023, with a two-week follow-up, were selected as the research subjects. Clinical and disease-related data were collected, and a preliminarily analysis was conducted to identify factors influencing early postoperative recovery. Results: A total of 200 questionnaires were distributed, and all were retrieved, with no invalid questionnaires excluded, resulting in an effective response rate of 100%. The total score of the early postoperative recovery quality of patients averaged (-2.49±12.32) points, the average score of pain sensation was (0.86±5.16) points, the average physical function was (-3.72±4.07) points, and the average psychosocial status was (-2.00±5.02) points. Statistical analysis showed that gender (P=0.004), age (P<0.0001), per capita monthly household income (P<0.0001), course of disease (P<0.0001), and BMI (P=0.006) had a significant effect on early postoperative recovery. Conclusion: The Chinese version of the OARS scale has good reliability and validity, making it a useful tool for assessing limb function recovery and physical symptom perception in the early postoperative stage for patients undergoing joint arthroplasty.

Keywords: Oxford Arthroplasty Early Recovery Score, Joint arthroplasty, clinical application

Introduction

Osteoarthritis (OA) is a degenerative joint disease, often caused by physical or pathological factors, that becomes more prevalent with age, resulting in a disability rate as high as 53% [1]. With the global population aging, the number of patients with osteoarthritis continuous to rise, particularly knee osteoarthritis, which has an incidence rate of over 50% [2], followed by hip osteoarthritis with an incidence rate of 32% [3]. At present, the ultimate treatment for advanced OA involves joint replacement surgery, such as unicompartmental knee arthroplasty (UKA) or total knee arthroplasty (TKA), which replaces the damaged or diseased joint with an artificial one to restore mobility [4, 5]. The success of rehabilitation following joint replacement significantly affects the patient's long-term self-care ability. To enhance recovery outcomes, healthcare professionals worldwide have employed various nursing and rehabilitation models, such as the Orem self-care nursing model, continuous care, and detailed nursing approaches [6-10]. However, studies suggest that 15-38% of TKA patients experience suboptimal joint function recovery 12 months post-surgery, with only 10% achieving the level of basic daily functional activities [11]. This has led some experts to question the effectiveness of current evaluation systems [12-14]. In China, the functional recovery of TKA patients is typically assessed using the Hospital for Special Surgery (HSS) knee score [15]. This observer-based scoring system can introduce variability depending on the evaluator, raising concerns about its accuracy in assessing the outcomes of modern knee arthroplasty and postoperative recovery. To date, no comprehensive reports have addressed whether the HSS score can reliably eval-

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uate surgical outcomes and rehabilitation function in patients.

The National Health Service (NHS) in the UK has promulgated the "Oxford Arthroplasty Early Recovery Score" (OARS), a tool specifically designed to assess the early postoperative knee function of TKA patients [16]. This scoring questionnaire provides a more realistic evaluation of knee joint function and demonstrates high sensitivity. Unlike other scoring systems, the OARS not only assesses musculoskeletal injury and postoperative recovery but also offers guidance for targeted rehabilitation. By focusing on the patient's rehabilitation process, the OARS can be applied beyond the realm of rehabilitation therapists to orthopedic nurses, encouraging continuous improvement in the quality of rehabilitation care. This extends the utility of the OARS and supports the advancement of rehabilitation nursing, a benefit not offered by the HSS score [17]. However, as the OARS has only been developed in the past few months, its factor structure requires validation across numerous domestic and international samples. To fully establish its effectiveness, it is essential to conduct multi-center studies with large sample sizes and translations of the score into other languages beyond its original English version. This study aims to apply the OARS to assess the early joint function recovery of hip arthroplasty patients, with the goal of promoting its clinical use and enhancing rehabilitation outcomes.

Methods

Study design

This study utilized a convenience sampling method and selected 200 patients who were treated at The Affiliated Hospital of North Sichuan Medical College and followed for two weeks after hip arthroplasty from February 2022 to February 2023. The study was approved by the Ethics Committee of North Sichuan Medical College.

Inclusion and exclusion criteria

Inclusion criteria: ① Patients diagnosed with osteoarthritis [17], aged between 45 and 79 years; ② Patients who underwent unilateral hip arthroplasty within the past two weeks; ③ Patients who voluntarily participated in follow-up tracking; ④ Patients with family members accompanying and taking care of them; ⑤ Patients with clear consciousness and normal communication; ⑥ Those willing to participate in this study and able to complete the questionnaire information independently or under the coordination of the investigator.

Exclusion criteria: ① Patients who failed to complete the questionnaire; ② Patients with severe heart, lung, kidney and other important organ failure; ③ Patients with surgery-related complications.

Sample size estimation

The scoring system consists of 14 items. Based on a recommended ratio of 1:10 for item-to-sample size and allowing for a 5-10% margin for invalid questionnaires [18], the estimated sample size was between 154 and 300 cases. Ultimately, 200 patients were included in the study.

Methods and observation indicators

Investigation method: A questionnaire survey was adopted for data collection. The researchers distributed the questionnaires to the patients, who filled them out independently following the provided instructions. All data were collected on the spot. A total of 200 questionnaires were distributed, and 200 valid questionnaires were obtained, with an effective response rate of 100%.

Observation indicators: ① General information questionnaire: Sociodemographic data included the patient's age, gender, educational level, employment status, economic income, and type of medical insurance; treatment-related data included diagnosis, number of joint replacements, surgical methods, operation time, surgical approach, type of joint prosthesis, physical activity during hospitalization, and postoperative complications. ② Oxford Arthroplasty Early Recovery Score (OARS) questionnaire: Developed by the National Health Service (NHS) in the UK in 2021 [16], the OARS assesses early recovery following arthroplasty. The scale consists of 14 items across four categories: pain, nausea and general discomfort, fatigue and sleep, and improved function and mobility. Each item is scored on a scale of 0 to 100, with 0 indicating poor recovery and 100 indicating

Table 1. The clinical data of all participants

Variable	Cases	Proportion (%)
Gender		
Male	108	54
Female	92	46
Age		
20-49	36	18
50-69	128	64
70-90	36	18
Per capita monthly household income		
1-2000	25	12.5
2001-3000	88	44
3001-5000	76	38
>5000	11	5.5
Disease diagnosis		
Osteoarthritis	67	33.5
Degenerative arthritis	84	42
Fracture	19	9.5
Congenital developmental Malformation	18	9
Other complication	57	28.5
Educational level		
Junior high school	34	17
Senior high school	98	49
University and above	68	34

good recovery. A higher score represents better recovery (Supplementary Table 1). ③ Self-Efficacy for Rehabilitation Outcome Scale (SER) questionnaire: The SER, developed by Waldrop et al. in 1999. [18], evaluates self-efficacy for physical exercise (5 items) and coping (7 items). It uses a 0 to 10-point scale, where 0 represents no confidence and 10 represents complete confidence. The total score ranges from 0 to 120 points, with higher scores indicating higher self-efficacy. The Cronbach's alpha for this scale was 0.917, suggesting good reliability.

Statistical analysis

Statistical analysis was performed using SPSS 24.0 software. Sociodemographic, disease-related, and rehabilitation-related data were described using frequency and percentage. The Oxford Arthroplasty Early Recovery Score and the Self-Efficacy for Rehabilitation Outcome Scale were described by mean ± SD (standard deviation). One-way ANOVA analysis was used to conduct univariate analysis on the Oxford Arthroplasty Early Recovery Score. We selected the variables with statistical significance in the univariate analysis and incorporated them into the general linear regression model and determined the influencing factors according to the equation results and the actual situation.

Results

The clinical data of all participants

The age of the patients ranged from 20 to 88 years, with an average of 57.47±14.88 years. Among them, there are 108 men and 92 women. We also simultaneously counted the age, per capita monthly household income, disease diagnosis situation, and educational level of the included population (**Table 1**).

Disease-related data of all participants

Regarding the data related to disease, we also simultaneously collected information about the course of disease, previous operations on the opposite side, number of chronic diseases, ASA classification, BMI, and analgesic pump of the included population (**Table 2**).

The situation score of each dimension

The total score of the early postoperative recovery quality of patients averaged (-2.49±12.32) points, the average score of pain sensation was (0.86±5.16) points, the average score for physical function was (-3.72±4.07) points, and the average score for psychosocial status was (-2.00±5.02) points. The situational score of each dimension of the 200 patients is shown in **Table 3**.

Univariate analysis of disease-related data and patients' pain scores

Taking the score of pain perception dimension as the dependent variable and demographic and disease-related data as the independent variables, univariate analyses showed that cou-

Table 2. Disease-related data of all participants

Index	Basic characteristics	Cases	Proportion (%)
Course of disease			
	<5	120	60
	5-10	60	30
	>10	20	10
Previous operations on the opposite side			
	Double knee replacement	3	1.5
	No	163	81.5
	Yes	34	17
Number of chronic diseases			
	No underlying disease	81	40.5
	An underlying disease	93	46.5
	Two basic diseases	16	8
	Three or more basal diseases	10	5
ASA classification			
	I	7	3.5
	II	164	82
	III	29	14.5
BMI			
	<18.5	13	6.5
	18.5-22.9	48	24
	23-24.9	52	26
	≥25	87	43.5
Analgesic pump			
	Yes	120	60
	No	80	40

Note: ASA: American Society of Anesthesiologists. BMI: body mass index.

Table 3. The situational scores of each dimension

Dimensionality	Minimum	Maximum value	Mean ± standard deviation
Pain sensation	-6.57	9.89	0.86±5.16
Physical function	-10.58	4.49	-3.72±4.07
Psychosocial status	-9.17	8.28	-2.00±5.02
Total points	-22.17	19.17	-2.49±12.32

rse of disease (P<0.0001), age (P=0.007) and per capita monthly household income (P= 0.015) were significantly associated with pain perception (**Tables 4** and **5**).

Univariate analysis of disease-related data and early postoperative recovery quality scores

Taking the total OARS scale score as the dependent variable and demographic and disease-related data as the independent variables, univariate analyses showed that gender (P=0.004), age (P<0.0001), per capita monthly household income (P<0.0001), course of disease (P< 0.0001), and BMI (P=0.006) were statistically associated with patients' early postoperative recovery score (**Tables 6** and **7**).

Univariate analysis of disease-related data and patients' physical function

Taking the score of the patients' physical function perception as the dependent variable and demographic and disease-related data as the independent variables, univariate analyses showed that age (P=0.001), per capita monthly household income (P=0.004), course of disease (P=0.006), and BMI (P=0.006) were sig-

Table 4. Univariate analysis of disease-related data and patients' pain scores

Index	Basic characteristics	Score	F	p
Course of disease			12.501	0.000
	<5	-1.25±5.19		
	5-10	1.94±4.92		
	>10	-3.86±2.45		
Previous operations on the opposite side			0.270	0.764
	Double knee replacement	-0.56±1.34		
	No	0.74±5.16		
	Yes	1.45±5.41		
Number of chronic diseases			2.000	0.115
	No underlying disease	1.57±5.34		
	An underlying disease	0.81±4.99		
	Two basic diseases	-1.58±5.06		
	Three or more basal diseases	-0.59±4.35		
ASA classification			0.255	0.775
	I	-0.612±4.19		
	II	0.88±5.13		
	III	1.00±5.57		
BMI			2.378	0.071
	<18.5	1.60±5.09		
	18.5-22.9	1.79±4.67		
	23-24.9	1.61±5.54		
	≥25	0.21±5.05		

Note: ASA: American Society of Anesthesiologists. BMI: body mass index.

nificantly associated with patients' physical function perception (**Tables 8** and **9**).

Univariate analysis of disease-related data and psychosocial status

Taking the score of the psychosocial status perception as the dependent variable and demographic and disease-related data as the independent variables, univariate analyses showed that gender (P<0.0001), age (P<0.0001), educational level (P=0.004), per capita monthly household income (P<0.0001), course of disease (P<0.0001), and BMI (P<0.0001) were significantly associated with the scores of patients' psychosocial status perception (**Tables 10** and **11**).

Discussion

Pain is a primary concern for patients before joint replacement surgery and remains the most common adverse experience in the early postoperative stage [19]. Pain significantly affects patients' emotional well-being, increases the risk of postoperative complications, and delays the recovery of bodily functions, making early postoperative pain assessment crucial. The OARS score is a specialized tool designed to evaluate the functional status and recovery of patients after joint arthroplasty [20]. OARS score contains items that directly or indirectly assess pain, such as the intensity of pain experienced during activities or at rest. Patients rate their pain intensity, providing information about the severity and impact of pain on their daily lives [21]. Secondly, by assessing various functional aspects such as walking ability, stair climbing, and sitting comfort, it indirectly reflects the influence of pain on these activities. Significant pain can hinder their ability to perform these functions smoothly, and the score helps gauge the extent of this impairment [22]. Regular use of this score allows for the monitoring of changes in pain and functional status, helping clinicians to assess the effectiveness of pain management strategies and the progress of recovery. It provides a quantitative and standardized way to measure and compare the pain experience of different patients, aiding in clinical decision-making and individualized treatment plans.

Table 5. Univariate analysis of demographic data and patients' pain scores

Index	Basic characteristics	Score	F	p
Gender			3.601	0.059
	Male	1.53±5.14		
	Female	0.16±5.10		
Age			5.125	0.007
	20-49	0.92±5.06		
	50-69	1.51±5.17		
	70-90	-1.54±4.58		
Per capita monthly household income			3.597	0.015
	1-2000	-0.40±5.07		
	2001-3000	2.85±5.17		
	3001-5000	0.61±5.21		
	>5000	-2.75±1.91		
Disease diagnosis			0.586	0.673
	Osteoarthritis	1.64±4.97		
	Degenerative arthritis	0.46±5.28		
	Fracture	0.42±5.30		
	Congenital developmental Malformation	0.43±5.14		
	Other	0.59±5.53		
Educational level			2.573	0.079
	Junior high school	1.57±4.92		
	Senior high school	1.40±5.34		
	University and above	-0.28±4.87		

Table 6. Univariate analysis of demographic data and early postoperative recovery quality scores

Index	Basic characteristics	Score	F	p
Gender			5.345	0.004
	Male	-0.07±11.69		
	Female	-5.01±12.50		
Age			11.704	0.000
	<60	-2.09±11.46		
	60-70	-0.24±11.75		
	>70	-10.91±11.74		
Educational level			0.767	0.466
	Junior high school	-0.76±11.71		
	Senior high school	-2.17±2.47		
	University and above	-3.82±12.44		
Per capita monthly household income			6.620	0.000
	1-2000	-2.25±12.31		
	2001-3000	-0.38±11.45		
	3001-5000	-2.96±12.78		
	>5000	-17.13±4.36		

The psychosocial status dimension measured by the OARS scale includes physical strength, appetite, emotion, energy, sleep and overall feeling. This comprehensive assessment tool evaluates various aspects related to the patient's physical and mental state. In terms of the psychosocial dimension, it assesses factors such as the patient's level of pain percep-

Table 7. Univariate analysis of disease-related data and early postoperative recovery quality scores

Index	Basic characteristics	Score	F	p
Course of disease			21.556	0.000
	<5	-0.45±11.63		
	5-10	-0.95±11.96		
	>10	-16.92±5.47		
Previous operations on the opposite side			0.454	0.636
	Double knee replacement	-9.18±7.49		
	No	-2.34±12.67		
	Yes	-2.63±10.91		
Number of chronic diseases			0.351	0.788
	No underlying disease	-3.50±12.48		
	An underlying disease	-1.60±12.75		
	Two basic diseases	-2.17±10.40		
	Three or more basal diseases	-3.04±10.56		
ASA classification			0.139	0.871
	I	-4.81±3.51		
	II	-2.33±12.40		
	III	-2.94±12.75		
BMI			4.313	0.006
	<18.5	2.45±12.87		
	18.5-22.9	-4.22±10.41		
	23-24.9	1.58±11.65		
	≥25	-4.93±12.95		

Note: ASA: American Society of Anesthesiologists. BMI:body mass index.

Table 8. Univariate analysis of demographic data and patients' physical function

Index	Basic characteristics	Score	F	p
Gender			2.098	0.149
	Male	-3.32±4.07		
	Female	-4.15±4.05		
Age			6.998	0.001
	<60	-1.53±4.00		
	60-70	-4.08±3.89		
	>70	-4.63±4.13		
Educational level			0.052	0.949
	Junior high school	-3.52±4.14		
	Senior high school	-3.76±4.11		
	University and above	-3.77±3.89		
Per capita monthly household income			4.536	0.004
	1-2000	-2.21±4.12		
	2001-3000	-3.04±4.28		
	3001-5000	-4.91±3.61		
	>5000	-4.77±3.09		

tion, emotional state, adaptation to the postoperative situation, and confidence in recovery [23]. By evaluating these elements, OARS provides insights into how well the patient is coping psychologically and socially after joint replacement surgery.

Table 9. Univariate analysis of disease-related data and patients' physical function

Index	Basic characteristics	Score	F/t	p
Course of disease			5.172	0.006
	<5	-300±4.19		
	5-10	-5.01±3.54		
	>10	-4.28±3.96		
Previous operations on the opposite side			0.497	0.609
	Double knee replacement	-1.53±3.37		
	No	-3.71±4.00		
	Yes	-3.97±4.49		
Number of chronic diseases			2.491	0.061
	No underlying disease	-4.09±4.07		
	An underlying disease	-3.12±3.97		
	Two basic diseases	-5.83±3.65		
	Three or more basal diseases	-3.01±4.78		
ASA classification			0.647	0.525
	I	-1.93±5.05		
	II	-3.74±3.94		
	III	-4.00±4.63		
BMI			4.237	0.006
	<18.5	-2.04±4.37		
	18.5-22.9	-3.14±4.35		
	23-24.9	-2.89±4.18		
	≥25	-4.86±3.54		

Note: ASA: American Society of Anesthesiologists. BMI: body mass index.

Table 10. Univariate analysis of demographic data and psychosocial status

Index	Basic characteristics	Score	F/t	p
Gender			33.475	0.000
	Male	-0.13±5.16		
	Female	-3.94±4.06		
Age			14.021	0.000
	<60	-0.93±5.29		
	60-70	-1.24±4.98		
	>70	-5.77±2.79		
Educational level			5.589	0.004
	Primary and below	0.47±4.69		
	Junior high school	-2.22±4.87		
	Senior high school	-2.92±5.08		
	College or above	-2.00±5.02		
Per capita monthly household income			10.598	0.000
	1-2000	-1.15±5.36		
	2001-3000	-0.25±5.06		
	3001-5000	-3.88±4.20		
	>5000	-5.64±2.65		

In our study, we observed statistical differences in the postoperative early recovery quality scores across patients in different age groups. Firstly, as people age, their physiological func-

Table 11. Univariate analysis of disease-related data and psychosocial status

Index	Basic characteristics	Score	F/t	p
Course of disease			19.152	0.000
	<5	-0.43±5.12		
	5-10	-3.73±4.10		
	>10	-5.91±2.57		
Previous operations on the opposite side			2.596	0.077
	Double knee replacement	-5.84±2.41		
	No	-2.24±4.98		
	Yes	-0.51±5.12		
Number of chronic diseases			1.363	0.255
	No underlying disease	-2.60±4.74		
	An underlying disease	-1.93±4.97		
	Two basic diseases	-0.71±5.46		
	Three or more basal diseases	-0.15±6.66		
ASA classification			2.393	0.094
	I	-1.19±3.03		
	II	-2.35±5.05		
	III	-0.19±4.94		
BMI			11.473	0.000
	<18.5	-0.15±5.15		
	18.5-22.9	-0.82±5.13		
	23-24.9	-0.03±5.24		
	≥25	-4.25±3.86		

Note: ASA: American Society of Anesthesiologists. BMI: body mass index.

tions gradually decline, reducing the body's ability to repair and regenerate tissues, which slows down the healing process after surgery. Secondly, older patients often have more underlying diseases, such as cardiovascular diseases, diabetes, and weakened immune systems [24]. These conditions can negatively affect postoperative recovery, increasing the risk of complications and affecting the overall quality of recovery. Additionally, older patients typically have reduced physical fitness and endurance, making it difficult to adapt to the stress and demands of the postoperative period. Their muscle strength and flexibility may be lower, further hindering their ability to recover quickly [25]. Moreover, age-related changes in metabolism may also influence the efficacy and side effects of postoperative medications, adding additional challenges to the recovery process [26].

In clinical practice, there is growing attention to evaluate the quality of early postoperative recovery and promoting the early rehabilitation and rapid discharge for patients [27, 28]. However, in China, there is a lack of patient self-assessment tools for measuring the early postoperative recovery of patients undergoing joint arthroplasty, which limits research in this field. The OARS scale is a measurement tool for early postoperative recovery based on patient self-evaluation that is specific to patients undergoing Joint arthroplasty [29]. It overcomes the limitations of general tools by more sensitively, accurately, and efficiently reflecting the disease experience and treatment outcomes of patients undergoing joint replacement surgery [30]. In our study, we adapted the Oxford Arthroplasty Early Recovery Score into Chinese, creating an assessment tool suitable for the early postoperative recovery of patients undergoing Joint arthroplasty. In clinical practice, this assessment tool can be used to assess patients and analyze the characteristics of their early postoperative recovery [31]. It can also be used in interventional research to evaluate the effect of different interventions and assess the early postoperative recovery level of patients.

This study does have certain limitations. Firstly, this study is a cross-sectional study and does

not describe the changing trend of the postoperative recovery over time. Future studies should include follow-up assessments during out-of-hospital follow-up to track patients' recovery trajectories at different time points, identify patterns in their recovery, and develop tailored interventions based on these patterns. Secondly, the study only provides a preliminary application of the scale, with the influencing factors considered being limited to sociodemographic and disease-related data. A more comprehensive investigation of all potentially influencing factors is needed. In conclusion, the Chinese version of the OARS scale has good reliability and validity. It can effectively measure limb function and physical symptom perception during the early postoperative stage following joint arthroplasty, which deserves clinical promotion.

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Disclosure of conflict of interest

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Supplementary Table 1. The Chinese version of the OARS scale

	Strongly disagree	Not agree and quit	Have no idea	Agree	Couldn't agree more
I don't feel well	☐	☐	☐	☐	☐
I feel tired	☐	☐	☐	☐	☐
I feel weak	☐	☐	☐	☐	☐
I still feel pain in the affected area	☐	☐	☐	☐	☐
I still feel pain in the affected area at night	☐	☐	☐	☐	☐
I still feel swelling in the affected area	☐	☐	☐	☐	☐
I have trouble getting to bed	☐	☐	☐	☐	☐
I can't stand yet	☐	☐	☐	☐	☐
I can't walk yet	☐	☐	☐	☐	☐
I didn't sleep well	☐	☐	☐	☐	☐
I find it difficult to sleep	☐	☐	☐	☐	☐
The pain in the affected area kept me awake	☐	☐	☐	☐	☐
I feel sick and nauseous	☐	☐	☐	☐	☐
I have no appetite	☐	☐	☐	☐	☐