

A Study on the Effectiveness of Structured Health Education in the Perioperative Period for Patients with Knee Meniscus Injuries

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Abstract: Objective To explore the application effectiveness of structured health education in the perioperative period for patients with knee meniscus injuries. **Methods** A non-prospective controlled study was conducted. Forty patients undergoing meniscus injury surgery in the Orthopedics Department of our hospital from January 2024 to September 2024 were assigned to the control group and received conventional health education. Forty patients undergoing meniscus injury surgery from November 2024 to June 2025 were assigned to the observation group and received structured health education, which included establishing a health education team, optimizing educational materials, providing mobile platform support, and daily supervision. The Tegner scores, TSK-11 fear of movement scores, and the proportion of factors influencing failure to return to sports were compared between the two groups at 3 months postoperatively. **Results** The Tegner score in the observation group showed a significant increase compared to pre-intervention levels, and the TSK-11 fear of movement score demonstrated marked improvement. Statistical analysis revealed that the differences in these indicators between the two groups were statistically significant ($P < 0.05$). Further analysis of reasons for not returning to sports revealed that the proportion of participants in the observation group who were unable to resume sports due to personal fear and lack of knowledge about knee joint rehabilitation was significantly lower than that in the control group. **Conclusion** Implementing structured perioperative health education for patients with meniscus injuries effectively promotes postoperative recovery of knee joint function, alleviates fear of movement, and reduces barriers to rehabilitation through systematic interventions. This approach holds significant clinical value in facilitating patients' return to physical activity.

Keywords: Meniscus Injury; Structured Health Education; Perioperative Period; Tegner Score; Fear of Movement.

1. Introduction

Meniscal injury of the knee is a common sports injury in orthopedic clinical practice. Arthroscopic surgery has the advantages of minimal trauma, rapid recovery and satisfactory efficacy, and has become the preferred treatment for this disease [1].

However, it should be noted that successful surgery only lays the foundation for the recovery of knee joint function. Postoperative rehabilitation intervention directly affects the degree of functional recovery and the improvement of long-term quality of life in patients [2]. Conventional health education is limited by unsystematic content, short intervention duration and monotonous forms, resulting in unsatisfactory effects in clinical nursing practice. Against this background, structured health education, characterized by standardized procedures, systematic content and individual adaptability, has shown significant advantages in perioperative nursing for patients with knee meniscal injury. Specifically, structured health education refers to the development of a clearly planned, goal-oriented and scientifically evaluated health education program based on the severity of the disease, treatment progress and individual health needs [3]. Through diversified educational methods including oral instruction, printed materials, video teaching, one-on-one guidance and mobile applications, it helps patients and their families master disease-related knowledge and rehabilitation skills, thereby accelerating recovery. Several studies have confirmed that structured health education can effectively improve self-management ability in

patients after percutaneous coronary intervention and in young and middle-aged patients with stroke [4, 5]. Accordingly, this study aims to investigate the effect of structured health education in the perioperative period of patients with knee meniscal injury, so as to provide empirical evidence for the optimization of clinical nursing.

2. Subjects and Methods

2.1. Study Subjects

Forty patients who were diagnosed with knee meniscal injury and underwent surgical treatment in the Orthopedics Department of our hospital from January 2024 to September 2024 were randomly selected as the control group.

The observation group included 40 patients with the same condition admitted from November 2024 to June 2025. All operations in both groups were performed by the same senior orthopedic team to ensure consistent surgical methods and technical standards.

Inclusion criteria:

- 1) Diagnosed with meniscal injury by physical examination, imaging and arthroscopy;
- 2) Clear consciousness, good communication and comprehension ability;
- 3) Indicated for knee arthroscopic surgery.

Exclusion criteria:

- 1) Combined with other severe knee injuries requiring simultaneous surgery;
- 2) Cognitive dysfunction and unable to cooperate with the study;

3) Complicated with other severe systemic diseases. There were no statistically significant differences in

general data between the two groups (all $P > 0.05$), as shown in Table 1.

Table 1. Comparison of General Data Between the Two Groups

Group	n	Gender, n (%)		Age (mean±SD, years)	Injury site, n (%)		Return to sports, n (%)
		Male	Female		Left	Right	
Control group	40	26	14	35.9±13.39	17(42.5)	23(57.5)	15
Observation group	40	20	20	36.4±13.44	18(45.0)	22(55.0)	32

2.2. Methods

2.2.1. Control Group

Patients in the control group received routine, unstructured perioperative health education for knee meniscal injury in the Orthopedics Department, combined with conventional perioperative care and basic rehabilitation guidance. Details are as follows:

(1) Form and timing of health education: Led by responsible nurses, one-way information infusion was adopted, mainly including bedside oral explanation of precautions, centralized video playing of preoperative preparation, and provision of health education manuals on brace use after surgery for patients and family members to read by themselves. Health education was provided only at four fixed time points: admission, 1 day before surgery, after surgery until discharge, and at discharge. Contents at each time point were relatively independent without coherent connection.

(2) Contents of health education: Systematic perioperative disease-related information, including basic knowledge of knee meniscal injury, precautions for preoperative preparation, basic postoperative knee joint function exercises, application skills of knee braces, wound care after discharge, regular follow-up arrangements and other basic information.

(3) Perioperative nursing principles and measures: Conventional perioperative care focusing on patient safety and complication prevention. Preoperative examinations and basic preparations were completed. Postoperative vital signs, wound bleeding, treatments such as anti-infection, analgesia and dressing change were given to prevent deep vein thrombosis, infection and other complications.

(4) Rehabilitation nursing principles and measures: Following the principles of early intervention and gradual progression, routine rehabilitation guidance was provided according to postoperative recovery, including ankle pump exercises, isometric contraction of quadriceps femoris, passive and active knee motion training, and gradual ambulation and weight-bearing to promote basic recovery of knee function.

2.2.2. Observation Group

On the basis of routine health education in the control group, the observation group received additional systematic and individualized structured health education. Specific measures included:

(1) Establishment of an education team: A structured health education team consisting of 1 associate chief physician, 1 rehabilitation therapist and 4 orthopedic nurses was established, including 1 doctorate, 1 master and 4 bachelors. All members received specialized training covering pathophysiology of meniscal injury, key points of perioperative management, prevention of postoperative complications, principles of rehabilitation exercise and health

education methods, and passed unified assessment and practice to ensure standardized education quality.

(2) Optimization of educational materials: Based on routine materials, specialized educational materials for patients with meniscal injury were developed.

1) Five rehabilitation exercise manuals covering different postoperative stages were compiled, including training methods, purposes, precautions and frequency.

- Early postoperative stage: Focus on relieving pain and swelling, preventing thrombosis; ankle pump exercises and isometric contraction of quadriceps femoris were instructed, avoiding excessive knee motion.

- Middle postoperative stage: Focus on improving joint mobility and increasing muscle strength; straight leg raising and passive/active knee flexion-extension training were guided.

- Late-middle stage: Focus on enhancing muscle strength and joint stability; ambulation and partial weight-bearing training were provided.

2) A series of specialized functional exercise videos were produced, including preoperative pre-rehabilitation and staged postoperative exercises.

3) An “Internet +” learning platform was established, providing staged rehabilitation content, daily exercise check-in, non-compliance reminders and online consultation via mobile APP and WeChat official account.

(3) Improvement of education process: A full-course education system was established based on conventional time points.

1) Preoperative stage: Additional pre-rehabilitation guidance was provided via mobile platform after admission.

2) During hospitalization: Daily bedside one-to-one guidance and consultation were implemented, with mastery evaluation and completion of the Rehabilitation Exercise Implementation Record Form.

3) After discharge: Continuous nursing and regular follow-up were carried out through the platform to ensure intervention continuity.

2.2.3. Sample Size Estimation

The sample size was calculated using the formula for comparing means of two independent samples. Effect size parameters were set as follows: mean difference between two groups = 1.91, population standard deviation = 1.91; two-sided test level $\alpha = 0.05$, test power $(1-\beta) = 90\%$, sample size ratio 1:1. The calculated minimum sample size was 22 cases per group. The actual sample size in this study was 40 cases per group, which was higher than the calculated minimum and met the requirement of statistical test power.

2.3. Observation Indicators

To systematically and objectively evaluate the effect of structured health education, this study assessed outcomes from three aspects: functional recovery, psychological state,

and influencing factors.

1) Knee joint sports ability

The Tegner Activity Scale was used to objectively evaluate the patients' sports ability [6, 7]. The score ranges from 0 to 10; a higher score indicates stronger ability to participate in sports and high-intensity activities. It was used as the core indicator to evaluate the degree of functional recovery.

2) Kinesiophobia

Patients often suffer from kinesiophobia, which interferes with normal rehabilitation [8]. The Tampa Scale of Kinesiophobia-11 (TSK-11) was used to assess fear of pain and movement. It contains 11 items across 3 dimensions (cognition of activity, attitude toward activity, and behavior of activity), with a total score ranging from 11 to 44 [9].

A higher score indicates more severe kinesiophobia. This scale is a key tool for measuring psychological barriers during rehabilitation.

3) Analysis of reasons for not returning to sports

At 3 months after surgery, for patients who failed to return to sports (Tegner score did not reach the expected target), a uniformly designed questionnaire was used to collect the main reasons, which were then classified and analyzed.

2.4. Data Statistics and Analysis

Data processing was performed using SPSS 25.0 software. Levene test was used for comparison. A value of $P < 0.05$ was considered statistically significant.

3. Results

3.1. Comparison of Knee Joint Sports Ability and Kinesiophobia between the Observation Group and Control Group

The observation group showed significant improvement in Tegner score and obvious improvement in TSK-11 score, with statistically significant differences, as shown in Table 2.

Table 2. Comparison of Tegner and TSK-11 scores

Group	n	Tegner Activity Score	TSK-11 Score
Observation group	40	3.33±1.31	26.85±3.58
Control group	40	2.75±0.87	33.50±0.82
<i>F value</i>		2.56	36.05
<i>P value</i>		0.02	0

3.2. Analysis of Reasons for Failure to Return to Sports in The Observation and Control Groups

Results showed differences in the distribution of reasons

between the two groups.

In the observation group, 8 patients failed to return to sports, with a total of 24 reasons recorded. In the control group, 25 patients failed to return to sports, with a total of 52 reasons recorded. The distribution of influencing factors is shown in Table 3.

Table 3. Analysis of factors influencing failure to return to sports in the two groups [n (%)]

Group	No. of patients without return to sports	Total number of reasons	Insufficient leg strength	Lack of knowledge about rehabilitation exercise	Low level of rehabilitation cognition	Fear of re-injury
Observation group	8	24	5(20.83)	1(4.67)	0(0)	5(20.83)
Control group	25	52	19(36.54)	10(19.23)	4(7.69)	7(13.46)

4. Discussion

4.1. Structured Health Education Exerts Dual Beneficial Effects on Knee Function Recovery and Relief of Kinesiophobia

The results of this study showed that after intervention, the Tegner Activity Score in the observation group was significantly higher than that in the control group, while the TSK-11 score was significantly lower, with statistically significant differences between the two groups ($P < 0.05$). These quantitative changes, one increasing and the other decreasing, jointly demonstrate that structured health education has dual positive effects during perioperative rehabilitation in patients with knee meniscal injury. From the perspective of intervention mechanism, structured health education overcomes the limitations of conventional health education through multi-dimensional design. On the one hand, staged rehabilitation manuals, video tutorials, and mobile platform push notifications enable patients to master exercise

contents at different rehabilitation stages, providing step-by-step guidance for knee function recovery.

On the other hand, the whole-course intervention model, including preoperative pre-rehabilitation, daily supervision after surgery, and continuous guidance after discharge, strengthens patients' rehabilitation confidence. In addition, professional guidance corrects cognitive biases related to kinesiophobia, and staged feedback on rehabilitation effects improves patients' self-efficacy. Previous studies have confirmed that structured health education can improve patients' self-management ability and reduce medical costs [10]. In clinical practice, medical staff's attention to kinesiophobia and standardized cognitive intervention for patients are important factors improving postoperative rehabilitation outcomes [11, 12]. The structured health education model adopted in this study ensures that patients perform rehabilitation training correctly and safely through systematic knowledge delivery, staged video guidance, and skill verification, thereby relieving kinesiophobia. Ultimately, the dual goals of knee joint function recovery and

psychological improvement are achieved.

4.2. Analysis of Reasons for Failure to Return to Sports Reveals the Effectiveness and Remaining Challenges of Structured Health Education

This study analyzed the reasons for patients not returning to sports, providing a more concrete evaluation perspective. The results showed that the reasons for failure to return to sports in the control group were mainly concentrated in insufficient leg strength and lack of knowledge about rehabilitation exercises.

In sharp contrast, the distribution of reasons in the observation group changed fundamentally. The proportion of patients lacking knowledge about rehabilitation exercises decreased significantly from 19.23% to 4.67%, and the number of patients with low rehabilitation cognition decreased from 4 to 1. This change demonstrates the significant effect of structured health education in improving patients' rehabilitation compliance [13]. One of the innovations of the structured health education implemented in this study is that mobile APP and WeChat official account were used as the core platforms for continuous care after discharge. As a new medical and nursing intervention model, the Internet mobile platform can bridge the gap in rehabilitation support after discharge, allowing patients to obtain dynamic, interactive and sustainable rehabilitation support through mobile applications [14], which guarantees home-based rehabilitation. At the same time, wearable devices and VR therapy are being studied to address kinesiophobia. Lo HHM et al. [15] showed that VR therapy has been proven to reduce pain and kinesiophobia, which is also a future research direction for the management of kinesiophobia.

4.3. "Fear of Re-Injury" as the Primary Obstacle in the Observation Group Indicates the Direction for Precise Optimization in Future Interventions

Structured health education significantly reduced the overall fear-avoidance level of patients (indicated by TSK-11 scores). However, among patients in the observation group who failed to return to sports, "fear of re-injury" remained one of the most prominent factors. Scholars such as Shi Zhengliang [16] also suggested that psychological factors are crucial in returning to sports. The lower the patients' fear of re-injury, the higher the possibility of returning to pre-injury levels. The results of this study indicate that the current education model has a certain effect in relieving patients' fear in general. Nevertheless, for some patients with deeper fear or greater psychological trauma, the intervention intensity may still be insufficient. On this basis, future rehabilitation education should be precisely optimized, with emphasis on strengthening psychological support and intervention for patients.

5. Conclusion

This study confirms that structured health education has significant application value in perioperative rehabilitation of patients with knee meniscus injury. It can effectively promote the recovery of knee joint motor function and reduce kinesiophobia. This health education model successfully

solves the core problems of insufficient disease cognition and unclear mastery of rehabilitation methods in patients. However, it should be objectively recognized that kinesiophobia, as a key psychological barrier affecting rehabilitation, is the core psychological problem to be further solved for improving rehabilitation quality. Therefore, future research can focus on developing and verifying an enhanced structured health education model integrated with psychological interventions. This study has certain limitations. Due to limited objective conditions and time, the sample size is relatively small, and the generalizability of the results still needs to be further verified in large-sample studies.

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