

Impact of Risk Early Warning Management on Postoperative Rehabilitation Quality and Incidence of Delirium in Patients With Unilateral Intertrochanteric Femur Fracture

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Mingqiang Peng^{1,†}, Caihong Wen^{1,†}, Yuxi Wei¹, Wei Zhang¹, Zhenyu Liu¹, Yanhua Zhang¹, Songqing Li¹

¹Department of Traumatic Orthopedics, Renmin Hospital, Hubei University of Medicine, 442000 Shiyan, Hubei, China

AIM: This study aims to assess the impact of risk early warning management on postoperative rehabilitation outcomes in patients with unilateral intertrochanteric femur fracture (UIFF), and to investigate the effect on the incidence of postoperative delirium.

METHODS: This study included 284 patients with unilateral femoral intertrochanteric fracture admitted between January 2023 and December 2023. The patients received internal fixation with proximal femoral nail (PFN). Patients were divided into two groups: the experimental group (n = 142), which received risk early warning management, and the control group (n = 142), which received routine perioperative management. The coagulation function and self-care ability were evaluated in both groups before (before surgery) and after intervention (10 days after surgery). Furthermore, postoperative complication rate, hip rehabilitation quality, and satisfaction levels were comparatively analyzed between the two study groups.

RESULTS: Higher fibrinogen (FBG) and lower D-dimer (D-D) were found in the experimental group compared to the control group ($p < 0.05$). Furthermore, the experimental group showed a significantly lower incidence of delirium, as well as improved hip rehabilitation quality and self-care ability compared to the control group ($p < 0.05$). Additionally, the overall satisfaction levels were substantially higher in the experimental group of patients than those observed in the control group ($p < 0.05$).

CONCLUSIONS: Risk early warning management can enhance the coagulation function and reduce the risk of postoperative delirium in patients with UIFF. These findings will provide a more reliable safety package for the future surgical treatment of UIFF.

Keywords: postoperative rehabilitation quality; delirium; risk early warning management; intertrochanteric femur fracture

Introduction

Hip fractures are among the most common fracture types in clinical practice, often resulting from sudden squatting, lateral falls, or traffic accidents. These injuries predominantly affect older individuals, primarily due to age-related functional deterioration and considerable bone loss [1]. Unilateral intertrochanteric femur fracture (UIFF), a common subtype of hip fractures, is a break that extends from the base of the femoral neck to the level above the lesser trochanter [2]. UIFF typically requires extended bed rest, during which patients are at increased risk of complications, including respiratory dysfunction, urinary tract problems, deep vein thrombosis, and pressure ulcers, leading to an exceptionally high disability and fatality rate [3]. Improving the quality of rehabilitation and ensuring the safety of UIFF patients has emerged as a compelling topic in contemporary clinical research.

Conventional perioperative care primarily focuses on surgical outcomes, while limited studies have explored the impact of risk early warning management on optimizing postoperative rehabilitation trajectories in high-risk hip fracture patients. Risk early warning management is an emerging clinical strategy that emphasizes identifying key early warning targets and implementing graded pre-control interventions based on disease risk. This strategy aims to ensure comprehensive nursing care, prevent adverse risk events, optimize medical resource allocation, and enhance the overall quality of care [4]. Currently, risk early warning management is widely used in managing emergency and critical conditions, achieving promising results [5,6]. A recent study by Durantez-Fernández *et al.* [7] underscored the significance of risk early warning management in improving the safety of rehabilitation among patients with acute trauma. While existing findings provide a theoretical foundation for its application in UIFF, there remains a lack of evidence validating the application of this approach in this patient cohort.

Based on this, the present study conducts a comprehensive analysis of the influence of risk early warning management on patients with UIFF. The aim is to provide more robust clinical evidence to guide future treatment approaches for UIFF, with the ultimate goal of enhancing patients' outcomes and ensuring better prognostic and health-related results.

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Correspondence to: Songqing Li, Department of Traumatic Orthopedics, Renmin Hospital, Hubei University of Medicine, 442000 Shiyan, Hubei, China (e-mail: 13477315898@163.com).

[†] These authors contributed equally.

Materials and Methods

Sample Size Calculation

The sample size was determined based on the primary outcome of delirium incidence. According to the previous literature [8], the incidence of delirium was estimated to be 15% in the control group and 10% in the experimental group. Using a two-sided significance level ($\alpha = 0.05$) and a power ($1 - \beta$) of 80% ($\beta = 0.20$), the required sample size per group was calculated using the formula for comparing two independent proportions, resulting in approximately 116 individuals per group. Considering a potential 10% dropout rate, the target recruitment was set at 128 patients per group. After propensity score matching, 142 patients were included in each group, exceeding the required sample size and ensuring sufficient statistical power of the analysis.

Study Population

To minimize selection bias and enhance comparability between groups, propensity score matching (PSM) was performed at a 1:1 ratio using the nearest neighbor method with a caliper width of 0.2 standard deviations of the logit of the propensity score. Propensity scores were estimated using logistic regression analysis, incorporating baseline characteristics, such as age, sex, history of fractures, presence of diabetes mellitus, hypertension, Arbeitsgemeinschaft für Osteosynthesefragen/Orthopaedic Trauma Association (AO/OTA) fracture classification (A2 vs A3), and admission period (pre-June vs post-June). A total of 184 patients admitted between January and May 2023 and 171 patients admitted between June and December 2023 were initially identified. After PSM, 142 well-matched pairs were established, yielding 142 patients in both the control and experimental groups for the final analysis. All patients underwent closed reduction and internal fixation with proximal femoral nail (PFN), following the standard protocol for closed intertrochanteric fractures. Patients in the experimental group (admitted after June) received risk early warning management, while those in the control group (admitted before June) received routine perioperative care. The study protocol strictly adhered to the Declaration of Helsinki, and written informed consent was obtained from all patients before their inclusion in the study. A flow chart of the study design is illustrated in Fig. 1.

Inclusion and Exclusion Criteria

The inclusion criteria were as follows: (1) Diagnosis consistent with closed UIFF (AO/OTA 31-A2/A3) [9], confirmed through imaging. (2) Patient aged ≥ 65 years. (3) Eligible for surgical treatment, and have completed fracture surgical intervention at Shiyan People's Hospital, with stable vital signs and clear consciousness after the procedure. Exclusion criteria included: (1) presence of hematologic conditions, such as coagulation dysfunction; (2) pre-existing lower limb disability, invasive trauma, or other pathological conditions; (3) those with mental disorders, cognitive impairments, or poor compliance; (4) patients

with history of coagulopathy, hepatic dysfunction, or renal insufficiency; (5) those with active malignancy or immunocompromised status.

Surgical Procedure

The same experienced surgical team performed all the surgical procedures following a standard anesthesia protocol. Under general anesthesia, the patient was positioned supine, and fracture reduction was guided by C-arm fluoroscopy. After subsequent routine disinfection and sterile draping, a 3–5 cm incision was made centered over the greater trochanter to expose the piriform fossa of the femur. A guide pin was then inserted from the apex of the greater trochanter into the medullary canal, followed by reaming of the proximal femur. An intramedullary nail was then inserted, the helical blade was positioned and locked, and the distal interlocking nail was placed. After confirming satisfactory internal fixation under C-arm fluoroscopy guidance, the surgical site was rinsed with normal saline, a drainage tube was placed, and the incision was closed. Postoperative management included antibiotic treatment for 3–5 days, with the drainage tube removed within 48–72 hours.

Perioperative Management

Patients in the control group received standardized preoperative education provided by trained orthopedic nurses 1 day before surgery. The educational process covered the causation of UIFF, current clinical treatment approaches, expected surgical outcomes, postoperative nursing intervention measures, the significance of rehabilitation exercises, and perioperative precautions. Additionally, preoperative visits ensured that patients had fulfilled all the required preoperative preparations. Throughout the perioperative period, the clinical symptoms and changes in the vital signs were closely monitored. Intraoperative nursing assistance was provided in accordance with the surgical team's protocol and procedural requirements. After the procedure, patients were given routine anticoagulation and antibiotic treatment, turned over at regular intervals, and were closely observed for any complications. Any abnormalities detected were immediately reported to the attending physicians for prompt intervention.

Patients in the experimental group received risk early warning education. This approach was integrated into daily clinical rounds and implemented by a dedicated management team. The implementation protocol for this approach is summarized as follows:

(1) *Establishment of a risk early warning management team*: A specialized team including one head nurse and five trained nurses was established. All team members completed a 7-day training in risk early warning management. The risk level was determined based on key vital signs, such as heart rate, respiratory rate, body temperature, and level of consciousness. The risk scoring criteria are summarized in Table 1 [10].

(2) *Management of low-risk individuals*: Low-risk patients (score 0–4) received routine monitoring of vital signs and

Table 1. Criteria for determining risk levels.

Variable	3	2	1	0	1	2	3
Heart rate (beats/min)	-	<40	41–50	51–100	101–110	111–129	>130
Systolic blood pressure (mmHg)	<70	71–80	81–100	101–199	-	>200	-
Respiration (beats/min)	-	<8	-	9–14	15–20	21–29	>30
Body temperature (°C)		<35.0	-	35.1–37.5	37.6–38.5	>38.6	-
Urine output (mL/kg)	<0.3	0.3–0.5	0.5–1.0	>1	-	-	-
Consciousness	-	-	-	Sober	Responding to sound	Responding to pain	Unresponsive

Note: The numbers 3, 2, 1, 0, 1, 2, 3 in the variable row represent the scoring points assigned to different ranges of each vital sign parameter.

conventional orthopedic care, with regular observation of their clinical condition.

(3) *Management of moderate-risk individuals*: Moderate-risk patients (score 5–7 or those with a single-item score of 3) underwent vital signs monitoring at least every 4 hours, with measurement data recorded promptly and accurately. Any changes in the patient's condition or vital signs were immediately communicated to the attending physician or the on-call doctor, who was supposed to respond within 5 minutes. Nursing staff administered appropriate treatment interventions as per the clinician's instructions. Furthermore, a safety assessment board was displayed in the ward, and a red warning sign was placed at the patient's bedside to highlight increased risk.

(4) *Management of high-risk patients*: High-risk patients (score ≥ 7) received continuous monitoring of vital signs and frequent clinical assessments for any changes. All observations were recorded in real time with accuracy and detail. Any changes in the patient's condition and vital signs were promptly communicated to the attending physician or on-call doctor, who were expected to respond without delay. Additionally, emergency equipment and life-saving drugs were maintained bedside to allow for rapid treatment at any time.

Vital signs were continuously monitored for 72 hours post-operatively. Risk scores were recalculated every 12 hours, and interventions were escalated as needed if scores exceeded threshold values. These risk management strategies were implemented upon admission and maintained through patient discharge. All patients in the experimental group completed a one-month short-term follow-up after the procedure.

Coagulation Function Test

Fasting venous blood samples were collected from all patients both before surgery and 10 days postoperatively after the nursing intervention. Coagulation parameters, such as prothrombin time (PT), activated partial thromboplastin time (APTT), fibrinogen (FBG), and D-dimer (D-D), were assessed using a coagulation function analyzer.

Scoring Survey

The Exercise of Self-Care Agency Scale (ESCA) [11] was used to evaluate patients' self-care abilities both before and

10 days after intervention. The ESCA tool includes four dimensions, including self-concept, self-responsibility, self-care skills, and health knowledge, with a higher score indicating greater self-care ability. Furthermore, the Harris Hip Score (HSS) [12] was used to assess the quality of hip rehabilitation and hip function after the intervention. The HSS assesses four dimensions: pain, function, deformity, and range of motion. The score ranges from 0 to 100 points, with scores >90 considered excellent, 80–89 as good, 70–79 as fair, and <70 as poor. The excellent rate was determined as follows: number of excellent + good cases / total number of cases $\times 100\%$. Upon hospital discharge, a patient satisfaction survey was conducted, and the satisfaction rate was subsequently calculated.

Endpoints

Endpoint evaluations were conducted as follows:

Primary endpoint: The primary endpoint determination included a comparison of hip joint function recovery between the two groups.

Secondary endpoint: The coagulation function and ESCA scores were compared before and after the intervention, along with an evaluation of patient satisfaction with nursing care.

Safety endpoint: Incidence of complications during rehabilitation, such as wound infection and delirium. The diagnosis of delirium is based on a physician's diagnosis documented in the medical record or a documented Confusion Assessment Method (CAM) result.

Statistical Analysis

Statistical analysis was performed using SPSS 24.0 software (IBM, Armonk, NY, USA). Categorical data were expressed as frequencies and percentages [n (%)], and between-group comparisons were performed using the chi-square test. However, Fisher's exact test was applied when the expected frequency was less than 5. Continuous variables (measurement data) were presented as mean $\pm$ standard deviation ($\bar{x} \pm s$). The independent sample *t*-test was used for between-group comparisons, while within-group comparisons were performed using the paired *t*-test. Normality of data distribution was conducted using the Shapiro-Wilk test. A *p*-value of <0.05 was considered statistically significant.

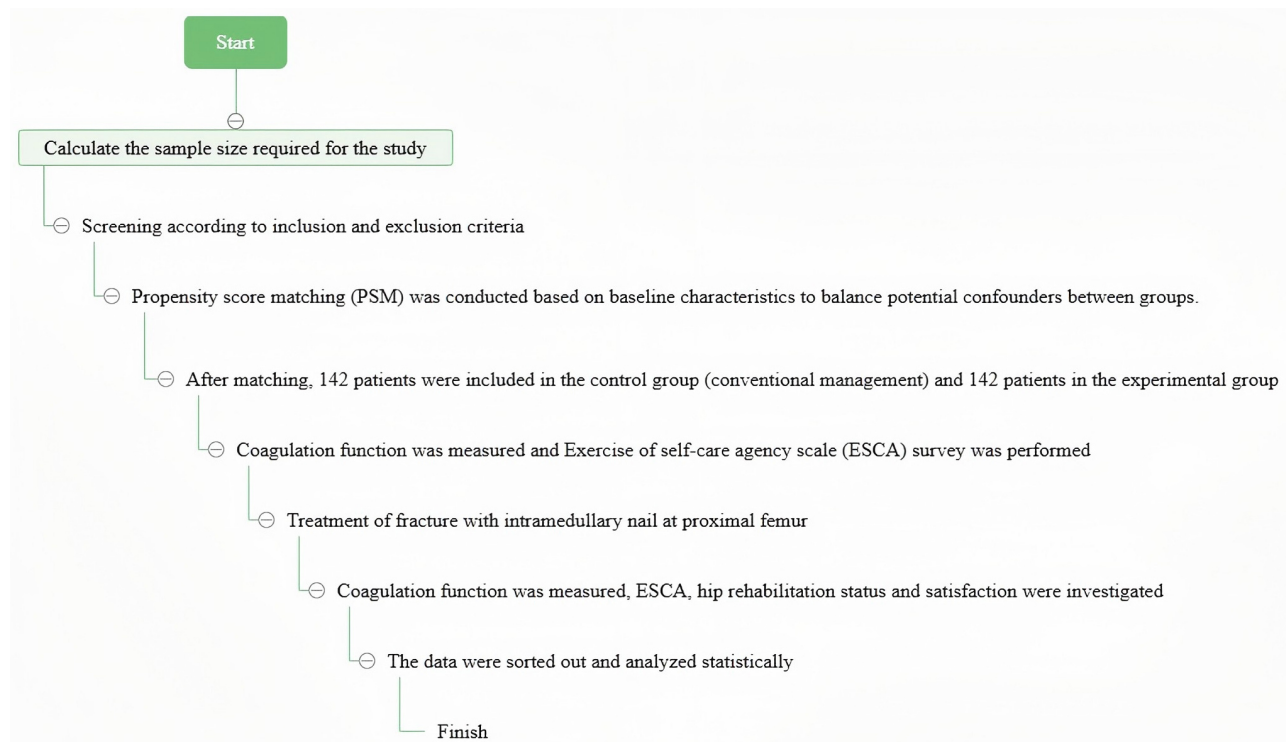


Fig. 1. A flow chart of the study design. This study followed a retrospective study design, recruiting patients admitted between January 2023 and December 2023. The patients admitted between June 2023 and December 2023 were included in the experimental group, whereas those admitted between January 2023 and May 2023 were in the control group.

Results

Comparison of Baseline Characteristics Between the Two Groups

Initially, a comparison of baseline data, including age, sex, history of fractures, combined diabetes mellitus, combined hypertension, fracture type, operation time, intraoperative bleeding, and length of hospital stay, demonstrated no significant differences between the control and experimental groups ($p > 0.05$), suggesting that the two patient groups were comparable (Table 2).

Comparison of Coagulation Function Between the Two Groups

The coagulation function analysis showed no significant differences between the two groups in PT, APTT, FBG, or D-D levels before the intervention ($p > 0.05$). There were no significant changes in PT, APTT levels, FBG and D-D in the experimental group after the intervention ($p > 0.05$). In contrast, the control group demonstrated no significant changes in PT, APTT, or FBG ($p > 0.05$), but D-D levels increased substantially after the interventions ($p < 0.05$). Furthermore, between-group comparisons revealed no significant differences in PT or APTT ($p > 0.05$); however, FBG levels were substantially higher and D-D levels were lower in the experimental group compared to the control group ($p < 0.05$) (Table 3).

Comparison of Complications Between the Two Groups

During the treatment period, there were no statistically significant differences in the incidence of hip stiffness, knee stiffness, foot drop, deep vein thrombosis (DVT) or wound infection between the two groups ($p > 0.05$). However, the incidence of delirium was 12.68% in the control group compared to 5.63% in the experimental group. The difference was statistically significant, with a decreased incidence observed in the experimental group ($p = 0.040$) (Table 4).

Comparison of Hip Function Recovery Between the Two Groups

Based on the hip function recovery analysis, the experimental group showed a substantially higher rate of excellent and good rehabilitation outcomes (92.96%) compared to the control group ($p = 0.024$, Table 5).

Comparison of Self-Care Ability Between the Control and Experimental Groups

Before the intervention, there was no statistically significant difference in ESCA scores between the two groups ($p > 0.05$). Following the intervention, the experimental group demonstrated considerable improvements in all four dimensions, including self-concept, self-responsibility, self-care skills, and health knowledge, with scores substantially higher than those observed in the control group ($p < 0.05$). In the control group, self-responsibility and health knowledge scores increased significantly ($p < 0.05$), while self-concept and self-care skills remained unchanged (Table 6).

Table 2. Comparison of baseline clinical data between the two groups.

Variable		Control group (n = 142)	Experimental group (n = 142)	<i>t</i> (or χ^2)	<i>p</i> -value
Age		78.27 $\pm$ 8.85	79.40 $\pm$ 8.10	1.126	0.261
Sex	male	77 (54.23)	84 (59.15)	0.703	0.402
	female	65 (45.77)	58 (40.85)		
History of fractures	have	24 (16.90)	16 (11.27)	1.862	0.172
	none	118 (83.10)	126 (88.73)		
Combined diabetes mellitus		68 (47.89)	59 (41.55)	1.154	0.283
Combined hypertension		72 (50.70)	79 (55.63)	0.693	0.405
AO/OTA fracture type	A2	78 (54.93)	81 (57.04)	0.129	0.720
	A3	64 (45.07)	61 (42.96)		
Operation time (min)		59.33 $\pm$ 8.78	61.02 $\pm$ 11.11	1.422	0.156
Intraoperative blood loss (mL)		85.37 $\pm$ 13.74	82.50 $\pm$ 17.58	1.535	0.126
Length of stay (d)		12.47 $\pm$ 2.51	12.51 $\pm$ 2.17	0.126	0.900

Note: AO, Arbeitsgemeinschaft für Osteosynthesefragen; OTA, Orthopaedic Trauma Association.

Table 3. Comparison of coagulation function between the two groups.

Group (n = 142)	PT (s)		APTT (s)		FBG (g/L)		D-D (mg/L)	
	Before	After	Before	After	Before	After	Before	After
Control	12.22 $\pm$ 0.65	12.28 $\pm$ 0.58	33.20 $\pm$ 0.55	33.20 $\pm$ 0.55	2.95 $\pm$ 0.20	2.96 $\pm$ 0.17	0.43 $\pm$ 0.11	1.66 $\pm$ 0.43*
Experimental	12.22 $\pm$ 0.58	12.22 $\pm$ 0.65	33.18 $\pm$ 0.56	33.33 $\pm$ 0.72	2.94 $\pm$ 0.15	3.26 $\pm$ 0.27	0.43 $\pm$ 0.17	0.44 $\pm$ 0.16
<i>t</i>	1.494	0.817	0.384	1.687	0.630	11.170	0.161	32.190
<i>p</i> -value	0.136	0.415	0.702	0.093	0.529	<0.001	0.872	<0.001

Note: * indicates $p < 0.05$ compared to the same group before intervention. PT, prothrombin time; APTT, activated partial thromboplastin time; FBG, fibrinogen; D-D, D-dimer.

Table 4. Comparison of complications between the two groups.

Group (n = 142)	Hip stiffness	Knee stiffness	Foot drop	DVT	Infected wounds	Delirium
Control	4 (2.82)	3 (2.11)	4 (2.82)	5 (3.52)	2 (1.41)	18 (12.68)
Experimental	2 (1.41)	0 (0.00)	1 (0.70)	3 (2.11)	1 (0.70)	8 (5.63)
χ^2	0.170	1.348	0.814	0.129	0.000	4.234
<i>p</i> -value	0.680	0.246	0.367	0.720	>0.999	0.040

Note: DVT, deep vein thrombosis.

Comparison of Satisfaction Rate Between the Two Groups

Finally, the findings of the satisfaction survey revealed an overall satisfaction rate of 95.77% in the experimental group, compared to 87.32% in the control group, indicating a significantly higher satisfaction rate among patients in the experimental group ($p = 0.011$, Table 7).

Discussion

The hip joint plays a crucial role in human mobility; therefore, the occurrence of a UIFF generally results in significant functional impairment, usually requiring extended bed rest [13]. In this study, we explored the impact of risk early warning management on patients with UIFF and found that this management model significantly improved rehabilitation outcomes, providing a more reliable support for patient prognosis, underscoring its potential clinical utility.

Firstly, the inter-group comparison of the coagulation function indicated that, after the intervention, FBG levels were higher and D-D levels were lower in the experimental group. This finding suggests that risk early warning management is more effective in improving the coagulation

function and maintaining a relatively stable physiological state in patients with UIFF. This improvement can be due to the structured coordination and proactive engagement of all components with the early warning risk management nursing system. Nursing care has evolved from a mechanical and passive approach to a more dynamic and comprehensive model, enabling prompt interventions to address risk factors and prevent the incidence of complications [14]. Additionally, under this management model, patients' families play an active role in the nursing care process. Their close collaboration with medical staff and encouragement of daily functional exercises help enhance blood circulation and improve blood vessel patency [15]. Therefore, this management model offers stronger support for maintaining optimal coagulation function in patients with UIFF.

In terms of postoperative complications, the incidence of delirium was substantially lower in the experimental group compared to the control group. We believe that risk early warning management helps improve the professional competency of nursing staff and enables comprehensive and efficient collaboration among healthcare personnel. Mak-

Table 5. Comparison of hip function recovery between the two groups.

Group (n = 142)	Excellent	Good	Fair	Poor	Excellent rate
Control	58 (40.85)	62 (43.66)	12 (8.45)	10 (7.04)	84.51
Experimental	69 (48.59)	63 (44.37)	9 (6.34)	1 (0.70)	92.96
χ^2					5.071
<i>p</i> -value					0.024

Table 6. Comparison of self-care ability between the two groups.

Group (n = 142)	Self-concept		Self-responsibility		Self-care skills		Health knowledge	
	Before	After	Before	After	Before	After	Before	After
Control	9.38 ± 1.17	9.39 ± 1.15	10.41 ± 1.74	12.38 ± 1.67*	22.58 ± 3.11	22.27 ± 3.24	25.56 ± 4.07	30.19 ± 6.02*
Experimental	9.56 ± 1.48	16.62 ± 2.20*	10.70 ± 1.56	14.63 ± 1.41*	22.80 ± 2.54	27.24 ± 3.18*	26.08 ± 3.26	35.06 ± 5.94*
<i>t</i>	1.158	34.710	1.472	12.260	0.648	13.030	1.190	6.857
<i>p</i> -value	0.248	<0.001	0.142	<0.001	0.518	<0.001	0.235	<0.001

Note: * indicates $p < 0.05$ compared to the same group before intervention.

Table 7. Comparison of the overall satisfaction rate between the two groups.

Group (n = 142)	Satisfied	Dissatisfied
Control	124 (87.32)	18 (12.68)
Experimental	136 (95.77)	6 (4.23)
χ^2	6.554	
<i>p</i> -value	0.011	

ing it convenient for patients, their families, and healthcare providers to access comprehensive and up-to-date information about patients' conditions, this model enhances active participation, timely decision-making, and targeted emergency nursing interventions. Consequently, it plays a critical role in preventing adverse risks after UIFF surgery.

A study by Chang *et al.* [16] reported that risk early warning management reduces the incidence of post-delivery complications in pregnant women with preeclampsia, which is consistent with our findings. Delirium, an acute brain dysfunction, is a common postoperative complication in UIFF patients; it is typically induced by central nervous system diseases, drug overdose or withdrawal effects, poisoning, metabolic imbalances, or infections [17], and its prevention is clinically essential. Therefore, we compared the incidence rate of delirium between the control and experimental groups. It can lead to severe symptoms such as consciousness, disorientation, paresthesia, and restlessness in patients, which not only affects rehabilitation but also increases the risk of secondary complications [18]. Risk early warning management, customized to the patient's clinical condition and rehabilitation progress, offers a structured and effective approach to reduce the risk of delirium. This approach provides both practical and theoretical support for enhancing patient safety and optimizing postoperative recovery in patients with hip fractures.

Furthermore, early warning risk care focuses not only on patients' physical health, but also emphasizes self-management and self-care capabilities [19]. Through effective communication, nurses educate patients on postoperative rehabilitation and care after hip fracture surgery, im-

proving understanding and equipping them with the knowledge needed for their self-management ability and rapid recovery. This management strategy enhances patients' self-care skills and self-efficacy, enabling them to cope effectively with various challenges during rehabilitation [20]. Additionally, early warning risk care involves developing individualized care plans for patients with different risk levels. This is achieved through a comprehensive evaluation of physical conditions, nutritional status, psychological well-being, and family support. The model integrates both physical and psychological dimensions of care, providing psychological counseling and social support to help patients establish a positive outlook and further enhance their self-care capabilities [21]. Therefore, ESCA scores in the experimental group improved substantially after intervention and were consistently higher than those in the control group. Supporting our observations, a study by Rodríguez *et al.* [22] on patients with acute pulmonary embolism demonstrated that risk early warning management has a positive impact on patients' self-care abilities.

Given the multiple promising effects of risk early warning management on rehabilitation safety and self-care ability of patients with UIFF, it is not surprising that patients in the experimental group showed greater improvement in hip joint function and experienced significantly higher satisfaction levels compared to the control group. These observations highlight the significant clinical utility of implementing risk early warning management in future treatment approaches of UIFF.

Despite some promising outcomes, we acknowledge several limitations in our study. The relatively short follow-up period restricts the assessment of the long-term prognostic impacts of the risk early warning management approach on patients with UIFF. Furthermore, while the implementation of risk early warning management demonstrated promising outcomes, there remains potential for further optimization and improvement of the approach. Future studies should conduct more comprehensive and longitudinal analyses to address these limitations and provide stronger evidence to support its application in standard clinical settings.

Conclusions

The risk early warning management approach improves coagulation function and enhances the safety and efficacy of postoperative rehabilitation in patients with UIFF, thereby providing a more reliable foundation for a favorable prognosis of patients. Its clinical utility is therefore strongly recommended.

Availability of Data and Materials

The datasets used during the current study are available from the corresponding author on reasonable request.

Author Contributions

MQP and CHW contributed equally to the conceptualization and design of the study. MQP was primarily responsible for data collection and analysis, and contributed to the draft of the manuscript; CHW played a key role in interpreting the results and drafting the manuscript. YXW and WZ both contributed to data analysis and interpretation, provided valuable feedback on the study's methodology and analysis and participated in writing and the critical revision of the manuscript for important intellectual content. ZYL, YHZ and SQL contributed to the project's overall management and participated in the study's design and implementation. They also contributed to writing and the critical revision of the manuscript for important intellectual content. All authors read and approved the final manuscript. All authors have participated sufficiently in the work and agreed to be accountable for all aspects of the work.

Ethics Approval and Consent to Participate

All patients provided informed consent to participate in this study, and the study was designed in adherence to the principles of the Declaration of Helsinki (2013). This study was approved by the ethics committee of Shiyan People's Hospital (Affiliated People's Hospital of Hubei University of Medicine) (No: SYRMYY-2024-142).

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Conflict of Interest

The authors declare no conflict of interest.

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