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Original Article

The Application of the Responsibility System Integrated Nursing Model in the Perioperative Period of Elderly Patients with Hip Fracture

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SUMMARY

Background: This study aimed to assess the effectiveness of a responsibility system integrated holistic care model during the perioperative period in elderly patients with hip fractures.

Methods: We retrospectively analyzed the clinical data of 104 patients with hip fractures who underwent surgical treatment at our hospital between July 2019 and January 2021. Based on different nursing protocols, patients were categorized into a control group (CG, n = 50, received routine care) and a research group (RG, n = 54, received a responsibility system integrated holistic care model). Perioperative indicators, hip joint function, functional independence, balance, quality of life, treatment compliance, and nursing quality were compared between the two groups.

Results: The RG demonstrated significantly shorter periods for admission to surgery, fracture healing time, return to normal walking, and postoperative hospital stay than the CG ($p < 0.05$); The RG had higher post-intervention Harris Hip scores, Functional Independence Measure scores, Berg Balance Scale score, Short Form 36 score, and ServQual scale score than the CG ($p < 0.05$). The overall treatment compliance rate was higher in the RG (96.30%) than in the CG (80.00%), and the complication rate was lower in RG (9.26%) than in the CG (26.00%) ($p < 0.05$).

Conclusion: Application of a responsibility-based integrated nursing model in the perioperative period of elderly patients with hip fractures showed significant nursing effects. It can enhance treatment compliance, shorten fracture healing time, improve hip joint function and balance ability, enhance functional independence, improve the quality of life, and reduce complications.

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1. Introduction

Fractures often occur in the elderly during traffic accidents and falls due to the degeneration of bone tissue and cartilage, reduced bone mass, and osteoporosis; the incidence of hip fractures accounts for 20% of all types of fractures.^{1,2} Surgery, which can effectively promote healing, is the primary clinical treatment option for hip fractures. However, among the elderly, physiological changes associated with aging, the blood being in a relatively hypercoagulable state, and the need for long-term bed rest after surgery often leads to complications such as deep vein thrombosis (DVT) of the lower extremities, pressure injury, and delirium, which prolong the rehabilitation process.^{3,4} Prompt and effective nursing care upon admission can reduce hospitalization duration, alleviate pain intensity, mitigate the risk of nosocomial infections, decrease hospitalization costs, and reduce the incidence of complications to some extent.⁵ Therefore, efficient and standardized perioperative care measures must be provided to patients in a timely manner to alleviate their condition and improve their quality of life and prognosis.

The holistic care model is a “practice that has healed the whole person as its goal.” This model treats each patient as an individual

participating in their own care and considers their preferences and beliefs instead of simply focusing on the physical ailments. It provides a clear division of labor and responsibilities among nursing staff, not only enhancing their sense of responsibility and self-awareness of nursing staff, but also providing more detailed and high-quality nursing services for patients.^{6–8} However, for patients undergoing surgery for hip fractures, systematic research evidence is lacking regarding whether this care model can effectively promote hip joint functional recovery, enhance functional independence and balance ability, and ultimately improve the quality of life. To further explore the feasibility of the holistic care model, this study included elderly patients with hip fractures as study subjects and explored the effects of this model on the postoperative rehabilitation process, hip function, balance, and quality of life.

2. Material and methods

2.1. Baseline data

The clinical data of 104 patients with hip fracture who received surgical treatment at our hospital from July 2019 to July 2021 were retrospectively analyzed. The patients included 51 men and 53 women; mean age 69.9 ± 5.3 (range, 61–83) years. The inclusion criteria were: complete clinical data; age ≥ 60 years; meeting the diagnostic

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criteria of hip fracture in the Expert Consensus on the Diagnosis and Treatment of Hip Fractures in the Elderly (2017);⁹ meeting the indications for surgery; and voluntarily signing informed consent. The exclusion criteria were: comorbidity with trauma, malignancy, inability to tolerate surgical treatment, old fractures or pathological fractures caused by osteomyelitis, bone tumors, etc.; cognitive dysfunction and communication impairment before fracture; coma, life-threatening condition; severe cardiovascular and cerebrovascular diseases; refusal of surgery and request for conservative treatment; impaired gait, balance, muscle strength, and mobility before fracture; and death during the perioperative period. Based on different nursing protocols, patients were categorized into a control group (CG, $n = 50$), who received routine care between July 2019 and June 2020, and a research group (RG, $n = 54$), who received responsibility system-integrated holistic care models between July 2020 and July 2021 (since July 2020, our hospital implemented a responsibility system-integrated holistic care model). A flowchart of the study design is shown in Figure 1. This study was approved by the Institutional Review Board of Ganzhou Hospital of Traditional Chinese Medicine (approval no. GZSZYYKYL20190002).

2.2. Methods

- (1) The CG received routine care, namely routine preoperative examination and consistent assessment of blood pressure, oxygen saturation, and other vital signs. If abnormalities were found, therapy was administered in a timely manner. Nurses assisted the doctor in completing the preoperative assessment. The patient's respiratory condition was unobstructed. Routine interdepartmental consultation was performed to discuss the patient's condition to formulate surgery and postoperative rehabilitation plans. Verbal explanations of the surgical plan, postoperative complications, and precautions were provided coupled with brief reassurance to the patient to alleviate anxiety and promote relaxation.
- (2) The RG received holistic care, as shown in Table 1.

2.3. Outcome measurement

- (1) Perioperative indicators. The time from admission to surgery,

fracture healing time, return to walking time, and postoperative length of hospital stay were recorded.

- (2) Hip function assessment. The Harris Hip Scale includes 4 dimensions of function (47 points), pain level (44 points), joint mobility (5 points), and joint deformity (4 points), ranging from 0–100 points, and a high score indicates good recovery of hip function. The assessment was performed before and 3 months after the intervention.
- (3) Functional independence, balance, and quality of life. The Functional Independence Measure (FIM) is an 18-item measurement tool that explores an individual's physical, psychological, and social functions, ranging from 0–126. Higher scores indicate greater functional independence. The Berg Balance Scale (BBS) is a 14-item objective measure that assesses static balance and fall risk in adults, with a total score of 56 points. Higher scores indicated better balance. The 36-Item Short-Form Health Survey (SF-36) is a set of generic, coherent, and easily administered quality-of-life measures that rely upon patient self-reporting, ranging 0–100, with high scores indicating a high quality of life. The assessment was performed before and 3 months after the intervention.
- (4) Treatment Compliance. Our self-developed questionnaire was used to assess treatment compliance, including daily life management, management of complications, medication compliance, exercise, diet, and outpatient follow-up, with a score of 0–100. 85–100 indicated complete adherence, 60–84 indicated general compliance, and < 60 means non-compliance; complete compliance + general compliance = total compliance, which had a Cronbach's α of 0.0798 and a split-half reliability of 0.869.
- (5) Complications. Postoperative complications, such as deep vein thrombosis, pulmonary infection, pressure injury, delirium, and irritability, were observed.
- (6) Service quality. The ServQual scale¹⁰ was used to assess the service quality in terms of reliability, tangibility, assurance, responsiveness, and empathy, with a score of 0–5 for each dimension and high service quality for high scores, and the scale Cronbach's α was 0.0864 with a split-half reliability of 0.993.

2.4. Statistical analysis

With Statistical Package for the Social Science (SPSS) 24.0, the

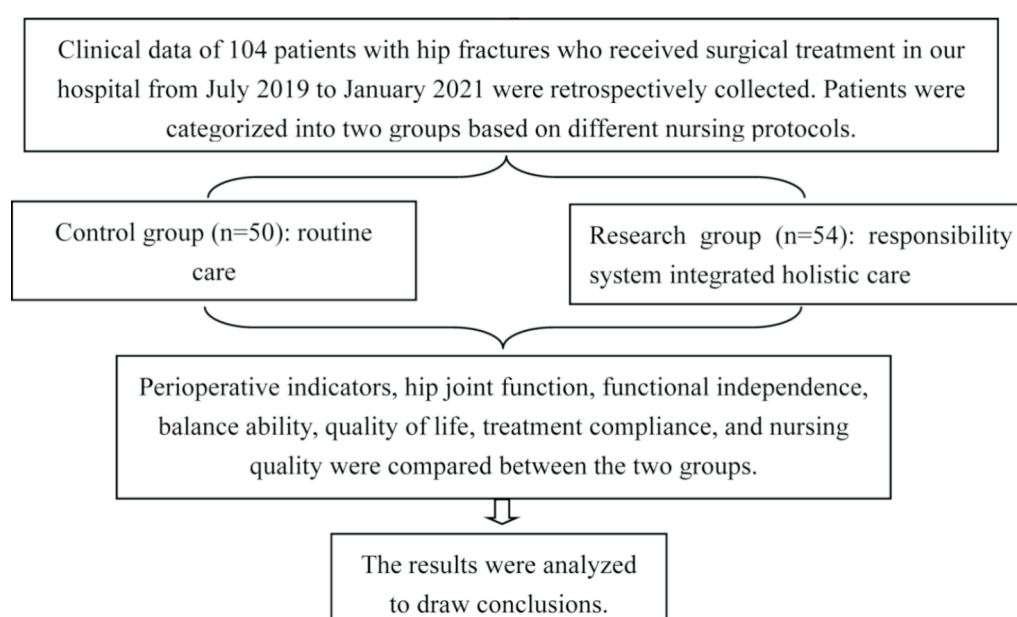


Figure 1. Flow chart of research design.

measurement data were expressed as mean $\pm$ standard deviation (mean $\pm$ SD), and the independent sample *t* and paired sample *t* tests were used for between-group and within-group comparisons, respectively, and the count data were expressed using % and compared by χ^2 test; $p < 0.05$ was considered a significant difference.

3. Results

3.1. Baseline data

The baseline data of the RG were not significantly different from

those of the CG ($p > 0.05$), suggesting that the two groups were comparable (Table 2).

3.2. Perioperative-related indicators

The time from admission to surgery, fracture healing time, time to return to normal walking, and postoperative hospital stay were shorter in the RG than in the CG ($p < 0.05$), indicating that the holistic care model shortened the patient's admission-to-operation time and accelerated fracture healing and recovery (Figure 2).

Table 1

Nursing contents in the research group.

Time	Nursing measures
Preoperatively	1) A nursing team consists of an attending physician (responsible for medication management, condition diagnosis and treatment, etc.), a head nurse (responsible for training, division of labor, supervision, etc.), a primary nurse (responsible for managing high-risk patients, health education, implementation of medical orders, etc.), and three nurses (responsible for specific implementation of nursing, telephone follow-up, etc.), with the nurse leader assuming the position of team leader, responsible for dividing responsibilities to individuals, unifying training-related terms, and discussing and formulating surgical procedures and overall care plans with team members according to the conditions of elderly patients. 2) Preoperative preparation. Radiological and routine examinations were performed after admission. A fast examination channel was set for the elderly, and the results will come out within 40 minutes; While waiting for the results, the team members comprehensively evaluated the patient's fracture, complications and comorbidities, and guide pre-operative preparations. The attending doctor evaluated the patient's pain level. If the pain was severe, a nerve block was performed in the iliac fascia region under the guidance of B-ultrasound. 3) Preoperative care. Patients were issued the Hip Fracture Nursing Health Handbook and explained the surgical protocols for hip fracture, disease-related knowledge, postoperative complications, pain and precautions through videos, manuals and PPTs to correct misconceptions. Nurses treated patients with equality and enthusiasm, reinforced communication, and minimized patients' and family members' anxiety; group members discussed patients' perioperative complications and countermeasures together, comprehensively assessed patients' cardiopulmonary function, nutritional status, degree of trauma, skin condition, etc., and formulated targeted preventive measures.
Intraoperatively	Instruments required for surgery were placed on the operating table 1 h in advance, inventoried and checked. The operating room was disinfected and insulated intraoperatively to prevent hypothermia.
Postoperatively	1) Monitoring vital signs. The patient's pulse, blood pressure, and other vital signs were closely monitored. The incision was noted for blood leakage and infection. Blood transfusion was administered if necessary to prevent the occurrence of delirium due to cerebral hypoxia or reduced blood volume. 2) Pain care. During ward rounds, the primary nurse assessed the patient's pain level and individualized pain management based on visual analog scale scores. For those with mild pain (0–4 points), the pain level can be relieved by music therapy, reading, and distraction; For those with moderate pain (5–7 points), the pain can be reduced by applying cold or hot packs, and massaging; For those with intolerable pain (8–10 points), pain medication or the analgesic pump were prescribed. 3) Rehabilitation training. When effects of anesthesia have subsided, patients were instructed to perform flexion and extension exercises of the ankle and toe joints in bed, 10 min/time, 3 times/d; Patients were instructed to perform deep breathing and coughing; Upper limb muscle strength was exercised by fist clenching; Patients were instructed to perform isometric contraction exercises of the quadriceps and gluteus muscles 1–2 d postoperatively, 10 s/time, 10–15 times/d, to promote blood circulation in the lower limbs; Patients were instructed to perform lip retraction breathing exercises, chest raising exercises, balloon blowing exercises and hip and knee flexion and extension exercises, straight leg raising, etc., 3–5 d postoperatively, 10 postures each time, 3 times/d; At 6–7 d postoperatively, patients perform exercises of lower limb internal retraction, posterior extension and abduction, 10 movements each time, 3 times/d; At 8–10 d postoperatively, patients were guided to practice walking; At 11–14 d postoperatively, patients were guided to perform activities of daily living, such as putting on slippers, going up and down stairs, toileting, putting on and taking off clothes, etc. Fall prevention care. Berg Balance Scale score < 40 indicates a risk of fall, warning signs need to be posted at the patient's bedside, and the patient needs to be accompanied by family members when exercise or walking.
Post-discharge	A WeChat group or public WeChat account was established to regularly disseminate rehabilitation-related information to patients; For the first 3 months after discharge, biweekly telephone follow-up was maintained to assess their recovery.

Table 2

Comparison of baseline data [n / (mean $\pm$ SD)].

Group	Male/female	Age (years)	Cause of injury	Type of fracture	Surgical procedure	Comorbidities
			Traffic/falls	Left femoral neck fracture/ right femoral neck fracture/ left intertrochanteric fracture/ right intertrochanteric fracture	Total or hemi hip replacement/intramedullary nail internal fixation	Hypertension/diabetes/ coronary artery disease
Control group (n = 50)	25/25	69.2 $\pm$ 5.5	6/44	16/14/12/8	32/18	10/8/5
Research group (n = 54)	26/28	70.3 $\pm$ 4.9	9/45	18/13/11/12	35/19	13/10/7

3.3. Hip joint function

The pain, deformity, function, and joint mobility scores on the Harris Hip Scale were higher in the RG than in the CG after the intervention ($p < 0.05$), indicating that the holistic care model enhanced hip function (Figure 3).

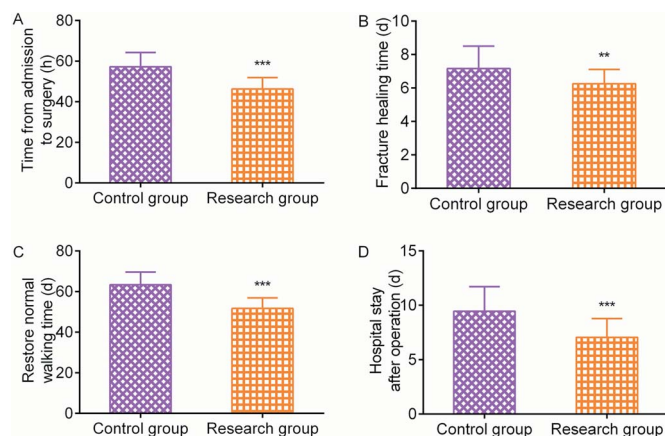


Figure 2. Comparison of indicators in the perioperative period between two groups. Note: A, time from admission to surgery; B, fracture healing time; C, time to independent walking; D, postoperative hospitalization time. Compared to the control group, ** $p < 0.01$, *** $p < 0.001$.

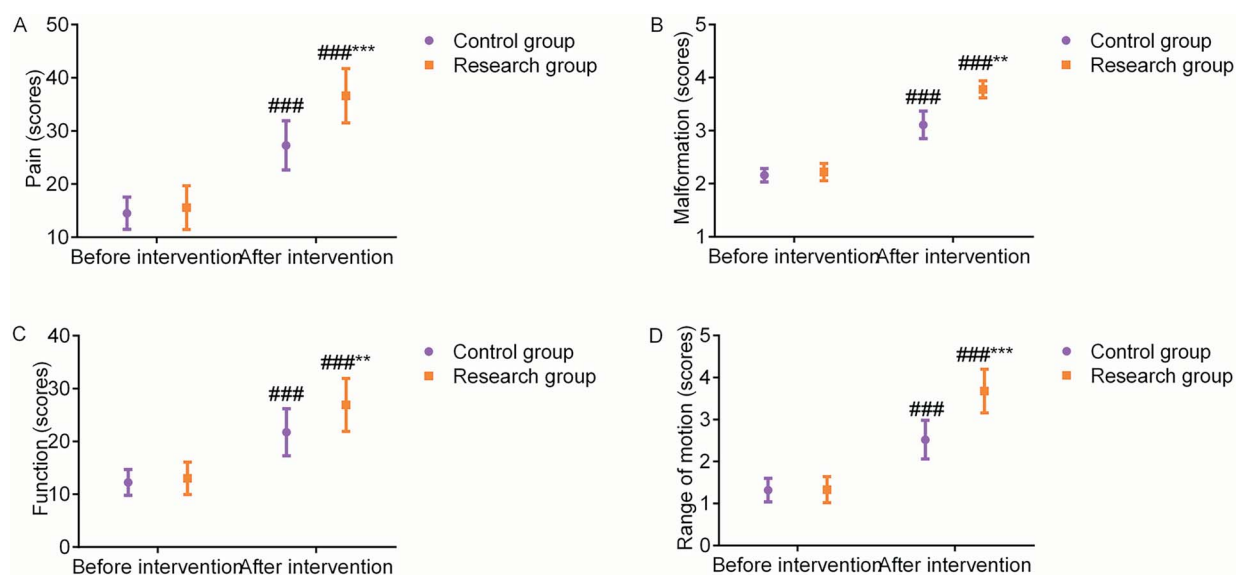


Figure 3. Comparison of Harris hip scores between the two groups. Note: A, pain score; B, deformity score; C, functional score; D, joint mobility score. Compared to the control group, ** $p < 0.01$, *** $p < 0.001$; compared to the pre-intervention period within this group, #### $p < 0.001$.

Table 3

Comparison of FIM scores, BBS scores, and SF-36 scores between two groups (mean $\pm$ SD, points).

Group	FIM score		BBS score		SF-36 score	
	Pre-intervention	Post-intervention	Pre-intervention	Post-intervention	Pre-intervention	Post-intervention
Control group (n = 50)	31.05 $\pm$ 4.58	80.46 $\pm$ 11.25####	37.62 $\pm$ 4.25	42.15 $\pm$ 5.28###	37.62 $\pm$ 4.25	42.15 $\pm$ 5.28###
Research group (n = 54)	32.37 $\pm$ 5.18	98.62 $\pm$ 12.28####	36.97 $\pm$ 5.11	48.85 $\pm$ 6.32####	36.97 $\pm$ 5.11	48.85 $\pm$ 6.32####

Compared to the control group, ** $p < 0.01$, *** $p < 0.001$; compared to the pre-intervention period within this group, #### $p < 0.001$.

BBS: berg balance scale; FIM: functional independence measure; SF-36: 36-Item Short-Form Health Survey.

Table 4

Comparison of treatment compliance n (%).

Group	Complete compliance	General compliance	Non-compliance	Total compliance rate
Control group (n = 50)	18 (36.00)	22 (44.00)	10 (20.00)	40 (80.00)
Research group (n = 54)	29 (53.70)	23 (42.59)	2 (3.70)	52 (96.30)**

Note: Compared to the control group, ** $p < 0.01$.

3.4. Functional independence, balance ability, and quality of life

The FIM, BBS, and SF-36 scores were higher in the RG than in the CG after the intervention ($p < 0.05$), indicating that the holistic care model improved patients' functional independence and balance (Table 3).

3.5. Treatment compliance

The overall treatment compliance rate was higher in the RG (96.30%) than in the CG (80.00%) ($p < 0.05$), indicating that the holistic care model improved patient treatment compliance (Table 4).

3.6. Complications

The incidence of complications was lower in the RG (9.26%) than in the CG (26.00%) ($p < 0.05$), indicating that the holistic care model prevented the incidence of complications (Table 5).

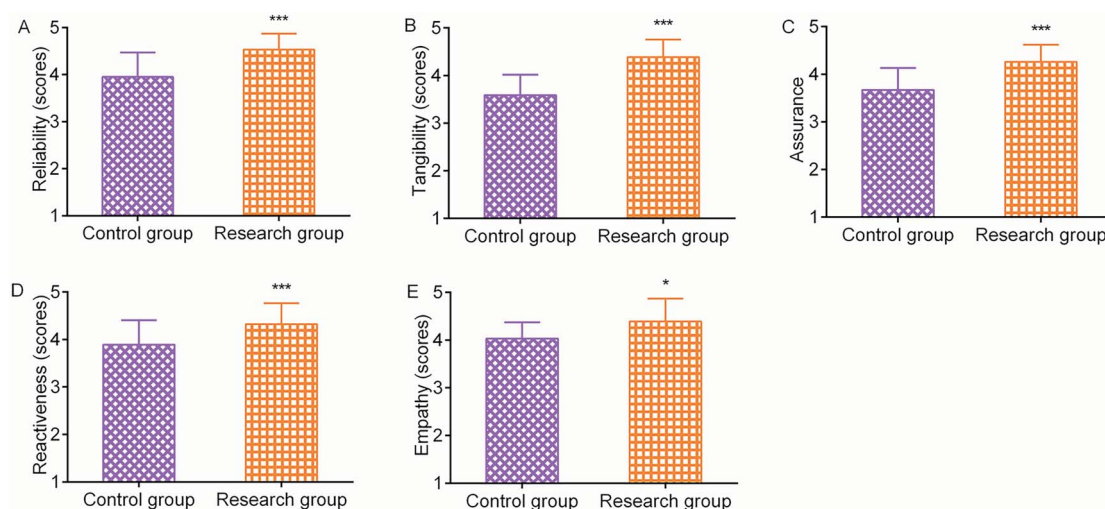
3.7. Quality of care scores

The ServQual scale scores were higher in the RG than in the CG ($p < 0.05$), indicating that the holistic care model improved the quality of nursing services (Figure 4).

Table 5

Comparison of complications n (%).

Group	Deep vein thrombosis in lower extremity	Pulmonary infection	Pressure injury	Delirium or irritability	Total
Control group (n = 50)	4 (8.00)	3 (6.00)	4 (8.00)	2 (4.00)	13 (26.00)
Research group (n = 54)	2 (3.70)	2 (3.70)	1 (1.85)	0	5 (9.26)*

Note: Compared to the control group, * $p < 0.05$.**Figure 4.** Comparison of ServQual scale scores. Note: A, Reliability score; B, Tangibles score; C, Assurance score; D, Responsiveness score; E, Empathy score. Compared to the control group, *** $p < 0.001$ and * $p < 0.05$.

4. Discussion

Hip fractures traumatize elderly patients physically and psychologically, leading to high disability, mortality, and economic burden. Thus, perioperative care for elderly patients is highly valued.^{11,12} However, routine care is inadequate to meet these patients' needs, necessitating the implementation of alternative care models. The responsibility system of integrated nursing is a patient-centered care model in which the primary nurse, following established nursing protocols, provides planned and purposeful holistic care services aimed at safeguarding the patient's physical and mental well-being. This care spans the entire hospital stay from admission to discharge. The core responsibility system for integrated nursing lies in refining the level of care and implementing a hierarchical distribution of duties. This approach effectively transforms the functional nursing model by reversing the fragmented care provided by different nurses to patients. It empowers nurses by fostering a sense of responsibility and enables them to deliver continuous and comprehensive care throughout the patient's treatment.¹³

The results of this study showed that, compared to the CG, the RG had a higher overall compliance rate, higher Harris Hip Score and FIM, and lower incidence of complications. This indicates that implementing a responsibility system integrated with a nursing model for elderly patients with hip fractures can improve the efficiency of diagnosis and treatment, enhance the quality of care, accelerate fracture healing, improve hip joint function, and prevent complications. Fang¹⁴ et al. found that holistic care could improve the quality of routine care and reduce patient complications. Wang¹⁵ reported that the holistic care model could reduce complications and shorten the fracture healing time, all of which support the findings of this study. The underlying mechanism is as follows. We first established a care team, assigned specific tasks and responsibilities to each individual, and formulated the surgical procedure and comprehensive care plans according to the patient's actual condition and evidence-based guidelines. This approach could enhance the sense of respon-

sibility and self-awareness of nursing staff and guarantee the practicality, scientificity, and rationality of care plans. In addition, the team members have a clear division of labor, which enables them to maintain a good state of energy and physical strength, to maintain the continuity of detailed care, timely adjust feedback and implement continuous tracking. The examination items are performed for elderly in a priority manner, which can shorten the waiting time, improve the efficiency of diagnosis and treatment as well as the operation rate. Disease knowledge and perioperative precautions were introduced to patients via diversified health education methods before surgery, which can improve patient compliance with treatment and reduce psychological and physical stress. Preoperative analgesia for patients with unbearable pain can reduce spinal hyperalgesia and improve patient tolerance for surgery. Postoperative assessment of patients' pain levels, and music therapy, distraction, cold compresses, massage, and the use of analgesic pumps as prescribed by doctors can minimize patients' pain. Postoperative active or passive limb exercises can strengthen muscle strength, accelerate blood and lymph circulation, and enhance endurance, balance, and coordination, which further promote the absorption of inflammatory substances, and accelerate the recovery of hip joint function.^{16–20} Early functional exercise can stimulate the body's nerve endings to transmit nerve impulses, promote skeletal muscle contraction or relaxation, increase muscle strength, prevent muscle atrophy, maintain muscle fiber structure, prevent long-term bed rest, reduce muscle protein synthesis, and reduce complications such as injury and deep vein thrombosis of the lower extremities.^{21–23} The three months after the operation is a critical period for the patient's functional recovery. Therefore, guidance on diet, exercise, and medication via WeChat groups can motivate patients to continue receiving nursing services.

This study has the following shortcomings: the follow-up period was short, and the indicators at 3 months after surgery may not fully reflect the recovery process of patients, so the follow-up period needs to be extended later. Cognitive function in elderly patients exhibits a notable de-

cline, with individual variability, and research findings may be influenced by patients' subjective perceptions. The study sample size was small and from a single source, so further multicenter prospective studies with larger sample sizes need to be conducted to confirm the findings.

In conclusion, the responsibility system integrated holistic care model for the perioperative care of geriatric hip fractures is effective in improving treatment compliance, shortening fracture healing time, improving hip function and balance, improving functional independence and quality of life, reducing complications, and conserving medical resources. In the future, this nursing model may be applied to the perioperative care of other surgical patients, thereby benefiting a larger patient population.

Authorship

Juan Yang and Xuemei Zhu conceived the study, collected the data and performed the statistical analysis. Juan Yang wrote the manuscript. Xuemei Zhu revised the manuscript. Both authors approved the final manuscript.

Conflicts of interest statement

The authors declare that they have no competing interests.

Funding

No funding was received for conducting this study.

Ethics statement

This study was approved by the Institutional Review Board of Ganzhou Hospital of Traditional Chinese Medicine (approval no. GZSZYYKYLL20190002).

Statement of informed consent

All patients voluntarily signing the informed consent.

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