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Effect of Interaction Model of Client Health Behavior on discharge readiness of Elderly Patients with Hip Fractures

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SUMMARY: *To examine the iImpact of health education based on the Alternating Pattern of Clientele-side Fitness Behaviour on the discharge readiness of aged majors with haunch catagma.* ***Design:*** *Single-blind, stochastic command experiment.* ***Methods:*** *Using a consecutive sampling approach, 84 older adult sick person with haunch catagma were enrolled between October 1, 2023, and December, 31, 2024. Participants were stochastic distribution in a proportion of 1:1 via computer-generated randomization to either the Control or intervention groups. The intervene tranches got health education according to the Alternating Pattern of Clientele-side Fitness Behavior, while the command tranches got standard orthopedic teaching sessions. primary result was hospital discharge readiness, assessed using validated scales. Secondary outcomes included Barthel Index scores and 30-day post-discharge unplanned readmissions. Data analysis was conducted using SPSS version 26.* ***Results:*** *In the intervention group, 94.9% of sick person self- statements readiness for leave hospitalwhich was significantly taller than the 77.5% in the control group. The Hospital Discharge Readiness Scale scores of the two tranches differed significantly, with the intervene tranches scoring taller than the command tranches. The Barthel Index scores improved significantly in the intervenevs. command tranches, with a obvious difference between the groups. Furthermore, the intervention group had a reduced 30-day unplanned readmission rate compared to the control group.* ***Conclusion:*** *The Interaction Model of Client Health Behavior-Based Health Education greatly improved the readiness of aged majors with haunch catagma to be discharged from hospitals. In addition, it facilitated recovery of activities of action of everyday life, and reduced the venture of 30-day readmission. These findings support the inclusion of the Alternating Pattern of Clientele-side Fitness Behaviour-Directed Programs in standard rehabilitation pathways, particularly for frail older adults who require multidimensional discharge planning.*

KEYWORDS: *Hip Fracture; health Education; health promotion; discharge readiness; nursing theory*

Meanings for the occupation and sick person nurse
Influence (Location):
What question did the research location?

The study addressed the challenge of inadequate discharge readiness among elderly hip fracture patients, which contributes to poor recovery, increased complications, and higher unplanned readmission rates.

What were the main findings?

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The study found that patients who received the IMCHB-based health education intervention had significantly higher discharge readiness scores, improved functional recovery (measured by the Barthel Index), and a lower 30-day unplanned eadmit proportion contrast to the command tranches. **Where and on whom will the investigate have an influence?**

This investigate will influence healthcare providers, particularly nursing staff and rehabilitation specialists, in hospitals and geriatric nurse settings. It is particularly relevant for aged majors with haunch catagma, as it provides a structured approach to discharge education, reducing complications and readmissions.

Reporting Method:

This study has been reported following the Consolidated Standards of Reporting Experiments (CONSORT) guidelines.

Patient or Public Contribution:

We appreciate the altruistic participation and collaboration of all patients and their families.

What does this article contribution to the extensive world residential district?

•Using this concept to treat older individuals with hip fractures may provide the global community with a fresh and practical approach to intervention.

•The consequences of this research offer specific guide for optimizing clinical nursing practice.

•Enhancing the preparedness of senior hip fracture patients for discharge can cut healthcare costs and decrease the readmission rate of patients due to poor preparation.

Trial and Protocol Registration:

This randomized controlled trial (RCT) was conducted without prior registration in a common clinical trial login.. At the time of study design and implementation, the research team was unaware of the medical book editing organization (ICMJE) requirement mandating prospective registration for all RCTs. We acknowledge this oversight may limit the transparency of our research process. To address this, we have provided a comprehensive description of the trial methodology within this manuscript, including full details of randomization procedures, blinding strategies, outcome measures, and statistical analysis plans (see Methods section). The complete dataset supporting this research are usable on demand from the relevant writer. This research was ratify by the Youjiang Medical University for Nationalities Ethics Committee (Approval No. 2023122619), and we affirm that all procedures adhered to the Declaration of Helsinki. Future studies led by our team will strictly comply with clinical trial registration guidelines.

1 Introduction

Hip fractures among older adults have become increasingly common as the global population ages. As the most prevalent and serious osteoporotic fractures, hip fractures are associated withof its high morbidity, disability, and mortality rates, making them a significant public health concern. These fractures negatively impact quality of life and healthy life expectancy in aging populations. According to Cheung's study (Ching-Lung Cheung et al., 2018), the number of haunch catagma in Asia is projected to reach 6.5 million by 2050, representing a 2.28-fold increase from 2018 to 2050. The mortality and disability rates of individuals with hip fractures remain high even after surgery and rehabilitation. The mortality rate within a year of treatment is as high as 20 – 31%, and only 30 – 50% of recover can regain their pre-catagma standard of health and self-governed in daily action (Colum Downey, Martin Kelly, & John F Quinlan, 2019; Suzanne M. Dyer et al., 2016; Veronese & Maggi, 2018). Additionally, the one-year unplanned readmission rate for patients with hip fractures is 30.1%,

increasing the mortality risk to 34.4% and extending hospitalized stays by an mean of 7 – 8 days per incident (Ali & Gibbons, 2017; Maliha Asif, Lauren Cadel, Kerry Kuluski, Amanda C. Everall, & Sara J. T. Guilcher, 2020).

Sick person discharge preparedness remains suboptimal despite marked improvements in the surgical manage of haunch catagma among older adults. In a study by Brent (Brent & Coffey, 2013), the readiness of patients with hip fractures to be discharged was low, with low scores in personal resilience and anticipatory support, due to insufficient discharge education and inadequate family and social support. Furthermore, to address medical resource shortages, most hospitals have implemented healthcare reforms aimed at reducing hospital stays and enhancing the quality of medical services. Although these reforms have alleviated the pressure on hospital resources, discharge preparations frequently remain inadequately coordinated (Huang et al., 2022). The transition to inpatient department leave is a difficult and flimsy time for sick person and caregivers, as demonstrated by multiple studies. Unexpected post-discharge urgent nurse care or re-admission not only uses healthcare facility but also adds to the care responsibility for patients and their families (Lauren Cadel, Kerry Kuluski, Amanda C. Everall, & Sara J. T. Guilcher, 2022; Shih, Lin, Wu, & Yang, 2020). The change from inpatient departmentto home nurse is a critical and flimsy period for sick person and caregivers, Moreover, the risk of negative outcomes is increased when sick person leave from the inpatient department are unable to manage their illnesses on their own, and have unmet healthcare needs. Therefore, it is crucial to enhance discharge readiness among older adults with hip fracture, ensuring a smoothness change from the inpatient departmentto their homes.

2 Background

Discharge readiness refers to a patient's readiness to be discharged from the hospital, their ability to manage post-discharge care, and their capacity to complete necessary healthcare tasks independently (Larsson, Wågström, Normann, & Thernström Blomqvist, 2016; Nurhayati, Songwathana, & Vachprasit, 2018). A structured evaluation of discharge readiness facilitates the early identification of high-risk patients, enhances discharge readiness, reduces length of hospital stay, decreases readmission rates, lowers healthcare costs, and improves patient satisfaction with the overall healthcare service (Bobay et al., 2021; Weiss, Costa, Yakusheva, & Bobay, 2014). Moreover, the perceived level of discharge readiness directly affects the safety of patient transitions from the hospital to the home. Patients who are adequately prepared for discharge experience improved quality of life, enhanced self-care abilities, and better home rehabilitation outcomes. However, discharging patients too soon may compromise recovery, increase their likelihood of hospital readmission, and worsen health outcomes (Gündüz, Durmaz, & Aydin, 2024).

The Alternating Pattern of Clientele-side Fitness Behaviour (IMCHB) was progress by Cox (Cox, 1982) in 1982 based on four theoretical models: the Fitness Belief Pattern, the Sageman Pattern, the Anderson and Newman Pattern, and the monitoring and management Pattern. This model of nursing practice connects nursing assessments, interventions, and outcomes. The pattern describes the influence of patient backdrop elements, fundamental goal, perceive appraisal, affective responses, and their alternatings with fitness nurse providers on fitness-related behaviours. The model emphasize the collaborative role of patients, families, and fitness nurse providers in moulding and accelerate fitness behaviours. This model has been widely applied in all areas of nursing practice and plays an important role in nursing assessment, diagnosis, intervention, and the promotion of health outcomes (Mathews, Secrest, & Muirhead, 2008). Using IMCHB to guide patients in an interventional study can improve their self-management skills, promote health behaviors, and enhance mental health (Cox &

Roghmann, 1984; Kim, Lee, & Ryu, 2020; Noh & Park, 2019). Furthermore, traditional geriatric care models may no longer be sufficient to address the growing healthcare demands of aging populations, as Donnellan's (Donnellan, n.d.)study also showed. Therefore, geriatric care models need to focus more on health maintenance and sustainability for older adults to maintain high physical and cognitive functioning and to participate effectively in social and productive activities.

Applying Cox's IMCHB to improve the discharge readiness of aged majorswith hip fractures is essential. However, to our knowledge, no study have specifically applied this model to patients with hip fracture. Therefore, this study aimed to evaluate the impact of IMCHB-based health education on the discharge readiness of older adults with hip fractures.

3 Material and Method

3.1 Aims and scheme

This was a simplex-sightless,, randomized command clinical experiment..We hypothesized that health education based on the IMCHB would enhance discharge readiness, promote recovery of activities of action of everyday life, and decrease the proportion of unplanned readmission among sick person in the intervene tranches. Before initiating the trial, it was necessary to assess the feasibility of the study and the intervention. We further hypothesized that IMCHB-based health education would be feasible, as evaluated by discharge readiness scores, Barthel Index, and unplanned readmission rates.

The study was categorized into control and intervention groups: the command tranches got traditional fitness teaching and the intervene tranches received IMCHB-based fitness teaching. We categorized the patients into two tranches to compare the command tranches with the intervenegroup and to determine the treatment effect of both interventions.

The research was proceed in the orthopedic department of a three-stage care inpatient department in Guangxi from October 1, 2023, to December 31, 2024. The study was proceed in according with the Stipulate Criterion of Statements Experiments (CONSORT)(Schulz, Altman, & Moher, 2010).

3.2 Population and specimen of the Research

Aged majors with haunch catagma hospitalized in the orthopedic section of a three-stage inpatient department in Guangxi between October 2023 and December 2024 were choose based on predefined inclusion and exclusion criteria. The sample size was calculated using the standard estimation formula for comparing the means of two independent samples, as shown below:

$$n_1 = n_2 = 2 \times \left[(\mu_{\alpha+}\mu_{\beta})\sigma / \delta \right]^2 \quad (1)$$

On the basis of α = 0.05, β = 0.10, from the bounding table: $_{\alpha}$ = 1.96,μ_{β} = 1.282, using two-sided test, According to the pre-test, the discharge readiness goal of the i intervene tranches was 90.35±5.27, and the goal of the command tranches was 88.58±6.64. the calculations showed that σ=1.77, δ=1.37, it was obtained σ/δ=1.29, calculated n_1 = n_2=35. To account for potential attrition (estimation at 20%) and considering practical clinical constraints, the ultimate specimen quantity of each group was modulation to 42 attendee per tranches, consequence in a total of 84 attendee. Sick person were stochastic distribution to either the intervene or command tranches using computerized randomization process. A total of 84 hip fracture sick person were included in this study. Informed consent was obtained

from all study attendee before enrollment.

3.3 Inclusion and Exclusion Criteria

3.3.1 The inclusion criteria were as follows

(1) sick person with independent unilateral hip fracture diagnosed by radiography or CT scan, with a freshly closed fracture (< 14 days); (2) age ≥ 65 years; (3) sick person who were aware of the purpose of the research and were willing to cooperate with the investigation; (4) stable condition, no concurrent evidence of pneumonia, deep vein thrombosis, or stress injury at the time of hospitalization; and (5) ability to communicate normally through verbal or textual face-to-face communication.

3.3.2 Exclusion criteria were as follows

(1) those with serious comorbidities and complications; (2) those who were unconscious, cognitively impaired, demented, or unable to communicate normally; and (3) those who requested withdrawal from the study during the intervention process or were lost to follow-up.

3.4 Randomization and allocation concealment

Eligible patients were screened promptly upon admission to the orthopedic department. Informed consent was obtained from each attendee, and proxy consent was obtained when necessary, within 24 h of hospital admission to the orthopedic department by the research nurse. Randomization was achieved using the SPSS software (version 26.0). Patients were distribution to the control or intervention tranches in a 1:1 proportion using randomized, undisclosed-size permutation blocks stratified by site. The research employed a simplex-sightless scheme, ensuring that attendee remained unaware of their tranches assignments.

3.5 Data Collection Tools

The data collection tools used in this research included demographic questionnaires, the Readiness for inpatient department Leave Scale (RHDS), and the Barthel Index. These tools are validated instruments with established reliability and validity.

3.5.1 Demographic information questionnaire

In this study, a questionnaire was designed to investigate the demographic characteristics of patients receiving health education based on the IMCHB.

3.5.2 Readiness for inpatient department Leave Scale

The scale is a simple and commonly used tool for assessing sick person' readiness for leave hospital. It was developed by Weiss through a after a multicenter study based on Meleis' theory of transition. Currently, the scale has been translated into multiple language versions, including a Chinese version adapted by Youye Lin in 2014, which was revised to reflect the cultural and patient-specific needs. Tthe Chinese version of the RHDS consists of three subscales, including the personal status, adaptive capacity, and anticipatory support. The scale has a Cronbach's a coefficient of 0.89 and a content validity index of 0.88, which has good reliability and validity. The Chinese version of the scale is simple and easy to use, and the scoring method is the same as that of the original scale, with a full goalof 120 points; taller

goal indicate higher readiness for inpatient department leave (Lin, Kao, Huang, Chi, & Chou, 2014).

3.5.3 Barthel index

This scale is used to measure the sick person's ability to perform action of everyday life, including eating, bathing, grooming, dressing, bowel command, toileting, transferring, mobility, and walking up and down stairs. The Barthel Index is goal on a scale ranging from 0 – 100, and we assume that patients with scores of < 100 have some degree of functional disability.

3.6 Interventions and Data Collection

3.6.1 Control group intervention

The command tranches got routine nurse, including routine postoperative fitness teaching, rehabilitation guidance, and discharge planning.

3.6.2 Intervention group intervention

On the basis of routine care, the intervention group implemented fitness teachingn for IMCHB by first forming a discharge preparation service team consisting of eight members, including one orthopedic surgeon, one rehabilitation therapist, one counselor, and four nurses. Second, the intervention was structured using the IMCHB as a framework, incorporating evidence from domestic and international literature as well as guidelines related to discharge preparation (Chesser, Chauhan, & Kelly, 2016; McDonough et al., 2021) and expert consensus (K. Wendt et al., 2016; Robert B Conley et al., 2020). We developed a health education program for older adults with hip fracture employing four major aspects: health information, professional skills, emotional support, and decision-making command to prepare for hospital discharge. And intervenes were delivered to individual attendee face-to-face in the orthopedic department, and information was supplemented by printed material and video facility.

Before the intervene, the patients were assessed by two nurses through a self-administered patient uniqueness assessment questionnaire. This questionnaire collected demographic data and evaluated patients' knowledge of their disease status and hip fracture, their need for rehabilitation information, their psychological status, and their willingness to participate in relevant health education. After understanding the patient's unique information, the patient was given four major aspects of health education: fitness information, occupation skills, emotional support, and decision command: (1) Health information (3 times a week, 30 – 60 min each time): mainly providing individualized health education to patients, explaining knowledge related to fracture rehabilitation, drug management, and home safety through illustrated manuals and videos. Meanwhile, group meetings are actively organized for patients to share their rehabilitation experiences and strengthen their internalization of knowledge. This study aimed to enable patients understand professional knowledge and stimulate intrinsic motivation for fracture rehabilitation. (2) Professional skills (1 time per day, 30 – 60 points each time): The patients were mainly instructed in rehabilitation training, with the rehabilitation therapist instructing them on bed activities, the use of walking aids, and progressive weight-bearing training. Patients were also encouraged to learn about self-testing and instructed to record their daily activities and pain scores by maintaining rehabilitation diaries. This aimed to equip patients with rehabilitation training skills and improve their self-care abilities. (3) Emotional support (two times a week, 30 – 60 points each time): By conducting psychological counseling, the counselor provided one-on-one individualized

psychological guidance based on the patients' goal on the Anxiety and Depression Self-Assessment Scale and their psychological conditions. Encourage patients with excellent performance to share their insights to increase their confidence and participation. Accelerated participation in health education training was encouraged so that patients and their families can express their feelings, thereby improving emotional, familial, and social support. The goal was to enable patients to develop an optimistic attitude and boost confidence in recovery. (4) Decision-making control (once a month): The Discharge Preparation Service Team guides patients to conduct self-assessments every month and jointly formulates rehabilitation exercise plans and goals for each stage. Patients were encouraged to write and complete the rehabilitation exercise diary daily, upload it to the WeChat group, and praise those who completed the milestones on time. For those who did not complete the program, we understood the difficulties encountered by the patients during the rehabilitation process through communication and provided professional guidance and assistance. (5) Follow-up: After the sick person were leave from the inpatient department, two telephone follow-up visits were conducted every month for 15 – 20 min, which allowed for program adjustment based on the patient's condition and served as reminders for scheduled follow ups.

3.6.3 Data Collection

Demographic and unique patient information were collected within 24 h of hospital admission. After the intervention, the RHDS was collected on the day of discharge, and the Barthel Index was collected before the intervention, on the day of discharge, 1 month after the intervention, and 3 months after the intervention for both groups. In addition, the readmission of patients in both groups was investigated within 30 days of the intervention.

3.7 Analysis of Data

Statistical analyses were performed using SPSS version 26.0 for Windows (IBM Corp., Armonk, NY, USA). Continuous variables were presented as mean ±criterion deviation (*SD*) or median (P_{25}, P_{75}), while qualitative variables were expressed using frequency counts and relative frequencies (%). Normal distribution analysis was performed using the Kolmogorov-Smirnov test, and differences between the two tranches were examined using an independent sample t-test for quantitative data. Qualitative data were analyzed using the Chi-square test or nonparametric Mann-Whitney and Kruskal-Wallis tests to compare the data between the two tranches of patients. Repeated-measures ANOVA was used to analyze the differences in Barthel Index scores between pre- and post-intervention on the day of discharge and at 1 and 3 months after intervention. A P value < 0.05 was considered statistically obvious.

3.8 Ethical Considerations

The research go ethics committee approval from Youjiang Medical University for Nationalities(Approval number: 2023122619). Additionally, participants were assured that their responses would be kept confidential. The Principles of the Declaration of Helsinki were followed in all stages of the study.

4 Results

During the study period, 96 patients were recruited, of which 7 did not meet the inclusion criteria, five refused to participate. The sample consisted of a total of 84 participants. To ensure the scientific validity and comparability of the findings, the included patients were

randomly categorized into the control group and the intervention group, with 42 patients in each group. The total number of patients who participated throughout the entire study was 79, and due to relevant objective factors, five patients dropped out midway, which was calculated to be a dropout rate of 5.95%. The demographic data of the patients in both tranches, in terms of pre-intervention age (P = 0.582), sex (P = 0.876), length of hospitalization (P = 0.358), place of residence (P = 0.064), education (P = 0.921), primary caregiver (P = 0.779), knowledge of the disease (P = 0.114), and desire to learn (P = 0.257), were not statistically significant (Table 1). Overall, the baseline patient data were comparable(Table 1).

Table 1: Comparison participants' characteristics of the two tranches

	Intervention Group (n=39)	Control Group (n=40)	Z/χ2	P
Age (years)	77(69,84)	77.5(74,83)	-0.550a	0.582
Length of stay (day)	9(7,13)	10(8,12)	-0.919a	0.358
Gender			0.024	0.876
Male	13(33.3)	14(35)		
Female	26(66.7)	26(65)		
Long-term residence			7.259	0.064
Provincial capitals and Prefecture- criterion cities	8(23.1)	5(12.5)		
County-level cities	3(7.7)	12(30.0)		
The villages and towns	14(35.9)	14(35.0)		
Rural	13(33.3)	9(22.5)		
Educational level			0.100	0.921
Primary and below	29(24.4)	28(70.0)		
Secondary	4(10.3)	10(25.0)		
High school	6(15.4)	2(5.0)		
Primary caregiver			0.499	0.779
Spouse	5(12.5)	4(10)		
Child	30(76.9)	30(75.0)		
Care worker	4(10.4)	6(15.0)		
Disease Understanding			2.496	0.114
Incomprehension	3(7.7)	8(20.0)		
Understandings	36(92.3)	32(80.0)		
Learning aspirations			1.286	0.257
Intense	11(28.2)	7(17.5)		
Ordinary	28(71.8)	33(82.5)		

Note: aQuantitative data conforming to non-normal data are expressed as median (IQR) using the Mann-Whitney U test. Other qualitative data are presented as n (%) and comparisons between tranches were made using the chi-square test.

Discharge readiness was assessed using the RHDS. Patients were initially asked, ‘Are you ready to be discharged from the hospital?’ Their responses indicated their readiness to be discharged. In this study, the two groups of patients showed different degrees of discharge readiness, with 94.9% of patients in the intervention group being adequately prepared for discharge compared to 77.5% of patients in the command tranches (χ^2 = 4.972, $p < 0.05$). Comparing the discharge readiness scores of the two groups, the mean discharge readiness

score was 79.03 ± 8.39 in the control group (n = 40) and 90.10 ± 2.37 in the intervention group (n = 39) (t = -7.941, $P < 0.001$), suggesting that the intervention group's readiness for discharge score was obvious taller than that of the command tranches. In addition, the personal status, adaptability, and anticipatory support goal were taller in the ntervene tranches than in the command tranches (Table 2).

Table 2: Comparison of Readiness for Hospital Discharge Between Groups

Characteristics	Intervention Group (n=39)	Control Group (n=40)	t	P
	Mean ± SD	Mean ± SD		
RHDS	90.10±2.37	79.03±8.39	-7.941	<0.001
Personal status	21.59±0.75	20.50±2.23	-2.793	0.007
Adaptability to adapt	36.95±1.31	31.60±4.09	-7.776	<0.001
Anticipated support	31.77±2.10	26.93±2.88	-8.570	<0.001

Note: SD = standard deviation. Readiness for Hospital Discharge (RHD) was measured using a validated 12-item scale (range 0-120), with aller goal indicating better preparedness.

In this study, the Barthel Index of patients in the two groups was analyzed using repeated-measures ANOVA, which showed a significant main effect of time, $F(3, 179.87) = 772.51$, $p < 0.001$, suggesting that there was an overall change in the Barthel Index of the two groups over time; a obvious main effect of between-groups, $F(1, 77) = 42.94$, $p < 0.001$, suggesting that there was a difference in Barthel Index between the intervene and command tranches; the alternating effect between time and tranches was obvious $F(3, 179.87) = 19.29$, $p < 0.001$, suggesting that there was a different trend in Barthel Index over time in the two groups. Further post hoc multiple comparisons (with Bonferroni correction) revealed that the Barthel Index of the intervention tranches was obvious taller than the baseline level on the day of discharge, 1 month, and 3 months post- intervene ($P < 0.001$), and the scores at 3 months post- intervene were obvious tallerr than those on the day of discharge and at 1 month post-intervention ($P < 0.001$). Conversely, the Barthel Index of the control tranches was obvious taller than the baseline level on the day of discharge and at 1 month and 3 months post- intervene ($P < 0.001$). The Barthel Index was also obvious taller than the baseline level in the command tranches on the day of discharge, 1 month and 3 months post- intervene ($p < 0.001$). At the same time points, the quality of life goal of the intervene tranches were obvious taller than those of the command tranches at 1 and 3 months post-intervene ($P < 0.001$) (Table 3).

Table 3: Consequence of Repeated Measures ANOVA for Barthel Index Across Four Time Points

Characteristics	Baseline	Day of discharge	1 month	3 month	RM ANOVA Results (Main Effects)		
	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	F(df)	p	η^2
Intervention Group (n=39)	45.00±5.26	62.31±6.67	77.95±6.64	90.00±4.59			
Control Group (n=40)	44.50±5.29	57.00±6.28	68.50±10.45	76.75±7.64			
Time Effect					722.51(2.34,179.87)	<0.001*	0.90
Group × Time					19.29(2.34,179.87)	<0.001*	0.20
Group Effect					42.94(1,77)	<0.001*	0.36

Note: SD = standard deviation. F (df): Greenhouse-Geisser corrected degrees of freedom (effect df, error df). Greenhouse-Geisser correction applied for time effect (Mauchly's W = 0.65, p<0.001). Post-hoc tests with Bonferroni modulation. η^2 denotes partial eta-squared.

The readmit proportion of sick person in the intervention group within 30 days was 7.7%, which was obvious lower than that of the command tranches (25%), and the difference was statistically obvious ($P = 0.038$) (Table 4).

Table 4: Comparison of unplanned readmissions between the two groups within 30 days of discharge

Characteristics	30-day hospital readmission		x2	P
	Yes, n(%)	No, n(%)		
Intervene Tranches (n=39)	3 (7.7%)	36 (92.3%)	4.303	0.038
Command Tranches (n=40)	10 (25%)	30 (75%)		

5 Discussion

Preparation for leave hospital is a time-sensitive and high- venture process that provides timely insight into the patient's perception of immediate discharge status and their ability to complete related medical care, which is key to ensuring patients' safely and effective rehabilitation at home after leave from the inpatient department (Hydzik et al., 2021). Assessing a patient's discharge readiness not only evaluates their ability to continue rehabilitation after discharge but also serves as a predictor of post-discharge outcomes, and readiness for discharge is crucial to the safe transition of patients from hospital to home care (Xiong, Liu, Chen, Tian, & Yang, 2021). In this study, more than half of the participants answered "yes" to the question "Do you feel ready to be discharged from the hospital?" The intervention group had a higher total discharge readiness score and higher scores on each dimension than the control group ($p < 0.001$). This findings aligns with those of Yongyu Zhang (Zhang Y Y, Li Na, & Ning Z X, 2024), further supporting the effectiveness of health education guided by the IMCHB in improving discharge readiness among aged majors with haunch fractures. By analyzing the reasons, using IMCHB as a guide, healthcare providers can understand the sick person's unique information, grasp the sick person's nursing needs in the discharge preparation stage, provide health education interventions that meet the patient's actual situation, maximize the assurance that the patient understands and grasps the relevant content during the health education interventions, and obtain an accurate and reasonable method of solving the health problems. These targeted interventions increase the level of sick person's readiness to be leave from the inpatient departmentl and promote recovery. The findings of one study also clearly indicated that assessing the discharge needs of aged majors with postoperative hip fracture and developing a targeted discharge care plan can effectively help patients improve their readiness for discharge. This approach not only helps reduce the occurrence of postoperative complications, but also reduces the risk of further falls, thus facilitating the early recovery of patients (Li S, Song J, Song M, Qiu C, & Gao Y, 2024). From the findings of this study, it can be seen that good discharge preparedness is effective in ensuring transition safety, recovery from illness, and health transition after hospital discharge (Kolarczyk, Witkowska, Szymiczek, & Młynarska, 2023; Zhang, Feng, & Qiu, 2021). Given that older patients with hip fractures are typically discharged while still in recovery phase, it is particularly important to assess their discharge readiness. Therefore, a scientific and comprehensive assessment of the current state of patients' readiness for discharge is important for improving the level of patients' readiness for discharge. Such assessments supports healthcare professionals in providing patient-centered, and enable patients to regain their optimal functional independence after hospital discharge.

Most older adults with hip fracture have low literacy level and limited education, with age-related decline in cognitive function, learning ability, and self-care skills. These factors compromise functional rehabilitation, leading toof the affected limb, and even the overall suboptimal treatment outcomes, increased disability and mortality rates, and a greater burden on the family and society. This highlights the urgent clinical need enhance patients' self-care abilities and improve their rehabilitation outcomes. In our research, the Bathel index scores of patients in the intervention tranches was obvious taller than that of the command tranches,, revealing that providing health education guided by the IMCHB framework effectively improved patients' understanding of rehabilitation exercises and their importance in daily living activities such as dressing, bathing, toileting, and walking. This approach maximizes patient's knowledge and mastery of comprehensive rehabilitation techniques, ensuring proper execution of functional exercises, including: mastering the angle of exercise, the strength of exercise, the time of exercise, the intensity and frequency of exercise, and how to correctly use assistive devices. Furthermore, our findings suggest that IMCHB-based health education significantly enhanced patients' cognitive engagement and behavioral change, thereby improving their self-care abilities and functional recovery .

The unplanned readmission of aged majors with haunch catagma for the same or related conditions after discharge remains a serious clinical concern (Suri & Qureshi, 2013). A previous study found that 28 days after discharge, unplanned readmissions peaked in patients with recurrent fractures (Chambers & Clarke, 1990). This finding was supported by Tian's study (Tian et al., 2023), which retrospectively analyzed older adult undergoing hip fracture surgery in two hospitals and found that more than 60% of sick person were readmit to the inpatient department within 30 days post-surgery (47/76). Unplanned readmission rates are an important indicator of quality of nurse and surgical outcomes. Therefore, the use of effective nursing interventions is essential to reduce the proportion of unplanned readmissions of sick person. In our study, the rate of unplanned readmissions was obvious lower in the intervention tranches than in the command tranches, indicating the effectiveness of IMCHB-based fitness teaching in reducing the rate of unplanned readmission in older adults with hip fracture.

6 Limitations of the Work

This research has some limitations. First, the specimen quantity was relatively small which may limit the generalizability of the findings. A larger specimen quantity would enhance the possibility of finding significant differences between tranches. Second, although the choose of variables and data collection instruments was considered and justified according to an extensive literature review, there may be other important variables or instruments that have not yet been choose for this research. Third, patient and provider adherence may affect the effectiveness of the intervention. Fourth, due to the clinical constraints, the follow-up period was relatively short, limiting the ability to assess long-term outcomes. Future studies should consider longer follow-up periods to evaluate the sustained effects of the intervention. Another limitation was that the NCT registration was not performed at the beginning of the study.

7 Conclusion

This study demonstrated that health education based on Cox's IMCHB significantly improved discharge readiness of older adults with hip fracture, reduce the rate of unplanned readmission, and had a positive effect on the recovery of patients' ability to perform activities of daily

living. The findings of the study suggest that IMCHB-based health education is a feasible and effective approach for optimizing discharge preparation and post-discharge rehabilitation in older adults with hip fractures.

Author Contributions

Liyang Nong: The conception and design of the study, drafting the article, revising it critically for important intellectual content. Cui Li: The conception and design of the study, project administration, final approval of the version to be submitted. Juanjuan Huang: Acquisition of data, revising it critically for important intellectual content. Yunmei Qin: Analysis and interpretation of data.

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Conflicts of Interest

The authors declare no conflicts of interest.

References

[1] Ali, A. M., & Gibbons, C. E. R. (2017). Predictors of 30-day hospital readmission after hip fracture: A systematic review. *Injury*, *48*(2), 243–252. doi: 10.1016/j.injury.2017.01.005

[2] Bobay, K. L., Conway-Phillips, R., Hughes, R. G., Costa, L., Bahr, S. J., Siclovan, D., … Weiss, M. (2021). Clinical nurses' perspectives on discharge practice changes from participating in a translational research study. *Journal of Nursing Management*, *29*(3), 553–561. doi: 10.1111/jonm.13171

[3] Brent, L., & Coffey, A. (2013). Patient's perception of their readiness for discharge following hip fracture surgery. *International Journal of Orthopaedic and Trauma Nursing*, *17*(4), 190–198. doi: 10.1016/j.ijotn.2013.01.001

[4] Chambers, M., & Clarke, A. (1990). Measuring readmission rates. *BMJ (Clinical Research Ed.)*, *301*(6761), 1134–1136. doi: 10.1136/bmj.301.6761.1134

[5] Chesser, T., Chauhan, G., & Kelly, M. (2016). Management of hip fractures in the elderly. *Surgery (Oxford)*, *34*(9), 440–443. doi: 10.1016/j.mpsur.2016.06.002

[6] Ching-Lung Cheung, Seng Bin Ang, Manoj Chadha, Eddie Siu-Lun Chow, Yoon-Sok Chung, Fen Lee Hew, … Saeko Fujiwara. (2018). An updated hip fracture projection in Asia: The Asian Federation of Osteoporosis Societies study. *Osteoporosis and Sarcopenia*, *4*(1), 16–21. doi: 10.1016/j.afos.2018.03.003

[7] Colum Downey, Martin Kelly, & John F Quinlan. (2019). Changing trends in the mortality rate at 1-year post hip fracture—A systematic review. *World Journal of*

Orthopedics, *10*(3), 166–175. doi: 10.5312/wjo.v10.i3.166

[8] Cox, C. L. (1982). An interaction model of client health behavior: Theoretical prescription for nursing. *Advances in Nursing Science*, *5*(1), 41–56. doi: 10.1097/00012272-198210000-00007

[9] Cox, C. L., & Roghmann, K. J. (1984). Empirical Test of the Interaction Model of Client Health Behavior. *Research in Nursing & Health*, *7*(4), 275–285. doi: 10.1002/nur.4770070406

[10] Donnellan, C. (n.d.). Promoting the Concept Healthy Ageing for Use in Gerontological Health and Social Care Policy and Practice. *Journal of Clinical Nursing*, *n/a*(n/a). doi: 10.1111/jocn.17558

[11] Gündüz, E. S., Durmaz, M., & Aydin, B. K. (2024). The Predictive Effect of the Level of Psychological Resilience on the Level of Readiness for Discharge in Patients Undergoing Orthopaedic Surgery. *Journal of Clinical Nursing*, *n/a*(n/a). doi: 10.1111/jocn.17454

[12] Huang, R.-Y., Lee, T.-T., Lin, Y.-H., Liu, C.-Y., Wu, H.-C., & Huang, S.-H. (2022). Factors Related to Family Caregivers' Readiness for the Hospital Discharge of Advanced Cancer Patients. *International Journal of Environmental Research and Public Health*, *19*(13), 8097. doi: 10.3390/ijerph19138097

[13] Hydzik, P., Kolarczyk, E., Kustrzycki, W., Kubielas, G., Kałużna-Oleksy, M., Szczepanowski, R., & Uchmanowicz, B. (2021). Readiness for Discharge from Hospital after Myocardial Infarction: A Cross-Sectional Study. *International Journal of Environmental Research and Public Health*, *18*(13), 6937. doi: 10.3390/ijerph18136937

[14] K. Wendt, D. Heim, C. Josten, R. Kdolsky, H.-J. Oestern, H. Palm, … C. Copuroglu. (2016). Recommendations on hip fractures. *European Journal of Trauma and Emergency Surgery*, *42*(4), 425–431. doi: 10.1007/s00068-016-0684-3

[15] Kim, Y., Lee, H., & Ryu, G. W. (2020). Theoretical evaluation of Cox's interaction model of client health behavior for health promotion in adult women. *Korean Journal of Women Health Nursing*, *26*(2), 120–130. doi: 10.4069/kjwhn.2020.06.13

[16] Kolarczyk, E., Witkowska, A., Szymiczek, M., & Młynarska, A. (2023). The Variables of the Readiness for Discharge from Hospital in Patients after Myocardial Infarction. *International Journal of Environmental Research and Public Health*, *20*(2), 1582. doi: 10.3390/ijerph20021582

[17] Larsson, C., Wågström, U., Normann, E., & Thernström Blomqvist, Y. (2016). Parents experiences of discharge readiness from a Swedish neonatal intensive care unit. *Nursing Open*, *4*(2), 90–95. doi: 10.1002/nop2.71

[18] Lauren Cadel, Kerry Kuluski, Amanda C. Everall, & Sara J. T. Guilcher. (2022). Recommendations made by patients, caregivers, providers, and decision-makers to improve transitions in care for older adults with hip fracture: A qualitative study in Ontario, Canada. *BMC Geriatrics*, *22*(1), 291. doi: 10.1186/s12877-022-02943-6

[19] Lin, Y.-H., Kao, C.-C., Huang, A.-M., Chi, M.-T., & Chou, F.-H. (2014). Psychometric testing of the chinese version of the readiness for hospital discharge scale. *Hu Li Za Zhi The Journal of Nursing*, *61*(4), 56–65. doi: 10.6224/JN.61.4.56

[20] Maliha Asif, Lauren Cadel, Kerry Kuluski, Amanda C. Everall, & Sara J. T. Guilcher. (2020). Patient and caregiver experiences on care transitions for adults with a hip fracture: A scoping review. *Disability and Rehabilitation*, *42*(24), 3549–3558. doi: 10.1080/09638288.2019.1595181

[21] Mathews, S. K., Secrest, J., & Muirhead, L. (2008). The interaction model of client health behavior: A model for advanced practice nurses. *Journal of the American Academy of Nurse Practitioners*, *20*(8), 415–422. doi: 10.1111/j.1745-7599.2008.00343.x

[22] McDonough, C. M., Harris-Hayes, M., Kristensen, M. T., Overgaard, J. A., Herring, T. B., Kenny, A. M., & Mangione, K. K. (2021). Physical Therapy Management of Older Adults With Hip Fracture: Clinical Practice Guidelines Linked to the International Classification of Functioning, Disability and Health From the Academy of Orthopaedic Physical Therapy and the Academy of Geriatric Physical Therapy of the American Physical Therapy Association. *Journal of Orthopaedic & Sports Physical Therapy*, *51*(2), CPG1–CPG81. doi: 10.2519/jospt.2021.0301

[23] Noh, G. O., & Park, K. S. (2019). Effects of aroma self-foot reflexology on peripheral neuropathy, peripheral skin temperature, anxiety, and depression in gynaecologic cancer patients undergoing chemotherapy: A randomised controlled trial. *European Journal of Oncology Nursing*, *42*, 82–89. doi: 10.1016/j.ejon.2019.08.007

[24] Nurhayati, N., Songwathana, P., & Vachprasit, R. (2018). *Surgical patients' experiences of readiness for hospital discharge and perceived quality of discharge teaching in acute care hospitals*.

[25] Robert B Conley, Gemma Adib, Robert A Adler, Kristina E Åkesson, Ivy M Alexander, Kelly C Amenta, … Douglas P Kiel. (2020). Secondary Fracture Prevention: Consensus Clinical Recommendations from a Multistakeholder Coalition. *Journal of Bone and Mineral Research*, *35*(1), 36–52. doi: 10.1002/jbmr.3877

[26] Schulz, K. F., Altman, D. G., & Moher, D. (2010). CONSORT 2010 Statement: Updated guidelines for reporting parallel group randomised trials. *Trials*, *11*(1), 1–8. doi: 10.1186/1745-6215-11-32

[27] Shih, T., Lin, L., Wu, S., & Yang, M. (2020). The effect of caregiver's and nurse's perception of a patient's discharge readiness on postdischarge medical resource consumption. *Journal of Advanced Nursing*, *76*(6), 1355–1363. doi: 10.1111/jan.14329

[28] Suri, M. F. K., & Qureshi, A. I. (2013). Readmission within 1 month of discharge among patients with acute ischemic stroke: Results of the University HealthSystem Consortium Stroke Benchmarking study. *Journal of Vascular and Interventional Neurology*, *6*(2), 47–51.

[29] Suzanne M. Dyer, Maria Crotty, Nicola Fairhall, Jay Magaziner, Lauren A. Beaupre, Ian D. Cameron, & Catherine Sherrington. (2016). A critical review of the long-term

disability outcomes following hip fracture. *BMC Geriatrics*, *16*(1), 158. doi: 10.1186/s12877-016-0332-0

[30] Tian, M., Wang, Z., Zhu, Y., Tian, Y., Zhang, K., & Li, X. (2023). Incidence, Causes, and Risk Factors of Unplanned Readmissions in Elderly Patients Undergoing Hip Fracture Surgery: An Observational Study. *Clinical Interventions in Aging*, *18*, 317–326. doi: 10.2147/CIA.S395012

[31] Veronese, N., & Maggi, S. (2018). Epidemiology and social costs of hip fracture. *Injury*, *49*(8), 1458–1460. doi: 10.1016/j.injury.2018.04.015

[32] Weiss, M. E., Costa, L. L., Yakusheva, O., & Bobay, K. L. (2014). Validation of Patient and Nurse Short Forms of the Readiness for Hospital Discharge Scale and Their Relationship to Return to the Hospital. *Health Services Research*, *49*(1), 304–317. doi: 10.1111/1475-6773.12092

[33] Xiong, L., Liu, Y., Chen, Q., Tian, Y., & Yang, M. (2021). Readiness for Hospital Discharge of Adult Patients with Major Depressive Disorder in China: A Cross-Sectional Study. *Patient Preference and Adherence*, *15*, 1681–1692. doi: 10.2147/PPA.S319447

[34] Zhang, A., Feng, X., & Qiu, C. (2021). Discharge teaching, readiness for hospital discharge and post-discharge outcomes in cataract patients: A structural equation model analysis. *Journal of Nursing Management*, *29*(3), 543–552. doi: 10.1111/jonm.13169

[35] Zhang Y Y, Li N, & Ni Z X. (2024). Effect of hospital discharge readiness education model based on Meleis transition theory on hospital discharge readiness of lung cancer patients treated with chemotherapy. J Bengbu Med Coll, *49*(10), 1388–1392. doi: 10.13898/j.cnki.issn.1000-2200.2024.10.025

[36] Li S, Song J, Song M, Qiu C, & Gao Y. (2024). Construction of discharge readiness assessment index for elderly patients after hip fracture surgery. Chin J Mod Nurs, *30*(06), 707–712. doi: 10.3760/cma.j.cn115682-20230904-00879