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# Postoperative rehabilitation exercise experiences of geriatric patients with femoral neck fractures based on the perspective of medical staff: a qualitative study

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## Abstract

**Background** The incidence of femoral neck fractures in older adults is increasing each year. Active and reasonable postoperative rehabilitation exercises can restore the activity of geriatric patients with femoral neck fractures to a great extent, while also avoiding bedridden complications and re-fractures. This study explores the perspectives, experiences, and recommendations of medical staff regarding the implementation status, existing problems, promoting factors, and hindering factors of post-surgical rehabilitation exercises for geriatric patients with femoral neck fractures. The ultimate goal is to further optimize rehabilitation exercise programs and to expedite this process for patients.

**Methods** A qualitative, descriptive phenomenological study was conducted. A total of 21 clinical medical staff were selected using the purposive sampling method for semi-structured interviews. A content analysis method was used to collate and analyze the collected interview data.

**Results** A total of 2 themes and 6 sub-themes were defined. The themes consisted of multiple obstacles occurring during the implementation of rehabilitation exercises and the scientific cognition of medical staff on these exercises. Respondents found that patient initiative during rehabilitation exercises was insufficient, that the comprehensiveness and continuity of exercises could not be guaranteed, and that unification between textbook theory and clinical practice was incomplete. Moreover, respondents believed that their professional quality should be excellent, but that staffing and organizational management required optimization, and that support was required for the implementation of rehabilitation exercises.

**Conclusion** This study investigated the opinions and experiences of medical staff during postoperative rehabilitation exercises in geriatric patients with femoral neck fractures. Collaborative efforts should fully engage hospitals, communities, and families, enhance the alignment of health education with patient needs, advance the scientific development of an integrated medical model by refining the curriculum and teaching system, and significantly elevate the level of medical science and technology. This study will serve as a valuable reference for the establishment

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of future professional, and personalized rehabilitation programs tailored for geriatric patients with femoral neck fractures.

**Keywords** Femoral neck fracture, Geriatric patients, Postoperative, Rehabilitation exercise, Medical staff, Qualitative study

Hip fractures (HFs) are a global health problem characterized by high morbidity, high disability, and high mortality, and are a heavy burden to healthcare systems worldwide [1]. By 2050, the number of HF cases is expected to rise to 6.26 million, of which approximately half are likely to occur in Asia, particularly in China [2, 3]. The proportion of Chinese patients in this population is 23.79%, and it is expected that nearly 7% of older adults aged between 75 and 84 will have HFs in the next 10 years, as the incidence rate increases exponentially with age [4–6]. HFs refer to a fracture that occurs within 5 cm from the femoral head to the distal end. It is one of the most common fractures in older adults, especially in women, and includes femoral neck fractures, intertrochanteric fractures, and subtrochanteric fractures, with the latter being less common [7–9].

Femoral neck fractures (FNFs) are a major type of HF, and consist of a flat cone fracture that connects the femoral head and shaft [10]. FNFs are often predominant in patients over the age of 50, particularly in those between 60 and 70 [11]. The incidence of FNFs in patients over 55 years old is considered to be the best predictor of osteoporosis or osteoporotic fractures. In addition, the incidence of FNFs in older adults is increasing yearly due to osteoporosis, obesity, diabetes, and degenerative muscle tension [12].

If conservative treatment is performed after FNFs, long-term bed rest and continuous traction are required, which often leads to a series of serious complications such as pressure injury, hypostatic pneumonia, deep venous thrombosis of lower limbs, and ischemic necrosis, threatening the patient lives. The treatment of FNFs includes internal fixation, hemiarthroplasty, or total hip arthroplasty. Studies have shown that surgical interventions are the main measure to prevent and treat complications in geriatric patients with FNFs [13].

To date, there is no consensus on the frequency and timing of physical therapy to maximize functional recovery after surgery for FNFs [14]. However, it is undeniable that active and reasonable rehabilitation exercises can restore patient activity to a great extent, and avoid bedridden complications and re-fractures. In the International Rehabilitation Research Progress and Clinical Guidelines for Patients with Hip Fracture, it is highlighted that in the absence of contraindications, progressive, personalized, and periodic functional rehabilitation training within 24 h after surgery can promote the recovery of motor function and improve the quality

of life in geriatric patients with FNFs [15, 16]. The mortality risk of patients receiving hospital-based rehabilitation treatment decreased by 60% and 40% at 3 months and 1 year after discharge, respectively, when compared to those who did not [17]. There is growing evidence that exercise rehabilitation interventions have a positive impact on functional abilities beyond the subacute phase and later stages of care, indicating that structured exercise can improve overall activity after FNFs [18, 19]. Moreover, long-term bed rest, fractures, surgical trauma stress, sedative and analgesic treatments will increase the mortality of geriatric patients with FNFs.

At present, FNFs in older adults is still a serious challenge for medical staff and society, and a type of injury that cannot eliminate the psychological burden of patients and their families. Studies have shown that from the age of 50 to 55, the major organ functions begin to gradually decline [20]. After the age of 70, the probability of postoperative complications is significantly increased. In addition, the cognitive level of some geriatric patients may be low, which greatly affects the treatment and rehabilitation compliance of geriatric patients with FNFs, and decreases their postoperative quality of life. In addition, doctors, rehabilitation therapists, and nurses play an indispensable role in the management of these postoperative rehabilitation exercises.

Most studies to date have only evaluated the results of patients' rehabilitation exercises, and disregarded the opinions and experiences of medical staff during this process. Therefore, the purpose of this study is to conduct semi-structured interviews with medical staff to investigate their views, experiences, and suggestions on the implementation status, existing concerns, promotion, and hindrance factors of postoperative rehabilitation exercises in geriatric patients with FNFs. This will comprehensively explain patient experiences, feelings, and influencing factors during rehabilitation exercises. In order to further understand the necessity and effectiveness of rehabilitation exercises, this study provides valuable data support for medical staff to continuously optimize rehabilitation programs, accelerate the rehabilitation process, improve the participation and compliance of patients, and improve the quality of life of patients.

## Material and methods

This study was conducted in a tertiary hospital in Zhejiang from December 2023 to January 2024. The hospital follows the orthopedic rehabilitation standard proposed

by the Chinese Orthopedic Rehabilitation Expert Committee [21]. This involves using rehabilitation medical methods such as physical therapy, occupational therapy, prosthetics, orthotics, and other auxiliary devices to improve or compensate for patients' impaired body functions. These are based on orthopedic clinical diagnoses, treatments, and functional assessments. Inclusion criteria for this study included: no obvious fever, nausea or vomiting; well-controlled pain; stable vital signs; satisfactory position of the prosthesis confirmed by post-surgery X-ray reexamination with no complications such as fracture or dislocation; ability to walk normally or with crutches; mastery of functional exercise method conditions by either the patient or the home caregiver. In addition, the hierarchical diagnosis and treatment guidelines for femoral neck fractures in China provide detailed referral criteria for orthopedic patients [22]. These criteria were formulated based on the context of China's medical system and policies. Among them, the transfer criteria from urban tertiary hospitals or urban secondary/county-level hospitals to hospitals at the same level or lower for rehabilitation included: patients who still exhibited significant dysfunction after receiving early rehabilitation treatment (i.e., early bedside rehabilitation treatment in the hospital where the operation is performed) or not, and required continued hospitalization for rehabilitation. The transfer criteria from orthopedic departments of urban tertiary hospitals or urban secondary/county-level hospitals to community-based or home-based rehabilitation were as follows: patients' postoperative condition was stable, with mild

dysfunction in the operated joint, minimal or no pain, adequate joint motion and muscle strength to meet daily living needs without requiring hospitalization for further rehabilitation.

### Research method

A purposive sampling method was used to select 21 medical staff members from the hospital, including 6 orthopedists, 5 rehabilitation therapists, and 10 nurses. The inclusion criteria of respondents were: (1) voluntary participation in the interview and signed informed consent; (2) good language expression abilities; (3) 5 years or more of specialist work experience in the treatment or care of geriatric patients with FNFs; (4) professional title is intermediate or above. Exclusion criteria were: (1) off-duty during the study period, including sick leave, maternity leave, study abroad, business trips, rural services, and so on; (2) non-hospital in-service medical staff, including interns, standardized trainees, other trainees, and so on. Two individuals were interviewed after the data were repeated, and no new topics were presented during the data analysis as the sample saturation standard. The basic principle follows the qualitative research literature mentioned above [23]. All medical staff agreed to the interview, and no individual withdrew midway. The basic information of respondents is shown in Table 1.

### Interview outline

Based on previous studies [24, 25], and after expert consultation, the following interview outline was developed: (1) According to your clinical work experience, how do you think geriatric patients with FNFs cope with postoperative rehabilitation exercises? (2) How do you guide patients to perform daily rehabilitation exercises during work? (3) What problems do you think exist for current medical staff when guiding patients to perform rehabilitation exercises? How were they solved? (4) What factors do you think will affect patient compliance with rehabilitation exercises? (5) What factors do you think affect communication and cooperation among multi-disciplinary team members? (6) What are your opinions and suggestions on rehabilitation exercises for geriatric patients with FNFs?

### Data collection methods

The interview location was selected by interviewees to ensure a relatively quiet environment without interruptions. Before the formal interview, the researcher introduced the purpose, content, and significance of the study to respondents, and committed to strictly abide by the principle of confidentiality. The 21 respondents were anonymized as A-U based on the interview order. After obtaining signed informed consent of each respondent the interviews were recorded, and the interview site was

**Table 1** Demographic characteristics of respondents ( $n=21$ )

Variable	Frequency	%
Gender		
Female	13	61.90
Male	8	38.10
Age (years; mean and range)	38.10(28–54)	
Clinical working years (years; mean and range)	11.38(5–26)	
Departments		
Orthopedics department	13	61.90
Rehabilitation department	8	38.10
Standard of culture		
Doctor	5	23.81
Master	6	28.57
Bachelor	9	42.86
Junior college	1	4.76
Professional title		
Chief physician	4	19.05
Attending doctor	2	9.52
Rehabilitation therapist	5	23.81
Supervisor nurse	4	19.05
Senior nurse	6	28.57

noted. During the interview, respondents were encouraged to fully express their opinions and ideas, using listening, confirmation, questioning, and other interview skills, and non-verbal information was also captured. Each round of face-to-face interviews lasted for 30 to 50 min until no new topics appeared in all respondent materials.

#### Data analysis methods

A descriptive phenomenological research method was used, and data collection and analysis were carried out simultaneously. The recording was transcribed within 24 h of the interview. The qualitative analysis software QSR NVivo 12 was used to encode, identify, and summarize non-numerical data (interviews, audio, etc.) [26]. The content analysis method was used to analyze, collate, and summarize data [27]. Two researchers repeatedly read the interview data, and used the same method to analyze the interview content individually after they were entirely familiar with it. Analysis included extracting meaningful statements that were closely related to the purpose of this study, encoding and classifying recurring descriptions, phenomena, and problems to form a theme, analyzing the characteristics of the topic and the relationship between topics, classifying the topic group, performing a loop analysis and classification, and finally returning the information to the interviewee to verify the identified themes and sub-themes. The demographic data of respondents were analyzed using descriptive statistical methods.

#### Quality control methods

The interviewers received systematic training in qualitative research and possessed interview skills. The entire process was supervised by an associate professor proficient in qualitative research methods. The researchers completed transcription of each interview within 24 h, and 'standardized' the text data, deleting colloquial or repetitive words, and meaningless data. After each interview, the interviewees were contacted to verify the resulting data and ensure its authenticity, integrity, and accuracy. Furthermore, the researchers assessed their potential impact on the results, and revised the interview outline to minimize these effects.

#### Results

The respondents in this study included 8 males and 13 females, aged between 28 and 54 years, with an average age of  $38.10 \pm 7.71$  years. Clinical experience ranged from 5 to 26 years, with an average of  $11.38 \pm 7.43$  years. After performing the qualitative data analysis, the interview content could be summarized into 2 themes and 6 sub-themes.

#### The implementation of rehabilitation exercises faces multiple obstacles

##### *Patient initiatives during rehabilitation exercises are insufficient*

Individual initiative is an internal driving force that affects the initiation, purpose, and persistence of patient rehabilitation exercise behaviors [28]. An area of concern for medical staff is the extent of a patient's knowledge of their disease and of rehabilitation exercises. Notably, most patients lack relevant knowledge and have limited access to education, showing insufficient understanding and management of their own diseases and rehabilitation exercises.

*Respondent C: There is an old saying in China that 'one hundred days for bone and muscle injuries,' in other words, if a fracture or muscle injury occurs, it takes at least three months to recover. Some patients can't understand how important rehabilitation exercises are, and often think that once surgery is done, rest is the best way to recover. (Sighs helplessly)*

Some studies suggest that individuals need to overcome instinctive emotional responses to adverse stimuli during social interactions, but that when losing psychological resources, emotional control failure will lead to a vicious circle [29]. Medical staff stated that some patients and their families did not have enough trust in the hospital itself, including doctors, rehabilitation therapists, and nurses. In addition, the subjective initiative of patients for rehabilitation exercises may be affected by age, cost, and adverse psychological conditions.

*Respondent D: Some patients are not particularly cooperative with rehabilitation exercises. They will doubt whether each treatment is necessary and whether the cost is reasonable, so we have to explain it in detail before treatment.*

*Respondent I: Some patients are older, and they have an unnecessary negative attitude towards rehabilitation exercises. When we help them with rehabilitation exercises, their feedback is limited, and it is difficult for us to grasp their accurate rehabilitation.*

#### The uncertainty of the comprehensiveness and continuity of rehabilitation exercises

Postoperative rehabilitation exercises in geriatric patients with FNFs involves multidisciplinary cooperation. Geriatric patients are prone to pulmonary infections after surgery due to a decline in bodily function and a poor tolerance. This may be related to anesthesia airway spasms, surgical stress, and other factors. However, routine rehabilitation focuses on the corresponding training

of the disease, and the prevention effect on pulmonary infections is not ideal, thereby affecting patient prognoses [30]. Despite this, most respondents stated that the focus on pulmonary rehabilitation was far less than on musculoskeletal rehabilitation exercises.

*Respondent G: Rehabilitation exercises are about comprehensive rehabilitation and patient initiative, which requires cooperation between teams. In addition to musculoskeletal rehabilitation exercises, pulmonary rehabilitation is also crucial. We will guide basic chest expansion exercises and breathing methods, but pulmonary rehabilitation is not our focus.*

Family and community areas are the main places for discharged patients to carry out rehabilitation exercises. However, due to limited human and medical resources, patient follow-up is inadequate, which leads to the continuous interruption of patient rehabilitation exercises. In addition, due to insufficient information of rehabilitation exercise referrals, the willingness of patients to cooperate is reduced, and the workload of medical staff is increased.

*Respondent J: Patients and their families do not fully grasp exercise angles. While we recommend that all come back after outpatient visits, only few patients will actually come.*

*Respondent M: Some patients are not locals, and are not happy to come to the hospital each time for a review. Therefore, I hope that a referral system can be developed, and that detailed follow-up records can be accessible. The patient would choose the hospital closest to their home, and that way their rehabilitation exercise would not be interrupted.*

#### **Textbook theory and clinical practice are not completely unified**

Since the Ministry of Health organized the national compilation of textbooks in the 1980s, Chinese medical textbooks have had a long history. By the end of the year 2000, a total of 112 medical textbooks had been published in the 21st century, and the vast majority of these have continued to be used after several editions. Some senior medical staff stated that they simultaneously worked in the hospital and taught in undergraduate colleges. During teaching, they would often consciously supplement content to reflect clinical practice, or refer to other textbook editions to supplement charts and enhance understanding. Medical staff also mentioned that teaching materials were not the only source of content. In addition to these, there were many other knowledge sources, such as the latest academic journals, expert consensuses, guidelines, etc.

*Respondent B: Some guidelines have several editions, but textbooks still use content from 10 years ago. The person responsible for the compilation of teaching materials should be the national leader in this field, and the update of teaching materials should be more timely.*

*Respondent G: Rehabilitation exercises must be different from person to person, as each individual is different. Blindly copying from textbooks will only hinder the development of the discipline and the rehabilitation of patients. What we need to do is judge the rehabilitation exercise that the patient can perform based on their situation, and adjust accordingly.*

*Respondent Q: Many doctors and nurses acquire knowledge by consciously learning and correcting misconceptions after attending the clinic but there are still many who do not have this awareness.*

#### **Medical staff's scientific cognition of rehabilitation exercises**

##### **The necessary professional quality of medical staff**

Professional quality is a code of conduct that human beings need to abide by in social activities, including professional ethics, professional behavior habits, professional skills, and so on. The professional quality level of medical staff directly affects clinical treatment and nursing, and reflects the quality of medical services in hospitals [31]. Therefore, researchers asked medical staff what level of professional quality they should have.

All respondents had experience treating or caring for geriatric patients with FNFs. 17 respondents stated that excellent professional skills in rehabilitation exercises were essential, and a small number mentioned that professional ethics was also indispensable.

*Respondent D: The most important thing to master is basic theoretical knowledge and rehabilitation skills, to lay the foundation for future career development.*

*Respondent N: Professional skills are important, but professional ethics cannot be ignored. In the process of rehabilitation exercises, we need to show a sense of care, to respect patients, care for patients, and protect the privacy of patients.*

##### **Personnel allocation, organization, and management requiring optimization**

The National Institute for Health and Care Excellence (NICE) in the United Kingdom (UK) issued guidelines in 2011 advising that patients should be assessed by a rehabilitation therapist the day after surgery. This includes

observing their ability to sit or get up, and to carry out activities at least once a day from then onwards [32]. However, if patients have specific clinical features, such as irritability or rejection caused by dementia or delirium, hypotension, and poor pre-fracture activity, communication difficulties between medical staff and patients will increase, and patient compliance will be greatly reduced.

*Respondent A: Facing some patients with special conditions, such as dementia, delirium, etc., is a great test of our patience and professional knowledge, but also to their family members, which will increase the difficulty of follow-up treatment and rehabilitation.*

Some medical staff mentioned that the number of professionals providing rehabilitation exercises was short and that the setting was inadequate. The assistance they can provide to patients is often limited by time and workload. This is consistent with Catherine's view [33]. However, all respondents stated that doctors, rehabilitation therapists, and nurses coordinated with each other, performed their duties, communicated smoothly, and cooperated well.

*Respondent L: As a nurse, I have too much work to do, and I can only remind them to do rehabilitation exercises in the morning and during ward visits.*

*Respondent P: Doctors, rehabilitation therapists, and nurses perform their duties with mutual cooperation. This is good, and enables us to communicate the patient's situation at any time, helping resolve patient concerns promptly.*

#### **Implementation of rehabilitation exercise requires multifaceted support**

Studies have shown that accidental falls usually lead to insecurity and fear of falls. Poor psychological conditions may have a negative impact on patients' participation in daily activities, resulting in poor long-term functional recovery [34]. It has been reported that social support can also affect functional recovery [35]. Therefore, in addition to the support provided by medical staff, family, and friends play an important role in increasing patients' confidence and encouraging them to resume their previous activities.

*Respondent P: Patients are very eager to be accompanied by family. If children or spouses are more supportive of them, their confidence will increase, as will their willingness to carry out rehabilitation exercises.*

In addition, resource support such as equipment, personnel, and funds are key factors that cannot be ignored for the seamless implementation of rehabilitation exercises. All respondents said that rehabilitation exercises after FNF surgeries in older adults were dependent on the technical support of professionals and the use of advanced equipment. Some medical staff also proposed that the implementation of rehabilitation exercises requires collaboration between hospitals and the government for the provision of support.

*Respondent H: Rehabilitation exercises must not stop, and neither can we. Of course, it is better if equipment can keep up. In fact, this requires advocates to engage with government decision makers to seek support.*

#### **Discussion**

The results of this study showed that patient initiative in performing postoperative rehabilitation exercises in geriatric patients with FNFs was insufficient. Some medical staff found that patients could easily understand early postoperative rehabilitation exercises as a direct out-of-bed activity, but were prone to fear and a decline in rehabilitation exercises. At the same time, patients' awareness of the disease affected their compliance with rehabilitation exercises, which is consistent with the results of Herbert's study [36]. Medical staff stated that rehabilitation exercises that patients need to carry out are explained in detail to patients and their families, but that this is dependent on education level and family support. According to the patient's disease awareness, medical staff can use images instead of text to develop education materials to strengthen the education of patients and their families. Its content should enable patient cooperation and the performance of early rehabilitation exercises. Before surgery, pre-rehabilitation exercises are performed based on the patient's condition and the importance of post-surgery rehabilitation exercise is explained. It is emphasized that lack of rehabilitation will weaken their ability and endurance of physical activities, and increase pain levels, in order to gradually improve the patient's cooperation and their compliance awareness.

From the conducted interviewees, it was determined that patient initiative to carry out rehabilitation exercise may also be affected by age, costs, and adverse psychological statuses. This is defined as self-perceived burden by Yeung et al [37, 38]. Self-perceived burden is the sense of guilt, pain, and responsibility caused by patients' dependence on others in terms of care and emotional support due to their own diseases and nursing needs. Studies have shown that a patient's self-perceived burden has a negative impact on their physical fitness and

mental health recovery, while also affecting interactions between patients and the family with society, as well as other cognitive and emotional activities [39]. In addition, due to age restrictions, patients' self-care ability is generally low, and they often rely on others to take care of them. It is particularly common for geriatric patients to have self-perceived burden [40]. Therefore, medical staff need to evaluate a patient's self-perceived burden, understand the confusion and concerns of patients during rehabilitation exercises, give adequate guidance, and encourage patients to express and propose solutions. Medical staff, patients, and their families should jointly participate in the formulation of rehabilitation exercise programs, in order for medical staff to obtain the trust and cooperation of patients, evaluate the timely effect of rehabilitation exercises, and adjust the program at any time if needed.

The comprehensiveness and continuity of rehabilitation exercises are an essential component to improve motor function recovery and quality of life in geriatric patients with FNFs [15]. Most geriatric patients also have comorbidities. In addition, due to changes in organ physiological structure and functional decline caused by aging, geriatric patients are prone to pulmonary infection during postoperative bed rest [41]. Studies have shown that for geriatric patients with FNFs occurring after hip replacement surgery, the first rehabilitation focus should be cough, deep breathing training [42]. A study in Taiwan carried out a pulmonary rehabilitation program for geriatric patients with HFs. This program included deep breathing training, incentive vital capacity measurements, chest physical therapy, and cough-assisted movement training. It concluded that the incidence of pneumonia in geriatric patients with HFs receiving pulmonary rehabilitation program was low [43]. Some researchers believe that abdominal breathing drives diaphragm movement, thus affecting the state of the pelvic floor muscle, increasing the ambient temperature around the hip joint, and enhancing the body's balance and exercise capacity [44]. Therefore, functional exercises, such as ankle pump training and isometric contraction of quadriceps femoris, should also be combined with respiratory adjustment training, such as deep inhalation when the toe is hooked up and exhalation when stepping down, or deep inhalation when the thigh muscle is taut and slow exhalation when it is relaxed.

This study determined that the main reasons for the continuous interruption of patients' rehabilitation exercises were the increased inconvenience of transportation for patients' follow-up, and increasing difficulties of the rehabilitation exercise referral service, which weakens the patient's willingness to return. Most rehabilitation exercises for geriatric patients with FNFs occur in the community and with family. Therefore, it is practical to

establish a multi-dimensional continuous nursing model of hospital-community-family. This model relies on the adequate and complimentary sharing of information among hospitals, communities, and families. This could greatly improve the physical performance and quality of life of patients. It is worth noting that the establishment of a feedback mechanism to ensure timely and effective communication is essential for the development of this model. In addition, a 'telehealth' system could be established to optimize patient referrals, promote the syncing of high-quality resources, and achieve interconnection between regions. The connection between platforms from primary medical institutions and general hospitals would not only benefit residents, but also facilitate diagnosis and treatment.

With the continued development of medical education, China has had many achievements. Several medical colleges and universities have made pioneering advancements in the development of study curriculum and the teaching system, accumulating experience, and forming basic curriculum and teaching patterns. However, the results of this study show that China's medical education warrants improvement at the curriculum and teaching level, and that there is lack of consensus between textbook theory and clinical practice. Chen believes that a good textbook should fully meet the requirements of textbook construction, including "three basics" (basic knowledge, basic skills, basic theory) and "five characteristics" (ideological, scientific, advanced, enlightening, and applicable). In addition, the content of textbooks must be acknowledged and current in the industry [45]. The principles of pedagogy show that the regular reform of curriculum and teaching materials is the core, the development of teachers is the key, and the modification of educational concepts is the guide [46]. Among the many links and elements of the education system, teaching materials are the basic carriers for teaching, the basic support for education, and the basic role for talent training. Therefore, the compilation of teaching materials should be re-examined by experienced clinical medical experts, including theoretical workers and front-line workers. Under the leadership of the Ministry of Education and the Health Commission, dated teaching materials should be re-examined to fully reflect the characteristics of the "three basics" and the "five characteristics". Moreover, it is necessary to broaden talent training, strengthen curriculum, professional, and educator development, improve curriculum and teaching systems, cultivate clinical senior talents, carry out scientific research, and improve clinical practice.

With the development of society and the improvement of people's living standards, the medical and health industry has put forward higher requirements for the professional quality of medical staff. This requires

medical staff to have excellent professional qualities, to continuously improve their professional ethics, and to have strong professional norms. Therefore, talent training in medical colleges and universities should aim to cultivate the professional quality of medical and nursing students and to construct a scientific and reasonable talent training method. Firstly, ideological and political education requires strengthening and establishment of a curriculum system for professional quality training. Secondly, theoretical teaching and practical teaching require further attention. Medical colleges and universities should build relevant rehabilitation training centers according to current medical scenarios. A simulated working environment and teachers' guidance may help students to become familiar with characteristics of the job early, exercise professional skills, and strengthen professional behavior and ethics. Finally, by strengthening the construction of a campus culture, the professional quality of medical care can be integrated into the school spirit, teaching style and learning style in order to create an atmosphere conducive of professional quality [47].

The "role" concept was first introduced into the field of sociology by sociologist and social psychologist Mead, with the purpose to explain the predictable interactive behavioral pattern in communication and the relationship between individuals and society [48]. When medical staff were asked if they were clear about their own role in the process of rehabilitation exercises, most stated that they were very aware of their own role and responsibilities. The main roles of doctors and rehabilitation therapists are as therapists and decision makers, while the roles of nurses are as supervisors, supporters, and instructors. The close interaction and cooperation of rehabilitation team members is a key factor affecting the successful implementation of rehabilitation exercises after FNF surgery in older adults. Inadequate cooperation between staff will reduce the efficiency of rehabilitation exercises, aggravate patient problems, and adversely affect patients and the healthcare system. Some researchers have proposed a doctor-nurse integration model, which is a model in which doctors, rehabilitation therapists, and nurses jointly carry out clinical work, scientific research, and teaching [49]. Many studies have shown that an integrated medical care model can promote better cooperation between doctors and nurses, where care and rehabilitation programs are conducted simultaneously. Patient satisfaction can this be improved, and medical staff feel valued [50–52]. At present, there are limited studies on an integrated model of medical care in China, and specific implementation and evaluation methods are different in hospitals at different levels and fields. Therefore, it is necessary to explore a more reasonable integrated model of medical care. In addition, integration challenges include effective cooperation of medical staff

in the rehabilitation exercises of geriatric patients with FNFs, and the scientific evaluation of each treatment measure.

The results of this study show that in addition to patient factors, caregiver support, social support, and multi-form resource support are promoting factors for rehabilitation exercises. Caregivers play a key role in the treatment and rehabilitation of geriatric patients with FNFs. They care for patient's physical and emotional needs, and are encumbered by the associated medical and financial burden [53]. Previous studies have shown that caregivers of geriatric patients with FNFs should be given more attention and support from healthcare professionals, such as professional training and psychological counseling, in order to help caregivers obtain positive outlooks and reduce their care burden [54]. Therefore, it is necessary for medical institutions and governments to introduce new measures and policies, such as strengthening rehabilitation skills and refining rehabilitation exercise guidance. In addition, the government should also increase emotional support, pension support, and rehabilitation equipment, contributing funds to scientific research, attracting medical enterprises widely involved in equipment research and development to increase financial investment, improving the work efficiency of medical staff, and reducing medical expenses to patients and their families.

The consensus among Chinese orthopedic rehabilitation experts [21] indicates that China's rehabilitation medical service system is not comprehensive. Most treatment rehabilitation options and aids are not covered by medical insurance, resulting in out-of-pocket expenses, and limiting access to rehabilitation services. In the UK, geriatric patients with FNFs decide whether to return home or transfer to a rehabilitation unit, residential care, or nursing care after discharge based on their individual recovery needs [55]. In Switzerland, in addition to inpatient rehabilitation, certain geriatric patients with FNFs also have the opportunity for early discharge within 24 h following outpatient total hip arthroplasty (OTHA) [56, 57]. Thus, there is no doubt that OTHA can significantly expedite patient recovery, enhance patient satisfaction, and reduce costs to the healthcare system. Establishing an OTHA center and implementing OTHA represents a significant shift towards modern hospital development models. However, despite initial implementation in some medical institutions, OTHA has not gained widespread popularity in China. Therefore, there is still a need for substantial improvements and vigorous promotion of the OTHA system to provide a more effective option for geriatric Chinese patients with FNFs [58].

In 2009, IBM proposed the concept of "Smart Earth", which integrates the Internet of Things through supercomputers and cloud computing, and fully applies the



generation of IT technologies. Since then, smart healthcare has emerged as an important support platform for patient outcomes. The ultimate goal of smart healthcare is to build a systematic, holistic, and synergistic integrated medical service system to provide efficient, continuous, and convenient medical services. It is essential to promote mutual cooperation between hospitals and service providers at different levels, break through barriers, and reduce costs, in order to seek the best combination of resources and obtain the optimal allocation of limited medical resources [59]. Currently, AI technology can be used to complete prescription image recognition, prescription verification, and so on, creating animations of prescription effects, such as the application of the Sora technology. In the future, with the incorporation of digital technology into medical treatment, we can expect medical staff to fully integrate AI technology to construct a comprehensive and personalized rehabilitation exercise program for geriatric patients with FNFs after surgery. Moreover, AI technology may assist or even replace some manpower to complete rehabilitation exercises. Hence, it is tempting to speculate that the medical technology industry has room for future development which can greatly enable efficient healthcare systems.

### Limitations

This study is subject to some limitations due to the small number of medical staff interviewed and the involvement of only one hospital in southeastern China. In future studies, the scope of interviews can be broadened, a more diverse range of subjects can be recruited from various regions and hospitals, or randomized controlled trials can be conducted to facilitate multi-center studies to further substantiate the results of this study.

### Conclusions

This study focuses on the opinions and experiences of medical staff during postoperative rehabilitation exercises in geriatric patients with FNFs. Medical staff should accurately assess the patient's symptoms, exercise capacity, and quality of life, broaden their avenues for health education, improve the degree of matched health education and patients' needs, and develop professional, comprehensive, and personalized rehabilitation exercise programs. The cooperation of hospitals, communities, and families is essential during this process, in order to improve the curriculum and teaching system, to promote the scientific development of an integrated medical and nursing model, to greatly improve the level of medical sciences and technology, to build an optimal rehabilitation exercise support system for geriatric patients with FNFs, and to accelerate the rehabilitation of patients.

### Supplementary Information

The online version contains supplementary material available at <https://doi.org/10.1186/s12877-024-05266-w>.

Supplementary Material 1

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### Author contributions

G.Y.Z. and Z.X.H. led the analysis and writing of this paper. G.Y.Z. and Z.F.F. led data collection in semi-structured interviews. Z.X.Y. and B.Y.C. led data analysis. Z.X.H. led the conceptual development of the study, with support from the wider team. All authors read and approved the final version of the manuscript.

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### Data availability

The data associated with the paper are not publicly available but are available from the corresponding author on reasonable request.

### Declarations

#### Ethics approval and consent to participate

The study was conducted in accordance with the principles of the Declaration of Helsinki. The study was also approved by the Ethical Review Board (ERB) of the Zhejiang Chinese Medical University (code: 20231117-9). All participants were fully informed about how their data and information would be used in this study, and their right to withdraw their participation at any time. All participants were provided with an information sheet and the purposes of the study were described in depth. Written Informed consent was obtained from all the participants of the study.

#### Consent for publication

Not applicable.

#### Competing interests

The authors declare no competing interests.

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### References

- Liu Y, Chen X, Zhang P, et al. Comparing total hip arthroplasty and hemiarthroplasty for the treatment of displaced femoral neck fracture in the active elderly over 75 years old: a systematic review and meta-analysis of randomized control trials. *J Orthop Surg Res.* 2020;15(1):215. <https://doi.org/10.1186/s13018-020-01725-3>.
- Cooper C, Campion G, Melton LJ. 3rd. Hip fractures in the elderly: a worldwide projection. *Osteoporos Int.* 1992;2(6):285–9. <https://doi.org/10.1007/bf01623184>.
- Zhang C, Feng J, Wang S, et al. Incidence of and trends in hip fracture among adults in urban China: a nationwide retrospective cohort study. *PLoS Med.* 2020;17(8):e1003180. <https://doi.org/10.1371/journal.pmed.1003180>.

4. Han JS, Guo Y, Shen XS, et al. Research progress of home nursing for elderly patients with hip replacement. *Chin J Convul Med.* 2023;32(3):266–8. <https://doi.org/10.13517/j.cnki.ccm.2023.03.009>.
5. Chinese Geriatrics Society Bone and Joint Association Orthopaedic Trauma Committee. Experts' consensus on diagnosis and management of geriatric hip fractures (2017). *Chin J Orthop Trauma.* 2017;19(11):921–7. <https://doi.org/10.3760/cma.jissn.1671-7600.2017.11.001>.
6. O'Connor MI, Switzer JA, AAOS Clinical Practice Guideline Summary. Management of hip fractures in older adults. *J Am Acad Orthop Surg.* 2022;30(20):e1291–6. <https://doi.org/10.5435/jaas-d-22-00125>.
7. Ramponi DR, Kaufmann J, Drahnak G. Hip fractures. *Adv Emerg Nurs J.* 2018;40(1):8–15. <https://doi.org/10.1097/tme.000000000000180>.
8. Veronese N, Maggi S. Epidemiology and social costs of hip fracture. *Injury.* 2018;49(8):1458–60. <https://doi.org/10.1016/j.injury.2018.04.015>.
9. Bhandari M, Swiontkowski M. Management of Acute Hip fracture. *N Engl J Med.* 2017;377(21):2053–62. <https://doi.org/10.1056/NEJMcp1611090>.
10. Koabian S, Alatassi R, Alharbi S, et al. The relationship between femoral neck fracture in adult and avascular necrosis and nonunion: a retrospective study. *Ann Med Surg (Lond).* 2019;39:5–9. <https://doi.org/10.1016/j.amsu.2019.01.002>.
11. Tian ZZ, Pang D, Liu HN, et al. Effect of enhanced recovery after surgery for elderly patients with hemiarthroplasty for the treatment of femoral neck fracture. *Natl Med J China.* 2020;100(37):2903–7. <https://doi.org/10.3760/cma.j.cn112137-20200308-00647>.
12. Hong WS, Zhang YX, Lin Q, et al. Risk factors analysis and the establishment of Nomogram Prediction Model of Hidden Blood loss after total hip arthroplasty for femoral Neck fracture in Elderly Women. *Clin Interv Aging.* 2022;17:707–15. <https://doi.org/10.2147/cia.5363682>.
13. Saul D, Riekenberg J, Ammon JC, et al. Hip fractures: therapy, timing, and Complication Spectrum. *Orthop Surg.* 2019;11(6):994–1002. <https://doi.org/10.1111/os.12524>.
14. Fischer K, Trombik M, Freystätter G, et al. Timeline of functional recovery after hip fracture in seniors aged 65 and older: a prospective observational analysis. *Osteoporos Int.* 2019;30(7):1371–81. <https://doi.org/10.1007/s00198-019-04944-5>.
15. Ftouh S, Morga A, Swift C. Management of hip fracture in adults: summary of NICE guidance. *BMJ.* 2011;342:d3304. <https://doi.org/10.1136/bmj.d3304>.
16. Roberts KC, Brox WT, Jevsevar DS, et al. Management of hip fractures in the elderly. *J Am Acad Orthop Surg.* 2015;23(2):131–7. <https://doi.org/10.5435/jaas-d-14-00432>.
17. Tedesco D, Gibertoni D, Rucci P, et al. Impact of rehabilitation on mortality and readmissions after surgery for hip fracture. *BMC Health Serv Res.* 2018;18(1):701. <https://doi.org/10.1186/s12913-018-3523-x>.
18. Luan X, Tian X, Zhang H, et al. Exercise as a prescription for patients with various diseases. *J Sport Health Sci.* 2019;8(5):422–41. <https://doi.org/10.1016/j.jshs.2019.04.002>.
19. Diong J, Allen N, Sherrington C. Structured exercise improves mobility after hip fracture: a meta-analysis with meta-regression. *Br J Sports Med.* 2016;50(6):346–55. <https://doi.org/10.1136/bjsports-2014-094465>.
20. Merloz P. Optimization of perioperative management of proximal femoral fracture in the elderly. *Orthop Traumatol Surg Res.* 2018. 104(1s): S25–s30. <https://doi.org/10.1016/j.otsr.2017.04.020>
21. The orthopaedic rehabilitation expert committee of Bone Disease Special Fund of China Health Promotion Foundation. Chinese Expert Consensus on Orthopedic Rehabilitation. *Natl Med J China.* 2018;98(3):164–70. <https://doi.org/10.3760/cma.jissn.0376-2491.2018.03.002>.
22. Guideline for graded. Diagnosis and treatment of femoral neck fracture in Anhui Province (2015 edition)[J]. *Anhui Med J.* 2016;37(1):5–13.
23. Saunders B, Sim J, Kingstone T, et al. Saturation in qualitative research: exploring its conceptualization and operationalization. *Qual Quant.* 2018;52(4):1893–907. <https://doi.org/10.1007/s11135-017-0574-8>.
24. Zhang WZ, Ji H, Wang N, et al. Rehabilitation experience of patients after total knee arthroplasty: a qualitative meta-synthesis. *Chin J Nurs.* 2023;58(24):3028–36.
25. Adams J, Jones GD, Sadler E, et al. Physiotherapists' perspectives of barriers and facilitators to effective community provision after hip fracture: a qualitative study in England. *Age Ageing.* 2023;52(9). <https://doi.org/10.1093/ageing/afad130>.
26. Dhakal K. *N Vivo.* *J Med Libr Assoc.* 2022;110(2):270–2. <https://doi.org/10.5195/jmla.2022.1271>.
27. Zhou YX. *Nursing Quality Research: theory and case [M].* Hangzhou: Zhejiang University; 2017. p. 1.
28. Wang XX, Jiang YY, Wang SS, et al. A qualitative study on coping strategies of pulmonary rehabilitation barriers in patients with chronic obstructive pulmonary disease. *Chin J Nurs.* 2020;55(5):696–702.
29. Baumeister RF, Bratslavsky E, Muraven M, et al. Ego depletion: is the active self a limited resource? *J Pers Soc Psychol.* 1998;74(5):1252–65. <https://doi.org/10.1037//0022-3514.74.5.1252>.
30. Jin SS, Fan WJ, He JG, et al. Effect of lung rehabilitation training on the risk and clinical efficacy of pulmonary infection in elderly patients after hip arthroplasty. *Chin J Geriatric Care.* 2021;19(6):9–12.
31. Yang F, Yan YH. The influence of the effect of management by objective theory on professional quality of medical staff and patient satisfaction rate. *Med Forum.* 2021;25(8):1140–1. <https://doi.org/10.19435/j.1672-1721.2021.08.057>.
32. Sheehan KJ, Goubar A, Martin FC, et al. Discharge after hip fracture surgery in relation to mobilisation timing by patient characteristics: linked secondary analysis of the UK National Hip Fracture Database. *BMC Geriatr.* 2021;21(1):694. <https://doi.org/10.1186/s12877-021-02624-w>.
33. Johnston CL, Maxwell LJ, Alison JA. Establishing and delivering pulmonary rehabilitation in rural and remote settings: the opinions, attitudes and concerns of health care professionals. *Aust J Rural Health.* 2016;24(2):106–14. <https://doi.org/10.1111/ajr.12202>.
34. Eckert T, Kampe K, Kohler M, et al. Correlates of fear of falling and falls efficacy in geriatric patients recovering from hip/pelvic fracture. *Clin Rehabil.* 2020;34(3):416–25. <https://doi.org/10.1177/0269215519891233>.
35. Auais M, Al-Zoubi F, Matheson A, et al. Understanding the role of social factors in recovery after hip fractures: a structured scoping review. *Health Soc Care Community.* 2019;27(6):1375–87. <https://doi.org/10.1111/hsc.12830>.
36. Herbert G, Sutton E, Burden S, et al. Healthcare professionals' views of the enhanced recovery after surgery programme: a qualitative investigation. *BMC Health Serv Res.* 2017;17(1):617. <https://doi.org/10.1186/s12913-017-2547-y>.
37. Yeung NCY, Lu Q, Mak WWS. Self-perceived burden mediates the relationship between self-stigma and quality of life among Chinese American breast cancer survivors. *Support Care Cancer.* 2019;27(9):3337–45. <https://doi.org/10.1007/s00520-018-4630-2>.
38. Ren XR, Wei YY, Su XN, et al. Correlation between self-perceived burden and self-management behavior in elderly stroke survivors: a longitudinal observational study. *Med (Baltim).* 2020;99(44):e22862. <https://doi.org/10.1097/md.00000000000022862>.
39. Park CL, Zlateva I, Blank TO. Self-identity after cancer: survivor, victim, patient, and person with cancer. *J Gen Intern Med.* 2009;24(Suppl 2):S430–5. <https://doi.org/10.1007/s11606-009-0993-x>.
40. Qu TG. The relationship between activities of daily living and life satisfaction of the disabled older adults in the community: the role of social support and self-perceived burden. 2023.
41. Zielinski SM, Keijsers NL, Praet SF, et al. Functional outcome after successful internal fixation versus salvage arthroplasty of patients with a femoral neck fracture. *J Orthop Trauma.* 2014;28(12):e273–80. <https://doi.org/10.1097/bot.000000000000123>.
42. Shi CN. Value of Accelerated Rehabilitation surgery in Perioperative nursing of Elderly patients with total hip arthroplasty. *Syst Med.* 2020;5(11):136–8. <https://doi.org/10.19368/j.cnki.2096-1782.2020.11.136>.
43. Chang SC, Lai JI, Lu MC, et al. Reduction in the incidence of pneumonia in elderly patients after hip fracture surgery: an inpatient pulmonary rehabilitation program. *Med (Baltim).* 2018;97(33):e11845. <https://doi.org/10.1097/md.00000000000011845>.
44. Jia SS. Effect of functional Exercise based on dynamic and static complementary balance theory on hip joint function in patients with total hip arthroplasty. 2021.
45. Chen XP. Some Issues deserve consideration of Current Medical Education in China. *Med Soc.* 2022;35(9):1–4. <https://doi.org/10.13723/jyxysh.2022.09.001>.
46. Gu MY. The teaching reform and the change of educational concept in colleges and universities. *J Beijing Normal University(Social Sciences).* 2000(2): 129–33.
47. Hua M. Strengthen the construction of campus culture to enhance the medical professional spirit-the practice and exploration of campus culture construction in Henan Nursing Vocational College. *Policy Res Explor.* 2017(4): 89–92. <https://doi.org/10.16324/j.cnki.jcts.2017.04.001>
48. Shi HQ. Discussion on cultivation of Medical Students' Professional Role Cognition in Medical Colleges from the perspective of Role Theory. *J Changchun Univ.* 2020;30(12):31–4.
49. Xia XY, Wang JH. Research on the application of integrated medical care model in the implementation of traditional Chinese medicine

- nursing program. *Chin Foreign Med Res.* 2016;14(21):69–70. <https://doi.org/10.14033/j.cnki.cfmr.2016.21.037>.
50. Shrivastava R, Couturier Y, Kadoch N, et al. Patients' perspectives on integrated oral healthcare in a northern Quebec Indigenous primary health care organisation: a qualitative study. *BMJ Open.* 2019;9(7):e030005. <https://doi.org/10.1136/bmjopen-2019-030005>.
  51. Ang IYH, Tan CS, Nurjono M, et al. Retrospective evaluation of health-care utilisation and mortality of two post-discharge care programmes in Singapore. *BMJ Open.* 2019;9(5):e027220. <https://doi.org/10.1136/bmjopen-2018-027220>.
  52. Wang Y, Shen Q, Wang C. Efficacy of Rapid Rehabilitation Nursing in Postoperative Care in China: a Meta-analysis. *Rehabil Nurs.* 2023;48(5):170–9. <https://doi.org/10.1097/rnj.0000000000000427>.
  53. Boylan MR, Riesgo AM, Paulino CB et al. Is Patient Satisfaction Associated with Objective Measures of Geriatric Hip Fracture Care? *Bull Hosp Jt Dis* (2013), 2018. 76(4): 252–258.
  54. Xiao P, Zhou Y. Factors associated with the burden of family caregivers of elderly patients with femoral neck fracture: a cross-sectional study. *J Orthop Surg Res.* 2020;15(1):234. <https://doi.org/10.1186/s13018-020-01749-9>.
  55. Lisk R, Yeong K, Fluck D, et al. An orthogeriatric service can reduce prolonged hospital length of stay in hospital for older adults admitted with hip fractures: a monocentric study. *Aging Clin Exp Res.* 2023;35(12):3137–46. <https://doi.org/10.1007/s40520-023-02616-3>. Epub 2023 Nov 14.
  56. Bischoff-Ferrari HA, Dawson-Hughes B, Platz A, et al. Effect of high-dosage cholecalciferol and extended physiotherapy on complications after hip fracture: a randomized controlled trial. *Arch Intern Med.* 2010;170(9):813–20. <https://doi.org/10.1001/archinternmed.2010.67>.
  57. Bordoni V, Marelli N, Previtali D, et al. Outpatient total hip arthroplasty does not increase complications and readmissions: a meta-analysis. *Hip Int.* 2022;32(3):326–33. <https://doi.org/10.1177/1120700020948797>. Epub 2020 Aug 26.
  58. National Clinical Research Center For Geriatric Disorders Xiangya Hospital, Bone And Joint Specialty Committee Of The China Ambulatory Surgery Alliance, Joint Surgery Branch Of The Chinese Orthopedic Association, Osteoarthritis Study Group Of The Chinese Association Of Orthopedic Surgeons. [Chinese expert consensus on clinical practice of daytime hip arthroplasty]. *Zhongguo Xiu Fu Chong Jian Wai Ke Za Zhi.* 2024;38(5):513–20. <https://doi.org/10.7507/1002-1892.202403115>. Chinese.
  59. Ji YA, Kim HS. Scoping review of the literature on Smart Healthcare for older adults. *Yonsei Med J.* 2022;63(Suppl):S14–21. <https://doi.org/10.3349/yjm.2022.63.S14>.

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