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Research Progress on Fall Prevention Among Elderly Hospitalized Patients Based on Perceived Fall Risk

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Abstract: With an aging population, falls have become a global public health issue. The level of perceived risk of falling among elderly inpatients directly influences adherence to preventive measures and serves as a key entry point for fall prevention interventions. This paper synthesizes relevant domestic and international research to review the definition, characteristics, and commonly used assessment tools of fall risk perception. It analyzes the characteristics and influencing factors of fall risk perception among elderly inpatients and explores fall prevention interventions for this population based on fall risk perception, thereby providing a theoretical basis for the development of fall prevention strategies for elderly inpatients.

Keywords: Falls; Perception of fall risk; Elderly inpatients; Fall prevention

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1. Introduction

The World Health Organization (WHO) reports that approximately 684,000 people worldwide die each year as a result of falls, making falls the second leading cause of accidental injury-related deaths [1]. Falls are one of the primary causes of unplanned hospitalizations among older adults and, in severe cases, can even lead to death [2]. The daily fall rate among hospitalized patients worldwide ranges from 3.6% to 12.6% [3]. In China, the incidence of falls ranges from 1.4% to 18.2%, and approximately 14.23% of elderly inpatients experience at least one fall within a year [4,5]. More than 35% of patients experience soft tissue injuries, fractures, or even death following a fall, posing a serious threat to patient health [6]. Falls not only severely endanger patient health, increase medical costs, and prolong hospital stays, but also impose an economic burden on families and society, and constitute a major safety hazard that can trigger medical disputes [2].

The 2022 “Global Guidelines on Fall Prevention and Management in Older Adults” recommend focusing on older adults’ perception of fall risk [7]. Older adults’ perception of fall risk influences behavioral changes; enhancing this perception can promote their engagement and adherence to fall prevention programs [8,9]. The higher an older adult’s self-perceived risk of falling, the more likely they are to engage in proactive fall prevention behaviors [10]. Research by Hill et al. indicates that assessing patients’ perception of fall risk and encouraging their active participation in their own fall prevention efforts can reduce the incidence of falls by approximately 50% [11]. However, many older adults are unable to accurately perceive their fall risk, leading to overconfidence or excessive caution, which increases their risk of falling [12]. Multiple studies indicate that only about one-third of patients can accurately identify their fall risk [13,14]. Therefore, the rationality of fall risk perception is a key target for fall interventions among elderly inpatients.

Currently, most fall prevention studies still rely on healthcare-provider-led risk assessments and interventions, with insufficient attention paid to patients’ subjective risk perceptions [15]. In recent years, fall risk perception has gradually emerged as a research focus. Dolan et al. and others have proposed developing preventive measures based on patient-perceived risk factors to prevent falls [16]. Currently, research on fall risk perception among elderly inpatients in China remains insufficient. Therefore, this review summarizes the concepts, assessment tools, influencing factors, and intervention strategies to provide a theoretical basis and practical reference for patient-centered fall prevention.

2. The concept and core elements of falls risk perception

2.1. The concept of falls risk perception

There is currently no universally accepted definition of fall risk perception. In 1998, Braun defined fall risk perception as the perception of evaluating falls as a health issue and determining the importance of associated risk factors [17]. In 2021, Choi et al. defined fall risk perception as an individual’s judgment of their own risk of imminent falls based on a subjective assessment of environmental risk factors and their own gait ability [18]. In 2022, Bao Guanjun et al. introduced the concept of fall risk perception in China for the first time, interpreting it as the subjective cognition of high-risk groups regarding the likelihood of a fall and its potential harm [19]. Nie Zuoting et al. pointed out that fall risk perception refers to the subjective judgment, perception, and evaluation made by older adults during daily activities regarding the likelihood of future fall events and the severity of their consequences, based on their own physiological state, cognitive function, and the environment in which they find themselves [20]. In 2024, Nan Jiang employed a conceptual analysis method to systematically define fall risk perception, defining it as: the process by which an individual first self-assesses the probability of falling and then decides whether to take the risk seriously [21].

2.2. Attributes of fall risk perception

Fall risk perception is a constantly evolving and dynamic psychological process [22]. Fall risk perception among older adults involves both recognition and management. Older adults tend to recognize their own susceptibility to falls and then take proactive measures to reduce this risk [23]. Nan J and colleagues identified four core attributes of fall risk perception among older adults [9]:

(1) Fall risk perception is dynamic, exhibiting both continuous and stage-based characteristics;

(2) Fall risk perception involves whether one takes the risk of falling seriously;

(3) Fall risk perception is a self-assessment of the probability of falling, driven by the individual's independence;
(4) Perception of fall risk involves a variety of complex emotional responses. Three antecedents of fall risk perception among older adults: demographic and health factors, psychological factors, and environmental factors. Perception of fall risk leads to four consequences among older adults: risk-taking behavior, risk-compensating behavior, risk-transferring behavior, and emotional responses.

3. Assessment tools for fall risk perception

3.1. General-purpose fall risk perception assessment scales

3.1.1. Fall risk perception questionnaire for patients (FRPQ)

This questionnaire was developed in 2021 by Korean researchers Choi et al. to assess the level of fall risk perception among nursing home residents [19]. The questionnaire comprises three dimensions with a total of 27 items: the Personal Activity Ability dimension has 8 items, the Chronic Disease Factors dimension has 6 items, and the Environmental Factors dimension has 13 items. It uses a 4-point Likert scale, with a total score ranging from 0 to 81; a higher score indicates a higher level of fall risk perception among patients. The overall Cronbach's α coefficient for the scale is 0.948. In 2022, Chinese scholars Bao Guanjun et al. conducted a cross-cultural adaptation of the FRPO scale; the resulting Chinese version, after localization, comprises 3 dimensions and a total of 26 items [24]. The overall Cronbach's α coefficient for the Chinese version of the FRPO is 0.942, indicating good reliability and validity. The total score ranges from 0 to 78, with scores of 0–37, 38–63, and 64–78 indicating low, moderate, and high levels of perception, respectively [25]. In 2024, Choi et al. revised the FRPQ by reducing the number of items to 14, creating a short-form FRPQ, which offers the advantage of being quick and easy to administer repeatedly [26].

3.1.2. Fall-related perceptions scale among inpatients (FPS)

This scale was developed in 2015 by Twibell et al. and consists of 38 items across 4 subscales and 3 single items [27]:
(1) The Confidence in Avoiding Falls subscale includes 7 items and measure participants' perceived confidence in performing fall-risk activities during hospitalization.
(2) The Hospital Fall Fear Scale consists of 7 items and measures participants' level of concern about falling while engaging in high-risk activities.
(3) The Hospital Fall Consequences Scale consists of 12 items and assesses the potential adverse consequences of a fall.
(4) The Intention to Participate in Fall Prevention Scale consists of 9 items and measures participants' intention to seek help when engaging in high-risk behaviors.
(5) hree single-item measures assess, respectively, the perceived likelihood of falling, the likelihood of injury following a fall, and fear of falling during the hospital stay. This scale has a Cronbach's α coefficient ranging from 0.84 to 0.95, indicating good reliability and validity.

3.1.3. Fall risk self-assessment questionnaire of the STEADI

This questionnaire was developed by the Veterans Affairs Greater Los Angeles Healthcare System (VA-GLAHS) in 2011 [28]. It consists of 12 items. The total score ranges from 0 to 14, with a score of ≥ 4

indicating a risk of falling. Li Yaling et al. conducted a Chinese adaptation study to develop the Chinese version of the STEADI Fall Risk Self-Assessment Questionnaire [29]. The Cronbach's α coefficients for this questionnaire in three groups of older adults—inpatient wards, outpatient clinics, and the community were 0.716, 0.674, and 0.608, respectively. This questionnaire is suitable for self-administration by older inpatients and can be completed quickly for preliminary screening.

3.1.4. I Engaging fall self-assessment tool

This scale was developed by Tzeng et al. in 2014 to assess fall risk in hospitalized elderly patients [30]. It consists of two sections: fall risk factors and fall prevention measures, comprising a total of 12 dimensions and 61 items. Guo Xiaobei et al. conducted cross-cultural adaptation and revision to develop the Chinese version of the I Engaging Fall Self-Assessment Tool [31]. The Chinese version of the scale has an overall Cronbach's α coefficient of 0.973, a test-retest reliability of 0.851, and a content validity index of 0.956. It demonstrates good reliability and validity and can be used as a self-assessment tool for fall risk in hospitalized elderly patients.

3.1.5. Falls efficacy scale-international (FES-I)

This scale was developed by Kempen et al. and primarily assesses patients' self-efficacy in preventing falls, indirectly reflecting their level of perceived risk of falling [32]. The scale comprises two dimensions, indoor and outdoor activities; and consists of 16 items. A higher score indicates greater efficacy in preventing falls and a higher perception of fall risk. The scale has a Cronbach's alpha coefficient of 0.96 and a test-retest reliability of 0.96, demonstrating good reliability and validity. Guo Qiyun et al. conducted cross-cultural adaptation and revision in 2015, resulting in the Chinese version of the FES-I [33].

3.1.6. Self-awareness of falls in the elderly scale (SAFE)

This scale was developed by Taiwanese scholars Shyu et al. in 2018 to identify high-risk individuals with low self-awareness of fall risk, thereby improving the prediction of falls among elderly inpatients [34]. It comprises four dimensions, safety and environmental awareness, physical function awareness, medication awareness, and cognitive-behavioral awareness, with a total of 21 items. A higher score indicates a higher level of awareness regarding fall risk. He Xifei and colleagues tested this scale among elderly inpatients in China, yielding a Cronbach's α coefficient of 0.923, indicating that the Fall Awareness Scale possesses good reliability and validity [35].

3.1.7. Community-dwelling older adults' fall risk perception scale

This scale was developed in 2022 by Chinese scholars Bao Guanjun et al. [36]. It comprises three dimensions: perception of biobehavioral vulnerability to falls, perception of social and environmental vulnerability to falls, and perception of fall severity, totaling 17 items. The scale's overall Cronbach's α coefficient is 0.913, indicating good reliability and validity.

3.2. Specialized fall risk perception assessment scales

3.2.1. Fall risk perception scale for cancer patients

In 2024, Luo Ruijun et al. developed the Fall Risk Perception Scale for Cancer Patients to assess the level of fall risk perception among cancer patients [37]. The scale comprises five dimensions, perceived

susceptibility to falls, perceived susceptibility related to physical condition, perceived susceptibility related to personal activities, perceived susceptibility related to environmental factors, and perceived severity of falls, and consists of 30 items in total. The total score range of the scale is 30–150 points. The Cronbach's alpha coefficient for the total scale is 0.926, and the content validity is 0.867, indicating good reliability and validity.

3.2.2. Fall risk perception scale for Parkinson's disease (FRPS-PD)

In 2024, Yang X et al. developed the FRPS-PD to assess the level of fall risk perception in patients with Parkinson's disease [38]. The scale comprises two dimensions, risk perception and self-efficacy, with a total of 16 items. The Cronbach's α coefficient for the total scale is 0.952, and the content validity is 0.956, indicating good reliability and validity. However, the empirical application of this scale in clinical settings remains relatively limited.

4. Characteristics of fall risk perception among elderly inpatients

The perception of fall risk among elderly inpatients can be categorized into three types: overestimation, underestimation, and accurate assessment [19]. Those who overestimate the risk reduce their physical activity due to excessive fear, leading to muscle atrophy and decreased muscle strength, which in turn increases the risk of falling [39,40]. Those who underestimate the risk, however, disregard the danger of falling, engage in risky behaviors, and show lower adherence to preventive measures, thereby increasing the risk of falling [20].

Perceptual bias is a major cause of the discrepancy between subjective risk perception and objective risk, primarily manifesting as underperception and overperception [41]. Yang Xin et al. found that 67.6% of elderly patients in the high-risk group for falls exhibited underperception; in the moderate-risk group, 32.8% exhibited underperception and 30.2% exhibited overperception; and in the low-risk group, 64.7% exhibited overperception [10]. Lim et al. reported a 50.7% prevalence of overestimated fall risk perception among hospitalized elderly patients in Singapore [42]. Therefore, accurately assessing the level of fall risk perception in hospitalized elderly patients can help reduce the incidence of falls among this population.

Overestimating or underestimating fall risk leads to different coping behaviors regarding fall risk [43]. Those who underestimate fall risk tend to be overconfident and often engage in risky activities that exceed their physical capabilities [44]. Older adults overestimating their abilities and engaging in inappropriate risk-taking behaviors is a common cause of falls among this population [16]. Overconfidence and a reluctance to accept aging lead to poor adherence to fall prevention measures, resulting in a situation where healthcare providers must repeatedly educate patients, yet older inpatients struggle to maintain long-term compliance [45]. Those with an overestimated perception of fall risk fear falling and become overly dependent on others; over time, this can lead to muscle atrophy and declining physical function, thereby increasing the risk of falls [43]. Therefore, shifting the focus of prevention from an expert perspective to the patient themselves and accurately assessing the level of fall risk perception is of great significance for improving the effectiveness of fall prevention.

5. Factors influencing fall risk perception among elderly inpatients

5.1. Demographic factors

Perception of fall risk is influenced by age, educational level, alcohol consumption, sleep, and a history of falls within the past three months [10]. Age and educational level are significant factors affecting the perception of fall risk [46]. Higher levels of education are associated with higher levels of perceived fall risk; however, among those aged 80 and older, there exists a "cognitive blind spot" characterized by insufficient perception, with some older adults failing to recognize the risk despite having significant functional impairments [47]. Individuals with an education level of elementary school or below underestimates the incidence of falls 3.74 times more frequently than those with a high school education or higher [25]. Individuals with Type D personality have a lower risk of falling [48]. Men tend to have fewer negative perceptions regarding the consequences of falls [49]. Patients with a history of falls are prone to developing a fear of falling again, place greater emphasis on fall prevention, and exhibit higher levels of perceived fall risk [50]. Excessive fear or even phobia of falling can lead to an overestimation of fall risk and may even develop into hypokinesia, which is detrimental to recovery [51].

5.2. Physical condition

Individuals in poorer physical condition may underestimate their own capabilities through self-adaptive mechanisms, thereby developing an overestimation of fall risk. However, some studies suggest that older adults with objectively poorer physical condition are more likely to underestimate fall risk [52,53]. Sakurai et al. found that older adults with lower step-over ability were more likely to overestimate their own functional capacity and had lower perceptions of fall risk. This may be because older adults with poorer physical condition experience a decline in health, requiring more energy and time for adaptation and adjustment, leading to an irrational perception of fall risk [52,54]. Hughes et al. found that older adults with better self-rated health had lower perceptions of fall risk [55]. This result suggests that objective physical condition must undergo individual cognitive processing and be transformed into self-rated physical condition before it can influence the perception of fall risk.

5.3. Disease factors

Most participants who acknowledged their risk of falling suffered from chronic diseases that affect mobility and balance, such as multiple sclerosis and Parkinson's disease [56]. A lower number of comorbidities is one of the factors leading to patients underestimating their risk of falling [14]. DE SOUZA et al. pointed out that comorbidity status and the use of antihypertensive and lipid-lowering medications influence patients' perception of fall risk [47]. KANTOW et al. found that older adults' fall risk perception scores were associated with hypertension [57]. A study by Li Lei et al. indicated that the fewer chronic conditions a patient had, the lower their level of fall risk perception [48].

5.4. Psychological factors

An individual's psychological state has an amplifying effect on fall risk perception; emotions can influence an individual's risk perception by depleting cognitive resources [58]. Fear is a fundamental component of risk perception; it can trigger avoidance decisions and foster pessimistic risk perceptions [59,60]. Anxiety influences fall risk perception by intensifying an individual's fear of falling [61]. Anxiety or fear related to falling can impair goal-directed attention systems, consume limited cognitive resources, and reduce cognitive processing

efficiency, thereby leading to biases in risk perception [62]. Individuals with depression exhibit impaired cognitive function, particularly slowed cognitive processing speed, suggesting that this may affect perceptual judgment by reducing available cognitive resources [63]. Thus, emotions such as fear, anxiety, and depression play a significant role in the perception of fall risk, and their mechanisms of action may be indirectly realized through the depletion of cognitive resources.

5.5. Environmental factors

Accurate assessment of physical environmental risk factors influences older adults' perception of fall risk [54]. Some older adults believe that environmental factors (such as uneven ground) are more closely related to falls than physiological factors, possibly because they tend to attribute falls to the external environment [64]. This attribution reflects the role of self-esteem in older adults' perception of fall risk [65]. With technological advancements, age-friendly devices have expanded from traditional assistive devices to smart devices, both of which may influence the perception of fall risk. While assistive devices can enhance a sense of security and compensate for functional decline, they may also evoke feelings of discrimination, leading older adults to deny their high fall risk due to a reluctance to acknowledge disability and aging [66]. The frustration and shame resulting from failed experiences with smart devices further prompt older adults to avoid using such devices [67]. Older adults who perceive their physical environment as poor experience greater anxiety about falling and are more likely to restrict their activities and reduce social connections [68]. The extent to which older adults are familiar with their home and surrounding environment may also influence how they construct their perception of risk [64].

5.6. Sociocultural factors

Older adults are often labeled by society with negative, ageist stereotypes such as frailty, slowness, and reduced mobility [69]. Ageist stereotypes may be a significant factor influencing older hospitalized patients' perception of their risk of falling. In a culture that values conformity, older adults in China are easily influenced by others' evaluations [70]. They may adopt corresponding cognitive and behavioral patterns due to their identification with these stereotypes, thereby reinforcing them and leading to an overestimation of their own risk of falling [71]. Ageist and stereotypical labels may trigger feelings of aversion in older adults, prompting them to adopt opposing cognitive and behavioral strategies to resist these stereotypes, which manifests as underestimating the risk of falling and engaging in overly risky activities [72]. For older adults, independent mobility symbolizes dignity and self-worth, whereas the loss of autonomy implies becoming a burden to the family [65]. Research has found that some older adults consider maintaining independence and avoiding embarrassment more important than preventing falls, leading to irrational risk perception [22]. Self-esteem may indirectly influence risk perception by downplaying the perceived severity of fall consequences.

6. Fall Prevention interventions for elderly inpatients based on perception of fall risk

6.1. Enhancing fall risk perception and health education

Inadequate perception of fall risk among elderly inpatients is a major factor hindering their adoption of preventive behaviors [73]. Therefore, it is particularly important to enhance elderly inpatients' awareness of their own fall risk. A study by Hao et al. indicated that personalized, practical health education is crucial for

improving risk perception and preventive behaviors among the elderly. Elderly inpatients face a higher risk of falls [74]. In fall prevention, it is essential not only to assess fall risk but also to evaluate patients' perception of their own risk, thereby enabling individualized and targeted protection [19].

To enhance elderly inpatients' ability to perceive fall risk, a multidimensional health education strategy must be developed. First, the reinforcement of risk perception should be based on the identification of patients' cognitive biases. Studies indicate that some patients who are actually at high risk exhibit "underperception of risk"; therefore, health education should focus on explaining intrinsic risk factors closely related to older adults. Regarding health education methods, single-channel verbal instruction has limited effectiveness, whereas multimodal, interactive approaches offer greater advantages. Health education delivered through text-and-image, audiovisual, personalized, and digital formats can all effectively enhance patients' perception of fall risk [10]. Hill et al. noted that video-based education is more effective than text-and-image-based education in improving patients' ability to self-assess fall risk, increasing their motivation to prevent falls, and boosting their confidence in fall prevention [75]. Personalized health education reduced the fall rate among hospitalized patients by 50%; case-based health education can improve patient adherence to fall prevention measures and enhance awareness of fall risk [11,76]. The tool for preventing accidental injuries among older adults developed by the U.S. CDC plays a positive role in enhancing older adults' perception of fall risk [77]. Health education content should cover three dimensions, environmental safety, physical function, and psychological motivation, to stimulate patients' intrinsic motivation to actively participate in prevention.

6.2. Psychological intervention

Through psychological counseling and cognitive restructuring, help patients establish an objective understanding of risk, alleviate fear, or increase their level of concern. Cognitive-behavioral intervention is an evidence-based psychological approach that modifies patients' behavior by correcting erroneous cognitions, helping them develop appropriate cognitive and behavioral patterns to promote health [78]. Pfeiffer et al. conducted cognitive-behavioral interventions with patients who had suffered hip or pelvic fractures; results showed significant improvements in fall-related self-efficacy and fall risk perception one month after intervention [79]. A study by Xue Yaping et al. demonstrated that cognitive behavioral intervention can improve patients' balance and significantly alleviate their fear of falling, thereby facilitating an objective perception of fall risk [80]. Additionally, psychological support for patients can be enhanced through family support and peer education, helping them develop a proactive preventive mindset and improve their risk perception. Combining psychological intervention with health education can effectively correct risk perception biases among elderly inpatients and increase adherence to preventive behaviors.

6.3. Exercise intervention

Exercise intervention is one of the most commonly used methods to alleviate the fear of falling among elderly inpatients. By improving physical function, enhancing positive psychological attitudes, and increasing self-efficacy regarding falls, it effectively reduces the fear of falling and promotes an objective perception of fall risk [79]. Song Bo et al. found that moderate exercises such as standing, shoulder circles, head turns, eye-closing, and toe-tapping can improve cognitive function in the elderly, help them perceive fall risks, and reduce the incidence of falls [81]. Yun et al. implemented the Otago Exercise for patients with kinesophobia following hip and knee replacement surgery, which reduced the severity of postoperative kinesophobia

and alleviated the level of perceived fall risk [82]. Haertner et al. employed exercise imagery therapy, which resulted in improved flexibility and grip strength as well as reduced fear of falling following the intervention [83]. Exercise interventions improve physical function through diverse exercise modalities, thereby alleviating the fear of falling and helping patients objectively perceive fall risk.

6.4. Developing fall management strategies for elderly inpatients by integrating fall risk and risk perception assessments

Elderly inpatients face a high risk of falls and often exhibit a bias in their perception of this risk. It is recommended that fall prevention efforts not only assess the fall risk of elderly inpatients but also evaluate their perception of their own risk, thereby enabling personalized and targeted protection [10]. Solares et al. noted that the discrepancy between objective risk and perceived risk further increases the risk of falls [84]. Delbaere et al. pointed out that fall risk assessment should encompass both objective risk assessment and perceived risk assessment [44]. To implement individualized nursing interventions, it is essential to not only rely on patients' fall risk classification but also to consider their psychological characteristics and level of perception. Measuring patients' fall risk from a psychological and cognitive perspective is crucial for enhancing the effectiveness of fall prevention.

7. Conclusion

Perception of fall risk among elderly inpatients is a core factor influencing their fall prevention behaviors and directly impacts the effectiveness of fall prevention. Accurate perception of fall risk helps elderly inpatients avoid risky behaviors and adopt healthy practices to reduce their risk of falling. Enhancing elderly inpatients' perception of fall risk can effectively increase their proactive engagement and adherence to fall prevention measures. However, existing research still faces challenges such as insufficiently targeted assessment tools, a lack of longitudinal studies, and a lack of innovation in intervention models. Future fall prevention strategies should shift from a "healthcare-provider-centered" approach to a "patient-centered" one. Fall risk perception assessment should be integrated as a key component of routine nursing evaluations. By combining subjective and objective risk assessments to identify individual perceptual biases and implementing stratified, targeted interventions, we can effectively improve fall prevention outcomes for elderly inpatients and reduce fall incidence.

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