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Summary of Evidence on Fall Prevention Measures in Inpatients

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Abstract: *Objective* To search and evaluate the evidences of fall prevention measures in inpatients, and to summarize the evidences. *Methods* to retrieve database to September 2021 in the guide and the database (database construction measures of preventing falls in hospitalized patients the summary and system evaluation guidelines, relevant evidence), using something II Chinese version, "the 2016 edition of JBI authenticity of system evaluation paper assessment tool" and "2014 edition JBI evidence classification and grade system" to evaluate quality of literature and evidence grading. *Results* A total of 15 literatures were included, including 3 guidelines and 12 systematic reviews. Among the 15 pieces of evidence, 11 pieces are at the recommendation level of A and 4 pieces are at the recommendation level of B, The recommended levels are generally high. According to the evaluation and extraction results, the best evidence summary of prevention measures in 2 parts and 5 aspects, including 12 pieces, was finally formed. The five aspects of preventive measures are drug management, environmental modification, intervention for patients and caregivers, and intervention for health care personnel. *Conclusion* Medical staff should standardize and guide patients to master fall prevention measures according to the relevant level of evidence-based medical evidence, effectively ensure the safety of patients and reduce the loss caused by falls of patients.

Keywords: Inpatients, Fall, Evidence to Summarize

1. Introduction

A fall refers to a sudden, involuntary and unintentional loss of balance and fall to the ground or floor or a lower plane [1]. In China, falling is the fourth cause of death [2]. In the United States, up to 50% of hospitalized patients have the risk of falling, and 30% to 50% of falls during hospitalization lead to death and serious physical or psychological injuries unrelated to the natural course of the disease [3]. Non-accidental falls during hospitalization remain a continuing concern of healthcare institutions worldwide, which not only prolong the length of hospital stay, but also further increase the suffering and hospitalization costs of patients [4, 5]. Preventing and reducing patients' falls during hospitalization is one of the ten safety objectives issued by the National Hospital Management Association [6]. At present, the evidence summary of fall prevention measures in China is mainly about elderly patients. This study systematically searched the best research evidence of fall prevention measures for inpatients, and provided reasonable suggestions for the fall prevention work of inpatients.

2. Methods

2.1. Establish Evidence-based Questions

According to the problem of evidence-based development tool (PI-POST) to question [7], and the evidence application target population (P) for hospitalized patients, interventions (I) for fall risk assessment, exercise, multifactor intervention, etc., evidence application (P) for hospital care personnel, ending (O) as the fall incidence, evidence application (S) for the hospital environment, Evidence type (T) includes systematic evaluation, guidelines and evidence summary.

2.2. Search Strategy

Relevant electronic databases were searched to identify empirical studies published from inception to September 2021, including the JBI, Cochrane Library, Pubmed, RNAO, NGC,

Embase, Web of Science, CINAHL, Scopus, CNKI, VIP, and Wan Fang database, The search strategy was to use medical subject headings and free terms together, including (Fall OR Falls OR falling OR fallers OR fall-injury) AND (Prevention OR prevent OR preventing OR assessment) AND (hospital OR hospitalized OR hospitalization) AND (systematic review OR meta). Additionally, reference lists of screened studies and pertinent reviews were examined to identify other relevant articles.

2.3. Inclusion and Exclusion Criteria

2.3.1. Eligibility Criteria

(i). Participants

The study subjects were hospitalized patients.

(ii). Intervention

Interventions are a series of measures to prevent falls; Evidence types include guideline Meta or systematic evaluation or evidence summary;

2.3.2. Eligibility Criteria

Community patients in long-term care facilities; Full-text literature is not available; Repeated publication or translation; Low quality literature was evaluated

2.4. Quality Evaluation Criteria of Evidence

2.4.1. Quality Evaluation Criteria of the Guide

Adopt the 2012 Updated Clinical Guidelines for Research and Evaluation (Appraisal of Guidelines for Research and Evaluation, AGREE ii) of the United Kingdom [8], which consists of 6 areas, a total of 23 items and 2 additional comprehensive Evaluation items, Each entry is rated on a scale of 1 to 7 (1 = strongly disagree, 7 = strongly agree), and each area score is the sum of all entries in that area and normalized to the percentage of the highest possible score in that area. The calculation method is as follows: Maximum possible score =7 (agree) × number of items × number of evaluators; Minimum possible score =1 (strongly disagree) × number of items × number of evaluators; Percentage of standardization for this field = (Sum of all reviewers' evaluation scores - minimum possible score)/(Maximum possible score - minimum possible score) ×100%. The two comprehensive evaluation items were graded on a scale of 1-7, with 1 point = possible lowest quality and 7 points = possible highest quality.

2.4.2. Quality Evaluation Criteria for System Evaluation

The authenticity evaluation of the system evaluation (2016) [9] was evaluated using the JBI International Collaborating Center for Evidence-based Health Care. The tool included 11 evaluation items.

2.5. Evidence Quality Evaluation Process

The guidelines included in this study were independently evaluated by three researchers according to AGREE ii standards. The systematic evaluation was completed independently by two researchers according to JBI (2016) standards. In case of differences of opinion, the third researcher was discussed and resolved. After reaching a consensus, the final decision on inclusion or exclusion was made.

3. Results

3.1. Included Literature

A total of 756 related literatures were retrieved, and a total of 15 literatures were included after screening, including 3 guidelines [10, 11] and 12 systematic evaluations [12-24]. The basic information is shown in Table 1.

Table 1. *General information of the evidence included in this study.*

Author	Origin	Year	classification of evidence	Title
— [10]	RNAO	2017	Guideline	Preventing Falls and Reducing Injury from Falls Fourth Edition
— [11]	NICE	2013	Guideline	Falls in older people: assessing risk and prevention
— [12]	RNAO	2007	Guideline	Falls Prevention:Building the Foundations for Patient Safety
Wang Y [13]	Wan Fang	2021	Systematic review	Meta-analysis of the Morse Fall Assessment Scale for predicting fall risk in hospitalized patients
Greeley [14]	Pubmed	2020	Systematic review	Sitters as a Patient Safety Strategy to Reduce Hospital Falls:A Systematic Review
Heng [15]	Pubmed	2020	Systematic review	Hospital falls prevention with patient education: a scoping review
Avanecean [16]	JBI	2017	Systematic review	Effectiveness of patient-centered interventions on falls in the acute care setting compared to usual care: a systematic review
Matarese [17]	Pubmed	2014	Systematic review	Systematic review of fall risk screening tools for older patients in acute hospitals
Aranda-Gallardo [18]	Pubmed	2013	Systematic review	Instruments for assessing the risk of falls in acute hospitalized patients: a systematic review and meta-analysis
Miake-Lye [19]	Pubmed	2013	Systematic review	Inpatient Fall Prevention Programs as a Patient Safety Strategy: A Systematic Review
DiBardino [20]	Pubmed	2012	Systematic review	Meta-analysis: Multidisciplinary Fall Prevention Strategies in the Acute Care Inpatient Population
Cheng [21]	Wan Fang	2010	Systematic review	Systematic evaluation of fall prevention measures for inpatients
Stern [22]	JBI	2009	Systematic review	Interventions to reduce the incidence of falls in older adult patients in acute care hospitals: a systematic review
Coussement [23]	Pubmed	2008	Systematic review	Interventions for Preventing Falls in Acute- and Chronic-Care Hospitals: A Systematic Review and Meta-Analysis
Oliver [24]	Pubmed	2000	Systematic review	Do Hospital Fall Prevention Programs Work? A Systematic-Review.

3.2. System Evaluation Method Quality Evaluation Results

The results of systematic evaluation literature quality are shown in Table 2.

Table 2. *Methodological quality evaluation included in this study.*

Assessment items	Wang [13]	Greeley [14]	Heng [15]	Avanecean [16]	Matarese [17]	Aranda-Gallardo [18]	Miake-Lye [19]	DiBardino [20]	Cheng [21]	Stern [22]	Coussement [23]	Oliver [24]
1. Are the evidence-based questions presented clear and unambiguous?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
2. Whether inclusion criteria are appropriate for this evidence-based issue?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
3. Is the retrieval strategy appropriate	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
4. The adequacy of databases or resources for retrieving literature?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
5. Whether the literature quality evaluation criteria adopted are appropriate?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
6. Whether 2 or more evaluators independently complete the literature quality evaluation?	Y	Y	Y	N	Y	NC	Y	Y	Y	Y	Y	NC
7. Whether certain measures are taken to reduce errors when extracting data?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	NC	Y
8. Whether the method of combining studies is appropriate?	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y
9. Whether publication bias is assessed as a possibility?	N	NC	Y	Y	Y	N	NC	N	Y	N	N	Y
10. Whether policy or practice recommendations are based on systematic evaluation results?	N	Y	Y	Y	Y	N	Y	Y	Y	Y	N	Y
11. Whether the proposed direction for further research is appropriate?	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

Note:Y:Yes; N:No; NC: Not Clear

3.3. Guide Quality Evaluation Results

The quality evaluation results of the guidelines are shown in Table 3.

3.4. Evidence Summary Description

Evidence summary description results are shown in Table 4.

Table 3. *Percentage of standardization in each area included in the guidelines for this study.*

Guideline	Percentage of standardization by field (%)							
	Scope and Purpose	participant	rigor	clarity	applicability	independence	comprehensive evaluation (score)	recommend to use (score)
RNAO	100	90	79	92	62	92	89	90
NICE	89	67	60	78	58	75	83	89
RNAO	89	66	56	89	64	58	77	83

Table 4. *Best evidence for fall prevention measures in hospitalized patients.*

Dimensionality	Classification	Describe the evidence	Source	Type	Class	Recommendation level
assessment	Selection of scale	1. A meta-analysis was conducted to compare the Morse, STRATIFY, and Hendrich II fall risk Models. The Morse scale was used to assess falls in older patients over 65 years of age, and STRATIFY was more accurate, making it the best tool for assessing falls in hospitalized adults with acute disease	Pubmed	Systematic review	3a	A

Dimensionality	Classification	Describe the evidence	Source	Type	Class	Recommendation level
Intervention	pharmaceutical administration	2. The Morse Fall Assessment Scale as a separate indicator was moderately effective in predicting the risk of falls in hospitalized patients	Wan Fang	Systematic review	2a	B
		3. When the patient's health condition permits, gradually reduce or discontinue medication associated with fall risk in consultation with your pharmacist.	RNAO	Guideline	1a	A
		4. A combination of vitamin D and calcium is recommended for people at high risk of falls, such as elderly hospitalized patients	Pubmed	Systematic review	2a	B
	environmental renovation	5. Ensure that the environment is clean and tidy, stairs, corridors installed handrails; In the bedroom to the bathroom and other common aisle add induction lamp; Choose the bed with appropriate height, set the desk lamp that reaches easily to touch in bedside.	RNAO	Guideline	1a	A
		6. Environmental equipment upgrade; Reminder sign; Non-slip shoes; Eliminate the threshold and ground height difference; Additional height suitable and with a handrail shoe stool; Replace the slippery ground with non-slip material; Additional handrails near shower areas and toilets.	Pubmed	Systematic review	1a	A
	Patients and caregivers	7. Training hospital staff on fall prevention and health education for high-risk patients and their families can reduce the fall rate of inpatients.	RNAO	Guideline	1a	A
		8. Risk assessment, patient strength training, medication guidance, patient education	NICE	Guideline	1b	A
		9. Patient-centered interventions are more effective in reducing falls than conventional care	JBI	Systematic review	2a	A
		10. Collective risk assessment; Multifactor intervention was more effective than other interventions during follow-up. To educate patients; Medication guidance; Patients wear glasses and hearing AIDS	Pubmed	Systematic review	1a	A
		11. Aggressive interventions targeting patients' most important fall risk factors can help reduce the number of falls	Pubmed	Systematic review	2c	B
		12. Assess fall risk in high-risk populations	RNAO	Guideline	1a	A
		13. Adults assessed for risk of falling should wear hip protectors	RNAO	Guideline	1a	A
		14. Aggressive interventions targeting patients' most important fall risk factors can help reduce the number of falls.	Pubmed	Systematic review	2c	B
	Health care staff	15. Training on fall prevention knowledge for hospital staff.	RNAO	Guideline	1a	A

4. Discussion

In this study, 15 best evidences were summarized, and 15 literatures were selected and included, 5 of which were published or updated in the last 5 years, showing strong timeliness. Among the 15 pieces of evidence, 11 pieces are at the recommendation level of A and 4 pieces are at the recommendation level of B.

Evidence 1-2 describes the selection of assessment and screening scales for people at high risk of falling. Research shows that [25], the west China Fall Assessment Scale developed by West China Hospital has a better identification of falls in elderly inpatients than STRATIFY Scale. Although researchers have developed multiple scales for fall assessment, there is no recognized best assessment tool for different populations, cultural backgrounds and disease types. Limitations or incorrect use of fall risk assessment tools can lead to inappropriate identification of patients at risk of falling and delay or failure to implement fall prevention interventions.

Article 3-4 evidence is elaborated from the perspective of drug management. For the improvement of drugs, the current measures are mainly to reduce the use of drugs that increase the risk of falling and to supplement appropriate drugs to improve body function. For patients at high risk of falling, nurses can strengthen management according to their medication situation and reduce the fall caused by drug factors. Currently, there is a lack of communication with doctors about drug use.

Articles 5-6 evidence is summarized mainly in terms of the hospital environment. Studies have shown [26] that inpatients fall more frequently in hospital, and most falls are related to the ward environment. In addition, Hignett et al. [27] showed that the layout of the ward environment and supporting auxiliary facilities of inpatients were important factors for the occurrence of falls. Therefore, the transformation of ward environment is an important intervention to prevent falls.

Articles 7-14 the evidence is summarized mainly from the intervention of patients and caregivers. Intervention for patients and caregivers includes medication guidance, ward environment introduction, patient strength training, use of fall protectors, follow-up, etc. Strengthening the fall prevention knowledge training for hospital staff and health education for high-risk patients and their families can reduce the fall rate of inpatients. Intervention needs to consider the actual situation such as time, intervention participants, individual differences of patients, and targeted intervention according to the most important risk factors of patients can effectively reduce the occurrence of falls.

Article 15 the evidence summarizes mainly from interventions that should be directed at health care providers.

The included guidelines emphasize that health education should be targeted and that nurses and other health professionals need to be trained in fall prevention to facilitate the transfer of theoretical knowledge into clinical judgment and effectively improve clinical assessment and intervention capabilities. Studies show that [28] the missed reporting rate of falls of inpatients is 43.87%, and the related systems (management, supervision, communication) and training system are not perfect, the incident reporting system is not perfect, and the practicing environment needs to be improved. The training for falls is mainly for nurses and its scope should be expanded.

5. Conclusion

This study summarized the fall assessment and prevention of hospitalized patients with best evidence, draw lessons from the high-quality literature, respectively from the selection of questionnaire, drug management, environment renovation, intervention for patients and caregivers, five aspects of interference from the medical and health care workers to clarify fall prevention measures, provide relevant evidence-based basis for medical staff. Medical staff have taken many intervention measures in the prevention of patients' falls, but there are also the following limitations: The main assessment scale for inpatients' falls is Morse Scale, which is not classified according to patients' diseases and ages; The evaluation of patients with high risk of falling is mainly aimed at elderly patients and patients with underlying diseases. There is a lack of evaluation of drugs used by patients and guidance for the use of high-risk drugs to prevent falls. The clinical judgment and intervention ability of medical and health care personnel to fall needs to be strengthened. The main contents of intervention measures are oral health education, lack of practical muscle training and follow-up intervention. In the future, the risk of falling in inpatients can be further evaluated in detail according to disease types, and relevant systems and practice environment can be improved.

Due to different medical conditions, customs and other factors, should be considered in the application of evidence, in line with the actual conditions of the hospital, the hospital patients to ensure that each piece of evidence of suitability, practicability, maneuverability and validity, the best evidence is applied in clinical practice, to guide the medical personnel and hospitalized patients to solve clinical problems.

Conflict of Interest

All the authors do not have any possible conflicts of interest.

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