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Review Article

Falls in Patients of Medical Institutions in South Korea: A Literature Review

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Background: Like many other countries, falls and related injuries in older adults are great concerns in South Korea. In particular, falls are common in medical institutions, often causing the increase of the length of hospitalization.

Objects: The purpose of this review was to help understand and address falls in hospitalized individuals in South Korea.

Methods: The review was conducted on literature published in Korean from 2010 to 2022, searched in the Korea Citation Index and PubMed. Keywords used for the search were as follows: falls, fall risk, fall risk assessment, hospital, inpatient, intervention, Korea, and prevention.

Results: A total of 54 articles were found and reviewed. The most common place of fall accidents was the inpatient room, where there were many cases of falls while walking. Loss of balance was the most common cause of falls, and many falls occurred in patients admitted to the internal medicine. Furthermore, a risk of falling increased with the type of medications taken. In terms of tools to assess patients' fall risk, the Morse Fall Scale (MFS) was commonly used. Patient-specific fall prevention activities were common to address falls, and they decreased the frequency of falls and the fear of falling. Factors influencing the effectiveness of the fall prevention activities included attitudes toward falls, education, environmental factors, patient safety culture, and self-efficacy in preventing falls.

Conclusion: Our results should help understand and address falls and injuries in medical institutions.

INTRODUCTION

Like many other countries, falls in older adults are a big problem in health and society in South Korea [1]. In particular, falls in medical institutions are common. According to the Korea Patient Safety Reporting & Learning System (KOPS), among 13,146 safety accidents reported in hospitals in 2021, falls accounted for 6,199 (47.2%) cases, which is 50% greater than poisonings. Furthermore, approximately 80% of the falls occurred in individuals aged over 60 years [2].

Moreover, falls are one of the most frequent accidents in patients in medical institutions and are used as an indicator to evaluate the quality of medical services concerning patient safety [3,4]. In addition, fall accidents in hospitalized patients cause physical injuries (i.e., fractures, brain injuries, and other musculoskeletal problems), leading to pain, loss of independence, or even death [5,6]. Approximately 10% of falls in hospitalized patients cause serious injuries [7], and 20% require medical treatments, which doubles in elderly patients [8]. Furthermore, falls in medical institutions not only threatens the safety of patients, but also causes an increase in medical expenses and imposes a considerable burden on medical institutions due to medical lawsuits [9].

The purpose of this review was to provide an overview of institutional approach to address falls and injuries in hospitalized individuals in medical institutions in South Korea from four different perspectives: 1) fall incidence and risk factors, 2) fall risk assessment, 3) fall prevention interventions, and 4) factors influencing the effectiveness of interventions provided by healthcare professionals, with a hope to help understand and address the issue.

MATERIALS AND METHODS

The literature published in Korean between 2010 and 2022 was searched through the Korea Citation Index and PubMed. Searching keywords included falls, fall risk, fall risk assessment, hospital, inpatient, intervention, Korea, and prevention. A total of 54 articles were found for review, and categorized into: 1) fall incidence and risk factors, 2) fall risk assessment, 3) fall prevention interventions, and 4) factors influencing the effectiveness of interventions (Table 1).

RESULTS

1. Fall Incidence and Risk Factors

In general, 38%–66% of falls occurred in impatient rooms [10-18]. Whereas, 57% of falls in patients with dementia in nursing hospitals occurred in lobbies and corridors [19]. 36%–55% of activities during falls accounted for ambulation [11,16,18,19]. Causes of falls included loss of balance, tripping, and dizziness, and the loss of balance was the most common cause [11,14,18,19]. The medical department in which falling accidents were commonly reported was the internal medicine [10,11,13,20], and most patients were in a clear state of consciousness [11,16-18]. 25%–56% of patients experienced injuries due to a fall [10-12,16,17,19-21], and 1%–12% experienced fractures (i.e., hip fractures) [10,11,16,19-21]. Finally, 60% of patients wore slippers at the time of a fall [11].

Risk factors of falls included age, medical departments that patients were admitted, urination disorder, unstable gait, gender, history of falling, orientation, fear of falling, and use of assistive devices [10-14,16-29]. The fall risk also depended on medications, and the fall risk increased by 5-, 6- and 7-folds with use of diuretics, antihistamines, and zolpidem, respectively [19,22].

2. Fall Risk Assessment

A total of nine tools were used to assess patients' fall risk in medical institutions. Commonly used tools included the Morse Fall Scale (MFS), Johns Hopkins Hospital Fall Risk Assessment Tool (JHFRAT), Hendrich II Fall Risk Model (HFRM II), Bobath Memorial Hospital Fall Risk Assessment Scale (BMFRA), and St. Thomas's Risk Assessment Tool in Falling Elderly Inpatients (STRATIFY) [30-38]. The sensitivity, specificity, positive predictive value, negative predictive value, area under the receiver operating characteristics curve, and Youden index, determined with study-specific cutoff scores, are shown in Table 2.

3. Fall Prevention Interventions

Most institutions administered fall prevention programs [39-44]. The number of falls and fear of falling decreased with the fall prevention interventions [40,43,44]. In particular, rhythmic walking exercises improved cognition as well as balance [41,44]. Lower extremity muscle strength also improved when resistance exercises were implemented along with fall prevention programs [42,44]. Furthermore, when patients were educated on the fall prevention with help of a tablet PC or printed materials, the effectiveness increased significantly [45].

4. Factors Influencing the Effectiveness of Interventions Provided by Healthcare Professionals

Nurses, nursing assistants, and physical therapists were involved in the fall prevention interventions [46-63]. Factors in-

Table 1. Articles reviewed in this study

Category	Number	Article
Fall incidence and fall risk factor	20	Ahn and Kim [13]; Cho and Lee [24]; Cho and Lee [11]; Cho et al. [14]; Choi et al. [10]; Hong et al. [25]; Hwang and Jung [26]; Jang and Lee [12]; Jeong et al. [23]; Kang and Song [20]; Kim et al. [21]; Kim and Lee [16]; Kim and Lee [27]; Lee and Yoon [18]; Lee and Kim [28]; Lee [22]; Lee and Gu [15]; Lee et al. [29]; Lim and Gu [19], Kim and Choi-Kwon [17]
Fall risk assessment tool	9	Baek et al. [32]; Cho et al. [35]; Choi et al. [36]; Kang and Song [33]; Kim et al. [30]; Kim et al [31]; Kim et al. [38]; Lee et al. [37]; Yoo et al. [34]
Fall prevention intervention	7	Chae and Yang [39]; Ju and Jeon [41]; Kim and Jung [40]; Kim et al. [45]; Lee et al. [42]; Lim and Gu [44]; Park et al. [43]
Factor influencing the effectiveness of interventions	18	Chang et al. [58]; Cho and Jang [60]; Jang and Kim [49]; Jeong and Park [52]; Jin and Ha [53]; Jung and Jung [50]; Jung et al. [48]; Jung [64]; Jung and Kim [63]; Kim [59]; Kim and Seo [54]; Lee and Choi [47]; Lim and Gu [55]; Park and Son [56]; Park and Han [46]; Park [61]; Park and Yun [62]; Yoo [51]
Total	54	

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Table 2. Sensitivity, specificity, PPV, NPV, AUC value and Youden index according to cutoff point of various fall risk assessment tools by each study

Study	Tool	Cutoff (score)	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)	AUC	Youden index
Kim et al. [30]	MFS	50	78.9	55.8	30.8	91.4	0.761	
	JHFRAT	12	69.0	60.0	30.1	88.6	0.708	
	BMFRA	11	76.1	58.3	31.8	90.9	0.715	
Kim et al. [31]	MFS	40	78.1	82.2			0.837	
	HFRM II	3	81.3	61.5			0.745	
	STRATIFY	2	84.4	73.5			0.828	
Baek et al. [32]	MFS	51	72.0	91.0	63.0	94.0	0.770	0.630
Kang and Song [33]	MFS	45	86.7	60.8	68.9	82.0	0.806	
	JHFRAT	11	62.5	63.3	63.0	62.8	0.656	
	BMFRA	10	75.0	58.3	64.3	70.0	0.695	
Yoo et al. [34]	MFS	40	78.1	82.2	12.4	99.1	0.802	0.603
	Fall risk score	6	84.4	86.0	16.4	99.4	0.852	0.704
	HFRM II	3	81.3	61.5	6.4	99.0	0.714	0.428
	STRATIFY	2	84.4	73.5	9.3	99.3	0.790	0.579
Cho et al. [35]	MFS	45	59.3	65.0	36.1	82.7	0.641	0.240
	JHFRAT	13	29.1	89.7	48.5	79.2	0.708	0.190
	HFRM II	5	57.3	78.0	46.5	84.6	0.742	0.350
Choi et al. [36]	MFS	50	61.8	76.8	13.3	97.5	0.728	
	JHFRAT	9	82.4	55.3	9.2	98.3	0.698	
	FAS-K	4	85.3	49.4	8.5	98.4	0.757	
Lee et al. [37]	MFS	32.5	78.8	37.9			0.613	0.167
	TUG	18.58 (second)	77.8	54.8			0.687	0.326
	Age	55 (years)	67.6	50.0			0.627	0.184
Kim et al. [38]	MFS	50	85.7	58.8	3.0	100.0	0.719	
	JHFRAT	14	67.8	80.2	7.0	99.9	0.728	

PPV, positive predictive value; NPV, negative predictive value; AUC, area under receiver operating characteristics curve; MFS, Morse Fall Scale; JHFRAT, Johns Hopkins Hospital Fall Risk Assessment Tool; BMFRA, Bobath Memorial Hospital Fall Risk Assessment Scale; HFRM II, Hendrich II Fall Risk Model; STRATIFY, St. Thomas's Risk Assessment Tool in Falling Elderly Inpatients; FAS-K, Fall Assessment Scale-Korean version; TUG, Timed Up and Go test.

fluencing the effectiveness of the fall prevention interventions included the level of understanding (i.e., 'how serious consequences are' and 'how important prevention is'), education on fall prevention interventions, environmental factors, patient safety culture, and fall prevention self-efficacy. Environmental factors included human resources, such as the number of patients per a program administrator, wages, working hours, and the physical environment (i.e., non-slip mats on the floor) for fall prevention.

DISCUSSION

The literature published in Korean suggests that characteristics of falls in hospitalized individuals in South Korea are summarized as follows. Most falls occur in inpatient rooms, and a most common cause of falls is the loss of balance while walking. Patients with a relatively short hospitalization period fall quite often [16], and many falls occur when they are going to a bathroom early in the morning or at night. Furthermore, aged individuals taking diuretics increase risk of falls.

Nine fall risk assessment tools (i.e., MFS, JHFRAT) have been used in medical institutions in South Korea. These tools are important in inpatient care as they provide baseline information on individuals at high risk of a fall. However, its sensitivity varies a lot from 30% to 87%. While our review suggests to use the MFS due to the highest sensitivity, its sensitivity also varies a lot from 59% to 87% depending on how they are administered. Therefore, it is necessary to develop a robust tool with high sensitivity for fall risk assessment to be used in medical institutions.

Interventions to prevent a fall in medical institutions in South Korea included patient-specific fall prevention activities (i.e., ask the patient to wear non-slip shoes that fit well), exercises (i.e., rhythmic walking), and strength and balance training. While they also followed up and reported the effectiveness of the interventions by monitoring the frequency of falls, more research seemed to be needed for hospitalized patients to confirm the effectiveness.

Education and attitude were considered factors that influenced the effectiveness of fall prevention activities. Patients and healthcare providers' attitudes toward fall prevention were highly correlated with the presence of education and the quan-

tity (i.e., time) of education. Since 49%–93% of fall prevention practitioners witnessed patients' falls [46-48,51,55,62,63], fall prevention education for practitioners is important. In addition, it was confirmed that fall prevention education influenced attitudes toward fall prevention in nursing students [64]. Therefore, fall prevention education is necessary not only for practitioners, but also for future practitioners. Furthermore, according to a study of caregivers, only 34% of them were educated on fall prevention [57]. Therefore, it is necessary to provide fall prevention education to all caregivers in medical institutions. In addition, lack of human resources, patient safety culture related to falls, and caring patients without considering individuals' fall risks are factors affecting the effectiveness of the fall prevention activities.

CONCLUSIONS

The purpose of this review was to provide an overview of institutional approach to address falls and injuries in hospitalized individuals in medical institutions in South Korea, from four different perspectives: 1) fall incidence and risk factors, 2) fall risk assessment, 3) fall prevention interventions, and 4) factors influencing the effectiveness of interventions provided by healthcare professionals. The most common place of fall accidents was the inpatient room, where there were many cases of falls while walking. Loss of balance was the most common cause of falls, and many falls occurred in patients admitted to the internal medicine. Furthermore, a risk of falling increased with the type of medications taken. In terms of tools to assess patients' fall risk, the MFS was commonly used. Patient-specific fall prevention activities were common to address falls, and they decreased the frequency of falls and the fear of falling. Factors influencing the effectiveness of the fall prevention activities included attitudes toward falls, education, environmental factors, patient safety culture, and self-efficacy in preventing falls. Our results should help understand and address falls and injuries in medical institutions.

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CONFLICTS OF INTEREST

No potential conflicts of interest relevant to this article are reported.

AUTHOR CONTRIBUTION

Conceptualization: JC. Data curation: JC. Formal analysis: JC. Funding acquisition: JC, WJC. Investigation: JC. Methodology: JC. Project administration: JC. Resources: JC. Software: JC. Supervision: JC, WJC. Validation: JC. Visualization: JC. Writing - original draft: JC. Writing - review & editing: JC, WJC.

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