Effects of Nurse-Led Fall Prevention Programs for Older Adults: A Systematic Review

Eunice Oladepe Ojo, Ladda Thiamwong*

Abstract: Falls among older adults are preventable events and fall prevention programs led by nursing staff are promising and viable programs for preventing falls. This systematic review aimed to gain insight into the effects of nurse-led fall prevention programs for older adults. The Preferred Reporting Items for Systemic Reviews and Meta-Analysis was used as a guideline in reporting this literature search conducted through CINAHL, MEDLINE, Eric, Science Direct, and Google Scholar databases. The Johns Hopkins Nursing Evidence-Based Practice was used to determine the level of evidence and quality rating of the articles, while data extraction was done by a matrix review method.

The review included six randomized controlled trials, two non-randomized controlled trials, and three quasi-experimental designs. Six studies directed their education component of the intervention on the nursing staff, while three focused on the older participants. Nurses' roles were patient assessment, patient education, administration of exercise programs, and follow-up post interventions. Fall rates and fall incidents were reduced in five studies, while three studies changed patients' behavior. Fall prevention programs with education components specific for older adults and nursing staff resulted in positive outcomes. Nursing staff make a significant contribution to improving patients' outcomes, and a fall prevention program that focuses on reducing injurious fall rates and enhancing participants' behavior could maximize its effects.

Pacific Rim Int J Nurs Res 2022; 26(3) 417-431

Keywords: Education, Fall Injury, Fall Prevention, Fall Rates, Nurse-led, Older Adults, Literature Review.

Received 20 December 2021; Revised 13 February 2022; Accepted 3 March 2022

Correspondence to: Eunice Oladepe Ojo, *DNP, RN, CV-BC, PCCN, DNP Graduate (Nurse Executive), College of Nursing, University of Central Florida, Orlando, FL, 32826, USA. E-mail: Oladepe2000@yahoo.com*
Ladda Thiamwong, *PhD, RN, Associate Professor, Department of Nursing Systems, College of Nursing University of Central Florida Orlando, FL, 32826, USA. E-mail: Ladda.Thiamwong@ucf.edu*

Introduction

Patient falls are a nursing-sensitive indicator that affects patient outcomes of care and are determined by the nursing quality and quantity of care.[1] Fall prevention is essential, especially for older adults, because they have a higher risk for falls with possible chronic complications. It is necessary to plan, implement, and evaluate various interventions directed towards nursing-sensitive indicators.[2] Several fall prevention interventions have been used in acute care, long-term care, or community settings to promote patient safety. Patient falls are a serious event that has a major impact

on patients and the healthcare system.[3] About 20% of older adults' incidents of falls results in serious complications such as head injuries and hip fractures that require hospitalization. Patient falls place a huge financial burden on the healthcare system; Medicare and Medicaid Services in the United States paid 75% of $50 billion for medical cost for falls in 2015.[3] The World Health Organization (WHO) identifies falls as the second leading cause of accidental or unintentional death in the world with up to 646,000 deaths every year.[4]

Falls are a serious challenge for older adults due to increased fall risks with aging and the possibility of falls with injuries. Patient falls are a public health problem that negatively impacts the quality of life,[5] and limits activities due to fear of repeated falls.[6] One of the risks for fall in older adults has been identified as a patient's cognitive status.[5] A study showed that participants who reported falls were more likely to report low memory, chronic health condition, and low functioning health status.[5] In another study, older adults with lumbar spinal stenosis have a high risk for fall due to their short strides. Others may have neurological symptoms such as motor dysfunction and lower extremity limitation, which put them at risk for falls.[7] Other important risk factors for falls in older adults are gender and lower body strength, with women having a higher risk for falls compared to men.[8] The use of certain medications increases the risks for fall, for example antiplatelet drugs are associated with a lesser risk for falls, while the use of betablockers increases the fall rate.[9] It is interesting that older adults who have had previous fall experience identified balance-related problems, insufficient vitamin D, and vision problems as their risks for falling.[10]

About 3 million older adults are treated in the emergency department for fall-related injury per year.[3] Since older adults present with many risks for fall and barriers to fall prevention programs, the nurses caring for patients need to perform a correct assessment to determine patients' level of risk for fall and develop a plan of care that meet their needs.[11] There is a need to determine the type of fall prevention strategies that are more applicable to specific older adults, their attributes, and those led by nurses.[12] Limited systematic reviews on nurse-led fall prevention programs and a previous systematic review included studies that were not all led by nursing staff.[13]

Nurses play important roles in implementing fall prevention programs. These include patient assessment,[11] communication with nursing assistants,[14] nursing documentation,[15] including patients in the plan of care,[16,14] and meeting the patients' needs such as bathroom supervision.[17] Nurses are critical stakeholders for fall prevention programs. They form the largest group of healthcare personnel whose contributions are critical in integrating fall prevention policy and achievement of outcomes.[18] Nurses are a part of a fall prevention interdisciplinary team of healthcare workers such as physical therapists, pharmacists, occupational therapists, patients, and their family members who collaborate to achieve fall prevention goals.[19]

Many of the past systematic reviews on fall prevention were focused on fall prevention education,[20] or reviewing fall prevention guidelines with strategies for preventing falls,[21] but did not include mode of delivery or involvement of nursing staff. Only 33.3% (n = 2) of the studies reviewed[13] involved nurses in the delivery of their educational intervention, 66.6% (n = 4) involved non-nursing staff. Therefore, there is a need for a systematic review of studies that specify fall prevention programs led by nursing staff and their specific roles.

Aim

This systematic review aimed to gain insight into the effects of nurse-led fall prevention programs and identify gaps in knowledge relevant to nurse-led fall interventions for older adults.

Methods

Design

The Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA), consisting of a 27-item checklist and a four-phase flow diagram, was used to report this systematic review. This review focused on the nurse-led fall prevention interventions, especially those with an education component and nursing roles. It provides insight into the availability and effects of nurse-led fall prevention programs. We operationally defined nurse-led as a nurse-driven program where nursing staff implemented the components of a fall prevention program, including identification and documentation of patients at risk for falls and application of the program components.[22]

Data Sources and Search Strategy

A literature search was conducted through the electronic databases of CINAHL, MEDLINE, ERIC, Science Direct, and Google Scholar. We searched for research articles over a 10-year timespan (2010-2020). The keywords related to patients' falls used in the search included fall prevention program, nurse-led, nurse-managed, nurse-delivered, nurse-based, older adults, elderly, geriatrics, aging, seniors, older people aged 65 years and above. One study focused on participants aged 60 years and above,[23] and was included in the selection since the study took place in Thailand, where an older adult is defined as an adult of 60 years and older.

Inclusion Criteria: This review examined research studies relevant to older adults ≥65 years old living in the community or any facility. The study types were any quantitative study on nurse-led fall interventions. They identified nurses as main or part of a fall prevention program provider using research methodologies including, but not limited to, randomized control trial (RCT), non-RCT, and quasi-experimental design.

Exclusion Criteria: Articles published in non-English languages, non-peer-reviewed, and qualitative articles were excluded from the study. We also excluded fall interventions led by other healthcare professionals. Conference proceedings, abstracts, dissertations, book chapters, editorials, and opinion pieces were excluded from this review.

Study Selection: The PRISMA diagram[24] in Figure 1 shows the number of articles screened and selected for eligibility. The selected articles were uploaded into EndNote bibliographic software, and duplicate studies were removed. Two reviewers worked independently to screen titles and abstracts and map the selected articles using the review's inclusion criteria. The articles that matched the eligibility criteria were retrieved in full text and were reviewed by two reviewers to avoid the risk of bias. The two reviewers resolved disagreement by further reviewing the full-text articles and the inclusion and exclusion criteria, which led to the addition of one more article, resulting in eleven articles selected for the review. For proper selection, a table of literature demographics (**Table 1**) and nurse-led interventions (**Table 2**) was developed for clarity of content and eligibility purpose.

Assessment of Methodological Quality: The Johns Hopkins Nursing Evidence-Based Practice[25] was used to determine the articles' level of evidence and quality rating, as shown in **Table 2**. It identifies five levels of evidence starting with experimental study as level I, quasi-experimental study as level II down to level V which is the author's opinion. Its three levels of quality rating are high, good, and low quality or with major flaws. Studies were rated high quality if they had a sufficient sample size, showed consistent results that are generalizable, and produced specific and clear conclusions. A good quality rating was assigned to studies with sufficient size, with some control, and reasonably consisting of results and recommendations. Studies were rated low if they presented inconsistent results or less sufficient samples with no definite conclusion. Two reviewers reviewed the selected articles and assessed their methodological quality. There was no disagreement between the reviewers on the quality of the articles.

Data Extraction: Data were extracted into two tables using the review matrix method that included

reading and analyzing literature to provide a concise report.[26] **Table 1** (demographic table) shows the authors, year, country, setting, and a sample of the studies included in the literature review. In terms of settings, 18% (n = 2) of the studies were conducted in a long-term care facility, 18% (n = 2) in a patient's home, 18% (n = 2) in a hospital, and 45% (n = 5) in the community setting. This is consistent with Montero-Odasso et al.[21] where a review included studies from all settings. However, many studies have focused only on community-dwelling older adults.[13,12,27] **Table 2** shows the aim, design, level of evidence, intervention, the education component of the intervention, nurses' role, usual care, outcome measures, treatment duration, results, follow-up, and quality ratings of the articles.

Results

Search Results

The literature search identified 197 articles that two reviewers screened. These articles resulted in 164 after the duplicates were removed. The 164 articles were screened by title and abstracts, out of which 63 were excluded, as shown in **Figure 1**. A total of 101 articles were assessed for eligibility, and 91 of them were excluded due to no intervention in eight articles, non-peer-reviewed in 19 articles, lack of a nurse-led intervention in 17 articles, no direct outcomes on patients in 16 articles, language other than English in four articles, and non-experimental design in four articles.

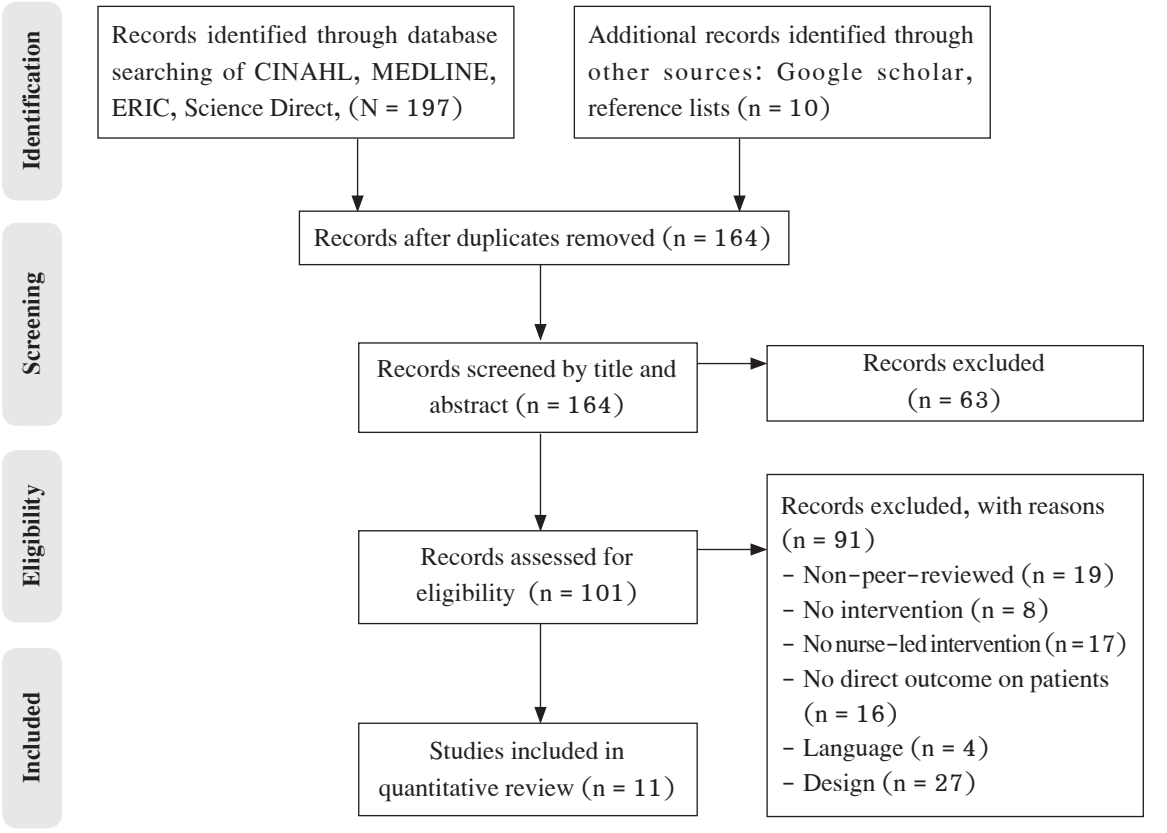


Figure 1: PRISMA Diagram

Study Characteristics

Table 1 shows the demographics of the reviewed articles, and 11 articles published from 2010 to 2020 were included in the review. Six of the articles used randomized controlled trials (RCT).[10,28,29,30,23,31] Three studies used a quasi-experimental design,[32,33,34] and two studies used non-RCT[35,9] The studies took place at different locations; three studies from the United States,[32,35,10] and two from Spain.[33,9] One study was conducted in Brazil,[30] one in Australia,[31] one in Portugal,[29] one in Netherland,[28] one from Thailand,[23] and one from Turkey.[34]

The review further showed that two studies were conducted in a hospital setting.[35,33] Two were conducted in a long-term care facility.[34,31] Five of the studies were conducted in community settings,[10,32,28,29,9] and two studies were conducted in patients' homes.[30,23] Five of the studies included in the review involved a control group (CG) which in most cases was similar in size to the intervention group (IG), but their usual care was not specified.[10,28,29,23,31] Four studies involved provision of educational brochure or pamphlet for residents for reinforcing the fall prevention topics of the intervention[10,32,28,23] Three studies employed the use of video or DVD to facilitate residents' learning and performance of fall prevention activities.[28,23,34]

Methodological Quality Assessment

Fifty-five percent (n = 6) of the studies met the criteria for level I of evidence while 45% (n = 5) met the criteria for level II. Sixty-three percent of the selected articles (n = 7) were rated as high quality due to their use of adequate control and sufficient sample size, which produced generalizable results and support for consistent recommendations that inferred definite and specific conclusions.[10,28,35,30,29,23,31] Four studies were rated good quality, even though they have sufficient samples but only presented some controls, fairly consistent recommendations and fairly definitive conclusions.[32,33.9,34]

Subgroup Analyses by Setting of the Study Location

We conducted subgroup analyses by the setting of the study location. Studies in hospitals that involved peer training on fall including "Tailoring Interventions for Patient Safety" (TIPS) (3 hospitals, 1 study, 37,231 patients) and fall risks assessment education for nurses[35] (1 hospital, 1 study, 581 patients) resulted in reduced falls.[33] The studies in long-term-care showed that evidence-based intervention including promotion of fall risk assessment of mobility and fall prevention exercise by a nurse (88 facilities, 5391 residents, 1 study), resulting in a similar rate of femoral neck fracture of IG and CG.[31] Fall prevention videos and poster boards with promotion of measures that support independence including fall risk assessment with Morse Fall Scale (1 facility, 46, residents, 1 study) reduced fall rates.[34] The studies at patient homes that involved modification of environment and fall risk behavior (patients' homes, 1 study, 118 residents) resulted in reduced fall incidence,[30] while exercise training and repeated performances (patients' homes, 1 study, 104 residents) was found effective for older adults and reduced their fear of falling.[23]

Results of studies conducted in the community settings involved using a sensory system of balance and posture with Fullerton Advanced Balance (FAB) scale (community, 52 residents, 1 study) improved balance and reduced fall risks,[29] while balance proprioception activities improvement (community, 572 participants, 1 study) resulted in the decreased mean number of falls.[9] Assessment of fall risks and subsequent development of care plan by nurses (86 primary care practices, 5451 participants, 1 study) resulted in reduced first reported injury in the IG,[10] while fall prevention safety education and fall risk assessment with MAHC-10 (community clinic, 30 participants, 1 study) resulted in reduced falls risks scores.[32] Meanwhile, cognitive behavioral modification, including promotion of exercise through realistic goals and expectations (community, 389 residents, 1 study), resulted in reduced concern for fall.[28]

Table 1 Demographics

Authors, Year Country	Setting	Sample
Ward et al. (2010) New South Wales	Aged care facilities	Older adults (n = 5391), median age 85 years IG (n = 88), 46 facilities, CG: 42 facilities
Thiamwong and Suwanno (2013) Nakhon Thailand	Patients' homes	Older adults (n = 104) aged 60 years and above with balance impairment and with no cognitive impairment who had independent mobility
Gouveia et al. (2014) Portugal	University laboratory in the community	Older adults aged 65 to 85, (n = 52) community dwellers with balance impairments. Intervention group (n = 27), Control group (n = 25)
Dorresteijn et al. (2016) Netherland	Community	Older adults aged 70 years and above (n = 389) who had reported at least one concern about falls and associated activities. Intervention group (n = 194) Control group (n = 195)
Perez-Ros et al. (2016) Valencia Spain	Community	Older adults aged 76.1 plus or minus 3.9 years, including 63.3% women
Uymaz and Nahcivan (2016) Istanbul Turkey	Nursing home	Nursing home residents with no cognitive impairment (n = 46). Mean age of 77 plus/minus 7.48
Bashin et al. (2020) New Haven Connecticut	Primary care settings in the community	Community resident older adults 70 years and older with fall risk mean age = 80 years in 86 primary care practices: IG = 43 practices CG = 43 practices
Chidume (2020) Alabama	Mobile community clinic	Community dwellers older adults 65 years and older who visited IPE mobile clinic (n = 30)
Dykes et al. (2020) Boston, Massachusetts, and New York	Hospital	Patients from 14 adult medical units from three academic medical centers. Pre-intervention (n = 17948), post-intervention (n = 19283)
Guerra et al. (2020) Brazil	Patients' homes	Older adults with arterial hypertension (n = 118) aged 65 to 75 years; IG = 62, CG = 62
Montejano-Lozoya et al. (2020) Comunitat Valencinia, Spain	Hospital	581 patients, intervention group, n=301; control group, (n = 278)

Non-Education Fall Prevention Interventions

Table 2 shows the interventions led by nursing staff in different settings with face-to-face instructions and support for older patients. There were various types of interventions with specific areas of focus. Two studies focused on balance and functional improvement and involved performance of exercise sessions that lasted an average of about 30 minutes, including a minimum

of 20 multiple or repeated sessions.[29, 23] The two studies showed that a balance-related intervention effectively improved balance,[23,29] with no conflicting results.

Two studies included exercise in their intervention but lacked specific duration or sessions of the exercise,[28,31] while one study was a duration of 20 minutes but lacked session information.[9] Eight studies included specific duration and outcomes of their follow-up post-intervention which varied from the shortest duration of one month to the longest duration of 44 months across the studies.[10,32,28,35,29,30,9,23] All the eight studies had follow-up through observation or assessment except[28] those that used telephone interviews. Meanwhile, three studies did not provide specific duration or outcomes of follow-up.[33,34,31] Only one study, Ward et al.[31] involved calcium and vitamin D supplements in its intervention.

Nurses' Roles in the Fall Prevention Interventions

Nurses performed several roles in the fall prevention interventions, including assessing patients for balance function, administering exercise programs, and observing patients' physical performances.[29,23] In addition, nurses performed the assessment of residents' risks for falls,[10,32,33] and developed patients' individualized plans of care on different areas of their needs.[10,35,23,34] The MAHC-10 assessment tool was used to identify patients at risk for fall. Those with scores of 0-4 indicated no risk, while a score of four or higher indicated a high risk for fall.[32] The Turkish version of the Morse Fall Scale was used to assess the study participants' risk for fall.[34]

Nurses provided fall prevention education that focused on identifying fall risks, medication safety, or performance of an exercise.[32,30,34] Nurses conducted and reinforced physical exercise programs.[30,9] Following the intervention, nurses conducted face-to-face or telephone interviews and collected data on the study outcomes.[10,32,28,35,29,30,9,23]

Educational Components of Fall Prevention Interventions

These are shown in **Table 2.** One study used education for nursing staff that focused on the performance of patients' assessment as its major intervention.[33] In contrast, six studies included an education component, training, or workshop for nurses that focused on the performance of the intervention such as patient assessment, exercise training, and behavior modification for patients.[10,35,28,29,23,31] Three studies directed their education component of the intervention at the participating patients with a focus on identifying fall risks and prevention.[32,30,34] Only two studies included family members in the training of the residents.[30,28] However, conflicting results were noted in the two studies that used education as their primary intervention. Montejano-Lozoya et al.[33] showed that educational activity for nurses resulted in a lower probability of falling in the intervention group (0.3%, n = 303) compared to the control group (2.2%, n = 278). In contrast, the educational intervention for patients in Uymaz and Nahcivan[34] did not affect the number of falls or concern for falling.

Patients' Outcomes

Fall Risks and Fear of Falling

Two studies identified fear or concern for fall as a risk for fall, which reduced significantly at the end of the intervention.[28,23] Fall risk assessment scores with standard instruments; FAB scale, Morse Fall Scale, and the Missouri Alliance for Home Care 10 (MAHC-10) question survey reduced after the intervention.[32,29,34] Meanwhile, the percentage of patients without fear of falling increased in the intervention group compared to the control group after the intervention.[34]

Fall Rate and Complications

Fall incidence, fall rates, and the rate of post-falls-related complications reduced to 45% (n = 5) of the intervention group in the studies.[30,33,9,10,31]

Change in Behavior

Three studies involved some change in patients' behavior after the intervention as evident by their reduced fear of falling,[23] concern for falling[28] and improved protective fall behavior[34] while knowledge of the effect of medication increased in one study.[34]

Appendix

Table 2 Review of Literature for Nurse-Led Fall Prevention Programs

Aim	Design	Level of Evidence	Intervention	Education Component of the Intervention	Nurses' Role	Usual Care	Outcome Measures	Treatment Duration	Results	Follow-up	Quality Rating
"To test the effectiveness of using a full-time project nurse to assist residential aged care facilities in using evidence-based approaches to falls injury prevention"	Clustered RCT	I	Promotion of: Assessment of fall risk assessment of mobility Use of calcium and vitamin D supplements bowel and bladder control Fall prevention exercises Footwear management Review of patients' medications Review of fall events	Training and planning and implementing exercise programming.	1. Promotion and provision of resources that aligns with 2005 fall prevention guideline. 2. Encouraging strategies that promote fall prevention Organized a 3-month networking meeting to facilitate the implementation of the program.	CG received education on data collection procedure and submission of monthly data	1. Post fall complication shown as neck of femur fracture 2. change in the use of vitamin D 3. change in the use of hip protector	17 months	1. No significant increase in the use of vitamin D (mean slope of 2.0 supplement per 100 beds per month) in both the IG and CG (P<0.001). 2. No difference in the slope of CG in the use of vitamin D in either pre or intervention period, (P=0.161 and P=0.092) 3. No difference in the use of hip protectors in both IG and CG. First stage; 0.25 per 100 beds. 2nd stage; 0.29 per 100 beds (P<0.001). 4. The rate of femoral neck fracture was similar in both IG and CG, (P=0.8) IG (n=709) CG (n=106)	No follow-up	High quality due to sufficient sample size and specific conclusions that align with important and consistent recommendations.
"This cohort study described the effects of participation in a 3-month simple home-based balancing training program on measures of balance performances and fear of falling in Thai older adults"	RCT	I	Home-based exercise training and its performance, repeated for 20 times until mastered. Individualized plan of exercise. Strengthening hip abductor and extensor exercise. Marching exercise. Stepping over a surface. Standing up with a folded arm. Performing tandem walk. Performing closed kinetic chain quadriceps exercise.	One week exercise training for two nurses who facilitated the exercise program	Implementation of the exercise program. Setting of individualized exercise program.	Not specified	1. Balance function evaluated by a. Timed up & go test b. Functional reach test 2. Fear of fall using Thai Version of Falls Efficacy Scale International (Thai FES-1)	12 weeks	There was significant difference in the functional reach test and time-up-go test scores of IG when compared to baseline (0.001). No significant difference in the functional reach test scores of CG compared to baseline scores (P=0.05). Fear of falling indicated by Thai FES-1 scores decreased significantly in the IG (P<0.001) but no significant difference in the CG.	One year	High quality: Findings generalizable to older adults and consistent with literature. Specific and applicable conclusions. Sufficient sample size with same sample size in IG and CG (n=52).
"This study aims to assess the effect of a nurse-led rehabilitation program (the ProBalance Programme) on balance and fall risk of community-dwelling older people from Madeira Island, Portugal."	Single-blind RCT	I	Six components of fall prevention program. 1. Using sensory systems of balance and posture 2. Controlling center of gravity 3. Gait improvement 4. Improving body posture 5. Improving body movement 6. Enduring exercise	Focused on 1. Fall risks 2. Impacts of falls 3. Compliance with fall prevention program. Session's frequency: 2 Session duration: 45 minutes	1. Delivery of sessions of intervention 2. Moderation of exercise durations	Not specified	Resident's balance with Fullerton Advanced Balanced scale (FAB) scores	90 minutes per session Two sessions per week 24 total sessions Duration total = 2160 minutes = 36 hours	12 weeks, There was a change in the mean (SD) of the FAB scores of 5.15 (2.81) in the IG (P<0.0001) compared to -1.45 (2.80) in the CG (P=0.032).	12 weeks, There was a change in the mean (SD) of the FAB scores of-1.88 (1.84) in the IG (P<0.0001) compared to 0.75 (2.99) in the CG (P=0.276)	High quality: 1. Comparable sizes of IG and CC 2. A sample size of 46 was used, ANOVA revealed 48 needed to achieve a CI 95% Power 3. Definitive conclusion: Improved balance.

Table 2 Review of Literature for Nurse-Led Fall Prevention Programs (Cont.)

Aim	Design	Level of Evidence	Intervention	Education Component of the Intervention	Nurses' Role	Usual Care	Outcome Measures	Treatment Duration	Results	Follow-up	Quality Rating
"The aim of this study was to assess the effectiveness of a home-based cognitive- behavioral program on concerns about falls, in frail, older people living in the community"	RCT	I	1. Cognitive-behavioral modification 2. Correcting misconception about falls 3. Promoting exercise through realistic goals and expectations	1. Training on the content of the intervention 2. Technique for behaviors modification	Home visits and telephone calls to address 1. Residents' concerns 2. Activity promotion 3. Building self-confidence 4. prevailing over hindrances 5. Safe practices	Not specified	Resident's concern for falling	Two of 60 minutes sessions One home visit of 75 minutes Four telephone contacts of 35 minutes each.	Residents' concern for fall reduced at 5 months (adjusted mean difference= -3.53, P<0.001)	At 12 weeks Reduced concerns for fall (adjusted mean difference= -3.92,P<0.001)	High quality: Conclusive and generalizable results. The sample size was adequate since 112 participants was needed to produce 80% with (P=0.05)
"The primary aim was to assess whether a proprioceptive exercise programme reduces the incidence of falls. A secondary aim was to assess the association between drugs and falls"	Non-RCT	II	Improving balance and proprioception through physical exercise. Discussion on fall prevention and its benefits. Engagement in a 20-minute exercise session at home.	Training on the content of the exercise program at the initial time and every month.	Implementation of the exercise program. Facilitator and supervisor of exercise program. Conducted the exercise training.	Not specified	Incidence of fall. Quality of life. Number of drugs prescribed	5 months	Mean number of falls decreased from 2 plus/ minus 1.5 falls to 1.5 plus/ minus 0.8 falls. Quality of life increased from 75.1 at baseline to 79.3 after intervention (P=0.001). Polypharmacy was an independent predictor of fall.	One year Incidence of fall decreased from 37% at baseline to 25.5% after intervention.	Good quality: Sufficient sample size, reasonable and consistent results
"The purpose of this research was to examine the effect of a nurse-led fall prevention education program in a sample of nursing home residents in Turkey."	Quasi-Experimental	II	Fall prevention education through video and poster board. Promotion of measures that support independence. Individualized medication safety education. Vision screening and treatment referral.	Education on fall prevention and related injuries. Education on measures that promote independency. Individualized medication education.	Provision of fall prevention education. Promotion of fall prevention measures. Provision of medication education. Facilitators of fall prevention poster.	Not specified	Fall rate, Fear of falling, Knowledge of medications	6 months	Fall rate reduced to 25.6% compared to 46.5% before the intervention (P=0.028). Fear of falling: The percentage of residents not afraid for falling increased from 27.9% to 34.9% after the intervention. Knowledge of the effect of medication (P=0.159). increased from 2.10 plus/ minus 1.10 to 2.26 plus/ minus 1.01	No follow-up	Good quality: Good sample size but low internal validity due to lack of control group. Specific conclusion but less generalizable because the sample did not represent all adult population.
"We conducted a pragmatic, cluster-randomized trial to evaluate the effectiveness of a multifactorial intervention that included risk assessment and individualized plans, administered by specially trained nurses, to prevent fall injuries"	Quasi-Experimental	II	Performing fall risks assessment. Making recommendations. Using standardized protocol. Developing individualized plan of care. Implementing the developed plan of care. Conducting the follow-up care for re-assessment of fall risk and revision of care plan.	Education on the five components of the intervention and residents' interview. Modalities: 26 online module and face to face instructions.	Implementation of the intervention: Assessment of fall risks, development of plan of care, Follow-up interview via phone or face to face.	Education resource brochure on fall prevention from CDC	Primary: First adjudicated serious injury. Secondary: First participant reported fall injury	40 months	No significant difference between the first adjudicated serious fall injury in the intervention and control group. IG: 4.9 events per 100-person yrs of follow-up. CG: 5.3 events per 100-person yrs of follow-up, hazard ratio = 0.92. The rate of the first participant reported injury was higher in CG: 28.6 events per 100-person yrs of follow-up compared to 25.6 events per 100 person yrs of f/u in the IG.	Every four months for 44 months	High quality: Sufficient sample size determined by power analysis, with consistent and generalizable results to similar populations of older adults. Meaningful and specific conclusions.

Table 2 Review of Literature for Nurse-Led Fall Prevention Programs (Cont.)

Aim	Design	Level of Evidence	Intervention	Education Component of the Intervention	Nurses' Role	Usual Care	Outcome Measures	Treatment Duration	Results	Follow-up	Quality Rating
"The purpose of this project was to implement a FPT to adults aged 65 and older that attended mobile IPE community clinics"	Quasi-Experimental	II	Implementation of fall prevention assessment using MAHC-10. Fall prevention safety education assessment "stay independent." Exercises for residents	Review of "check for safety guideline" to improve knowledge and improve safety.	Data collection. Performance of assessment of fall risks. Provided fall prevention education.	Not specified	Fall risk assessment scores. Fall prevention education (FPE) scores.	6 weeks	MACH-10 mean scores of participants decreased from 4.87 (SD=1.978) to 4.83 (SD=1.821). Stay independent mean scores decreased from 5.67 (SD=3.977) to 5.53 (SD=4.158).	One month re-assessment of fall risk using MAHC-10 and stay independent scores.	Good quality: Small sample size that could affect the generalizability of the project. Fair conclusion and recommendations for further studies.
"To assess whether a fall-prevention tool kit that engages patients and families in the fall prevention process throughout hospitalization is associated with reduced falls and injurious falls"	Non RCT	I	Tailoring Intervention for Patient Safety (TIPS) poster that links patient risk to evidence-based intervention. Generation of individualized poster from electronic health record and its display at patient's bedside.	Competency training by peer-champions	Implementation of fall prevention tool kit. Conduction of training for peers. Compliance monitoring related to the use of fall TIPS poster. Presentation of evidence of TIPS to leadership.	Not specified	Patient falls per 1000 patient days. Patient falls with injury per 1000 patient days.	Two months	Fall rate decreased from 2.92 falls per 1000 patient days to 2.49 falls per 1000 patient days. Fall rate injury decreased from 0.73 per 1000 patient days to 0.48 per 1000 patient days.	21 weeks	High quality: large sample size. Clear and specific sample size about fall prevention tool kit. Generalizable results to similar populations.
"To evaluate the effectiveness of the nursing intervention, Fall Prevention in reducing falls in older adults with arterial hypertension"	RCT	I	Implementation of fall prevention protocol that focused on 28 nursing activities. Modification of environment and behavior risks for fall.	Educating patients and families about the performance of fall prevention nursing activities.	Implementation of the intervention. Visitation to patients' homes. Teaching patients and their families about the performance of fall prevention activities. Reinforcement of fall prevention nursing activities.	Not specified	Fall incidence at three months after implementation.	Three months	There was a significance difference in the fall incidence in the IG=6.9% and in the CG=20%, (P=0.038).	Three months for reinforcement of nursing activities.	High quality: Sufficient sample size with a safety factor and similar IG and CG. conclusion that is generalizable to similar older adult population.
"Our objective was to assess the effect of educational intervention aimed at hospital nurses (systematic assessment of the risk of falls) in reducing the incidence of falls"	Quasi-experimental	II	Educational activities for nurses. Focused on assessment of patient risks. Educational workshop	Education on performance of fall risk assessment.	Assessment of patient risks for fall.	Not specified	Fall incidence	8 months	The IG had 0.3% fall incidence compared to CG with a 2.2% fall.	Follow-up duration not specified.	Good quality: sufficient sample size. Specific conclusion about fall risk assessment. Consistent recommendation to improve patient safety.

Discussion

Several studies have shown that fall prevention programs improve outcomes for older adults. The purpose of this systematic review was to evaluate the effectiveness of nurse-led fall prevention programs for older adults. Eleven experimental studies that met the inclusion criteria were included in the systematic review. Most of the studies were conducted outside acute care settings such as community or long-term care, where many older adults reside. Considering the education components of the nurse-led interventions in these studies, it was appropriate for the interventions to lead substantial outcomes. Only two studies provided the duration of the sessions of the education component: Thiamwong and Suwanno[23] provided one week of education for the nurses, and Gouveia et al.[29] provided two sessions of education for participants lasting 45 minutes per session. Many of the studies did not specify the care for the CG; except[31] which provided education on data submission and procedure and[10] which provided education resources from the CDC. It is necessary to mention that the study with education as the main intervention for the nursing staff resulted in the IG having 0.3% fall incidents compared to CG with 2.2%.[33] This was consistent with the result of the systematic review[13] where education for older adults improved their knowledge of fall prevention, although only 33% (n = 2) of the studies' interventions were led by nursing staff. The usual care for the CG was necessary for an accurate comparison of the level of intervention for both IG and CG.

The nursing staff who led the fall prevention programs were critical to its success considering their role in assessing patients, developing plans of care, including patient education, and ensuring proper care delivery. More than 50% of the studies included fall risk assessments that nurses performed before providing the interventions. The nurses' assessment of patients' risk is an important step that provides a baseline of patients' risks for falls and tailored interventions to meet their needs. This aligns with the findings from a systematic review[21] which showed that 100% of the guidelines included assessment tools.

Patients' fall risks assessment with a standardized tool is essential for improving patient quality of care through clinical decision making, individualized plan of care, matching patient risks with their needs, and improving communication among care providers.[19] For example, MAHC-10 is a standardized tool developed for home health agencies to aid their compliance with the CMS guideline. A score of less than four indicates a low risk for fall, while a score of four or higher indicates a high risk for fall.[32] The MAHC-10 mean score used in the study by Chidume[32] provided a clear understanding of patient assessment when the result showed a reduction in the mean scores from 4.87 (SD=1.978) to 4.83 (SD=1.821). Considering the Fullerton Advanced Balance (FAB) scale used for balance assessment in the study,[29] its score indicates fall risk where a score of 25 implies a high risk for fall. This information was beneficial to identify patients at increased risk for falls in addition to patients' balance. Meanwhile, assessment of balance with a standard instrument resulted in significant improvement in the functional reach test[23] and the FAB scores.[29]

An individualized plan of care for patients developed by their nurses resulted in a decreased fall rate from 2.92 falls per 1000 patient days to 2.49 falls per 1000 days.[35] A similar intervention, including an individualized plan of care, showed that the rate of participant-reported injury was higher in the CG with 28.6 events per 100 persons-year follow-ups compared to 25 events per 100 persons-year follow-ups.[10] These results showed that including an individualized plan of care in the fall prevention intervention effectively reduced fall rates.

Three studies resulted in a change in behavior, even though each study applied a different approach, including balance assessment, cognitive behavior modification, and fall prevention education video and poster board. Each of these interventions resulted in a

positive change. The knowledge of patients not being afraid of falling increased from 27.9% to 34. 9%.[34] This was consistent with the study[28] where concerns for fall (adjusted mean difference) = 3.92 ($p < 0.001$) and in another study[23] where fear of falling decreased as measured by the Falls Efficacy Scale International. Patients' fear of falling could impact their fall prevention effort; hence, it is vital to identify effective interventions that reduce their fear of falling.

All the studies reviewed included multiple strategies in their fall prevention program that resulted in improved outcomes except for the study that involved promoting a vitamin D supplement and using a hip protector that produced no significant difference. The review results showed that exercise, balance training, and education intervention were effective for fall prevention for this population irrespective of the study setting. These findings from the reviews indicate nursing research with appropriate sample size, provision of a grant to encourage participants and a more extended follow-up period to determine impacts on patients. They are applicable and generalizable to healthcare facilities, including acute, long-term care, and community settings since the studies were conducted in different settings where each of these facilities was represented.

Implications for Nursing Practice

The results of the nurse-led fall prevention programs revealed promising and effective interventions for fall prevention for older adults. Intervention modalities with education components were effective strategies to address fall prevention. Standardized assessment tools improve communication among care providers, aiding nursing compliance with fall prevention programs. Fall prevention programs that evaluate fall rates, patients' balance, and fall injuries could be an effective intervention for improving patients' outcomes. More than 60% of the studies included some education for the nursing staff or patients, resulting in positive outcomes. Healthcare facilities may include education in their fall prevention programs while nurse leaders consider including education for fall prevention in their budget.

Limitations

Each of the studies has a minimum of one major limitation. These included generalizability limitations related to participants having a higher level of education than the general population,[10] a small sample size ($n = 30$) coupled with a short period of one month of follow-up,[32] financial limitations and a drop rate in the IG doubled that of CG.[35] The studies included in the literature review used different fall prevention program modalities that made the study outcomes very challenging synthesis. Some relevant articles may have been missed regarding literature search by limiting the search to only five databases. Articles published in languages other than English were excluded from the review, which might have eliminated some crucial studies that met all other criteria except language. Eleven studies were selected from eight different countries. This review may have missed some nurse-led fall prevention programs outside the eleven studies selected for review from other counties of the world.

Conclusion

The literature review and synthesis showed that fall prevention programs with an education component might be effective for older adults. The results indicated that nursing staff tended to improve nursing care and their patients' outcomes. A combination of the outcomes of this review: fall rates, fall injury, and behavior change could maximize the effects of fall prevention program outcomes.

Acknowledgments

This paper received funding from the National Institutes of Health/National Institute on Aging (NIH/NIA R03AG06799). There was no other funding from any other organization or entity, and the authors have no affiliation or interest in any organization or individuals with any financial interest or link with the

materials presented in this paper. Also, this paper was a part of the degree of Doctorate in Nursing Practice in the College of Nursing at the University of Central Florida.

References

1. Montalvo I. The National Database of Nursing Quality Indicators (NDNQI). Online J Issues Nurs. 2007; 12(3):(3). doi: 10.3912/OJIN.Vol12No03Man02.
2. Heslop L, Lu S. Nursing-sensitive indicators: a concept analysis. J Adv Nurs. 2014;70(11):2469-82. https://doi.org/10.1111/jan.12503
3. Centers for Disease Control and Prevention. Older adults and fall data. Available from: https://www.cdc.gov/falls/facts.html
4. World Health Organization. Falls. [cited 2021 Apr 26]. Available from: https://www.who.int/news-room/fact-sheets/detail/falls. Accessed January 15th 2022
5. Trujillo AJ, Hyder AA, Steinhardt LC. Cognitive functioning and the probability of falls among seniors in Havana, Cuba. Int J Aging Hum Dev. 2011;73(2):175-94. doi: 10.2190/AG.73.2.d.
6. Van Loon IN, Joosten H, Iyasere O, Johansson L, Hamaker ME, Brown EA. The prevalence and impact of falls in elderly dialysis patients: frail elderly patient outcomes on dialysis (FEPOD) study. Arch Gerontol Geriatr. 2019; 83:285-91. https://doi.org/10.1016/j.archger.2019.05.015
7. Fujita N, Sakurai A, Miyamoto A, et al. Stride length of elderly patients with lumbar spinal stenosis: multi-center study using the Two-Step test. J Orthop Sci. 2019;24(5): 787-92. https://doi.org/10.1016/j.jos.2019.01.006
8. Carrasco C, Tomas-Carus P, Bravo J, Pereira C, Mendes F. Understanding fall risk factors in community-dwelling older adults: a cross-sectional study. Int J Older People Nurs. 2020;15(1):e12294. doi: 10.1111/opn.12294.
9. Perez-Ros P, Martinez-Arnau FM, Malafarina V, Tarazona-Santabalbina FJ. A one-year proprioceptive exercise programme reduces the incidence of falls in community-dwelling elderly people: a before-after non-randomised intervention study. Maturitas. 2016;94:155-60.
10. Bhasin S, Gill TM, Reuben DB, et al. A randomized trial of a multifactorial strategy to prevent serious fall injuries. N Engl J Med. 2020;383(2):129-40. https://doi.org/10.1056/NEJMoa2002183
11. Wilson DS, Montie M, Conlon P, Reynolds M, Ripley R, Titler MG. Nurses' perceptions of implementing fall prevention interventions to mitigate patient-specific fall risk factors. West J Nurs Res. 2016;38(8):1012-34. https://doi.org/10.1177/0193945916644995
12. Lee SH, Yu S. Effectiveness of multifactorial interventions in preventing falls among older adults in the community: a systematic review and meta-analysis. Int J Nurs Stud. 2020;106. https://doi.org/10.1016/j.ijnurstu.2020.103564
13. Ong MF, Soh KL, Saimon R, Wai MW, Mortell M, Soh KG. Fall prevention education to reduce fall risk among community-dwelling older persons: a systematic review. J. Nurs. Manag. 2021;29(8):2674-88. https://doi.org/10.1111/jonm.13434
14. Dykes PC, Carroll DL, Hurley AC, Benoit A, Middleton B. Why do patients in acute care hospitals fall? Can falls be prevented? J Nurs Adm. 2009;39(6):299-304. https://doi.org/10.1097/NNA.0b013e3181a7788a
15. Yasan C, Burton T, Tracey M. Nurses' documentation of falls prevention in a patient-centered care plan in a medical ward. Aust J Adv Nurs. 2020;37(2):19-24.
16. Chan E-Y, Samsudin SA, Lim YJ. Older patients' perception of engagement in functional self-care during hospitalization: a qualitative study. Geriatr Nurs. 2020;41(3):297-304. https://doi.org/10.1016/j.gerinurse.2019.11.009
17. Wong MMC, Pang PF. Factors associated with falls in psychogeriatric inpatients and comparison of two fall risk assessment tools. East Asian Arch Psychiatry. 2019; 29(1):10-4. https://doi.org/10.12809/eaap1774
18. Glogovsky D. How can policy change guide nursing practice to reduce in-patient falls? Nurs. 2017;47(12):63-7. https://doi.org/10.1097/01.NURSE.0000526903.22874.65
19. Agency for Healthcare Research and Quality. Preventing falls in hospitals. 2021 March. [cited 2022 Jan 15]. Available from: https://www.ahrq.gov/patient-safety/settings/hospital/fall-prevention/ toolkit/index.html.

20. Lee D-CA, Pritchard E, McDermott F, Haines TP. Falls prevention education for older adults during and after hospitalization: a systematic review and meta-analysis. Health Educ J. 2014;73(5):530-44. http://dx.doi.org/10.1177/0017896913499266
21. Montero-Odasso MM, Kamkar N, Pieruccini-Faria F, et al. Evaluation of clinical practice guidelines on fall prevention and management for older adults: a systematic review. JAMA Netw. 2021;4(12): e2138911. https://doi.org/10.1001/jamanetworkopen. 2021.3891
22. Morello RT, Barker AL, Ayton DR, et al. Implementation fidelity of a nurse-led falls prevention program in acute hospitals during the 6-PACK trial. BMC Health Serv. Res. 2017;17:1-10. https://doi.org/10.1186/s12913-017-2315-z
23. Thiamwong L, Suwanno J. Effects of simple balance training on balance performance and fear of falling in rural older adults. Int J Gerontol. 2014;8(3):143-6. https://doi.org/10.1016/j.ijge.2013.08.011
24. Moher D, Liberati A, Tetzlaff J, Altman DG. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. PLoS Med. 2009;6(7):e1000097. https://doi.org/10.1371/journal.pmed.1000097
25. JHNEBP. Johns Hopkins nursing evidence-based practice Available from: https://www.mghpcs.org/eed/ebp/Assets/documents/pdf/2017_Appendix%20D_Evidence%20Level%20and%20Quality%20Guide.pdf
26. Goldman KD, Schmalz KJ. The matrix method of literature reviews. Health Promot Pract. 2004;5(1):5-7. https://doi.org/10.1177/1524839903258885
27. Ye P, Liu Y, Zhang J, et al. Falls prevention interventions for community-dwelling older people living in mainland China: a narrative systematic review. BMC Health Serv Res. 2020;20(1):808. https://doi.org/10. 1186/s12913- 020-05645-0
28. Dorresteijn TAC, Rixt Zijlstra GA, Ambergen AW, Delbaere K, Vlaeyen JWS, Kempen GIJM. Effectiveness of a home-based cognitive-behavioral program to manage concerns about falls in community-dwelling, frail older people: results of a randomized controlled trial. BMC Geriatr. 2016; 16:1-11. https://doi.org/10.1186/s12877-015-0177-y
29. Gouveia BR, Gonçalves Jardim H, Martins MM, et al. An evaluation of a nurse-led rehabilitation programme (the ProBalance Programme) to improve balance and reduce fall risk of community-dwelling older people: a randomised controlled trial. Int J Nurs Stud. 2016;56:1-8. https://doi.org/10.1016/j.ijnurstu.2015.12.004
30. Guerra FVG, Moreira RP, de Oliveira Ferreira G, et al. Effectiveness of the fall prevention intervention in older adults with arterial hypertension: randomized clinical trial. J Geriatr Nurs. 2021;42(1):27-32. https://doi.org/10.1016/j.gerinurse.2020.11.002
31. Ward JA, Harden M, Gibson RE, et al. A cluster randomised controlled trial to prevent injury due to falls in a residential aged care population. Med J Aust. 2010;192(6):319-22.
32. Chidume T. Promoting older adult fall prevention education and awareness in a community setting: a nurse-led intervention. Appl Nurs Res. 2021;57:151392. https://doi.org/10.1016/j.apnr.2020.151392
33. Montejano-Lozoya R, Miguel-Montoya I, Gea-Caballero V, Mármol-López MI, Ruíz-Hontangas A, Ortí-Lucas R. Impact of nurses' intervention in the prevention of falls in hospitalized patients. Int J Environ Res. 2020;1717):6048. https://doi.org/10.3390/ijerph17176048
34. Uymaz PE, Nahcivan NO. Evaluation of a nurse-led fall prevention education program in Turkish nursing home residents. Educ Gerontol. 2016;42(5):299-309. https://doi.org/10.1080/03601277.2015.1109403
35. Dykes PC, Adelman JS, Alfieri L, et al. The Fall TIPS (Tailoring Interventions for Patient Safety) Program: a collaboration to end the persistent problem of patient falls. nurse lead. 2019;17(4):365-70. https://doi.org/10.1016/j.mnl.2018.11.006

ประสิทธิภาพของพยาบาลนำการป้องกันการพลัดตกหกล้มในผู้สูงอายุ: การทบทวนวรรณกรรมอย่างเป็นระบบ

*Eunice Oladepe Ojo, * Ladda Thiamwong*

บทคัดย่อ: การหกล้มในผู้สูงอายุเป็นเหตุการณ์ที่ป้องกันได้ และโปรแกรมป้องกันการหกล้มที่นำโดยพยาบาลถือว่ามีความสำคัญอย่างยิ่ง การทบทวนวรรณกรรมนี้มีวัตถุประสงค์เพื่อศึกษาเชิงลึกถึงผลลัพธ์ของโปรแกรมป้องกันการหกล้มที่นำโดยพยาบาล การนำเสนอผลการทบทวนวรรณกรรมนี้ได้ใช้แนวปฏิบัติของการทบทวนวรรณกรรม และฐานข้อมูลที่ใช้ในการค้นหา ได้แก่ CINAHL, MEDLINE, Eric, Science Direct, and Google Scholar ผู้วิจัยใช้แนวการปฏิบัติอิงข้อมูลเชิงประจักษ์ของจอห์นฮอปกินส์มาใช้ในการประเมินระดับและคุณภาพของงานวิจัยที่ผ่านการคัดเลือก และการสกัดข้อมูลใช้วิธีการทบทวนแบบเมทริก บทความการทบทวนนี้ประกอบด้วยงานวิจัยแบบทดลองและสุ่มตัวอย่าง 6 เรื่อง งานวิจัยแบบทดลองแต่ไม่สุ่มตัวอย่าง 2 เรื่อง งานวิจัยแบบกึ่งทดลอง 3 เรื่อง งานวิจัย 6 เรื่องมีองค์ประกอบด้านการให้ความรู้ที่เน้นพยาบาลเป็นหลัก และอีก 3 เรื่องมีองค์ประกอบด้านการให้ความรู้ที่เน้นผู้สูงอายุ บทบาทของพยาบาลได้แก่ การประเมินสุขภาพ การให้สุขศึกษาหรือความรู้แก่ผู้สูงอายุ การบริหารจัดการเรื่องการออกกำลังกาย และการติดตามประเมินผลลัพธ์ ซึ่งพบว่าอัตราการเกิดหกล้มลดลงใน 5 งานวิจัย และอีก 3 งานวิจัยพบว่าผู้ป่วยมีการปรับเปลี่ยนพฤติกรรม โปรแกรมป้องกันการหกล้มที่มีองค์ประกอบด้านการให้ความรู้ที่เน้นแก่ผู้สูงอายุและพยาบาลถือว่าเป็นโปรแกรมให้ผลลัพธ์เชิงบวก พยาบาลมีบทบาทสำคัญในปรับเปลี่ยนผลลัพธ์แก่ผู้สูงอายุไปในทางที่ดีขึ้น ลดจำนวนการหกล้ม และปรับเปลี่ยนพฤติกรรมทางสุขภาพที่จะนำไปสู่การป้องกันการหกล้มในอนาคต

Pacific Rim Int J Nurs Res 2022; 26(3) 417-431

คำสำคัญ: การศึกษา อุบัติเหตุหกล้ม การป้องกันหกล้ม อัตราการหกล้ม พยาบาลนำ ผู้สูงอายุ

***Correspondence to: Eunice Oladepe Ojo,** * DNP, RN, CV-BC, PCCN, DNP Graduate (Nurse Executive), College of Nursing, University of Central Florida, Orlando, FL, 32826, USA. E-mail: Oladepe2000@yahoo.com*
***Ladda Thiamwong,** PhD, RN, Associate Professor, Department of Nursing Systems, College of Nursing University of Central Florida Orlando, FL, 32826, USA. E-mail: Ladda.Thiamwong@ucf.edu*