Literature Review

TEXTO & CONTEXTO ENFERMAGEM
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EFFECTIVENESS OF EDUCATIONAL INTERVENTIONS FOR FALL PREVENTION: A SYSTEMATIC REVIEW

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ABSTRACT

Objective: to assess the effectiveness of educational interventions for fall prevention implemented in hospitals, at homes and nursing homes.
Method: this is a systematic review, carried out based on the guiding question: what is the effectiveness of isolated educational interventions for preventing falls in adults and the elderly developed in experimental studies? The search took place in the electronic databases: Scopus, PubMed/PMC, Web of Science, CINAHL, SciELO, Cochrane and EMBASE. The exposure factor was the educational intervention on preventing falls, and as outcomes: reducing fall rates, improving knowledge, awareness and adherence to preventive care for adult and elderly patients. Only randomized controlled trials, in all languages and published between 2011 and 2020 were included.
Results:1,474 articles were identified, of which 16 were included. Four studies did not show effectiveness related to fall prevention. As common characteristics, these studies were carried out with elderly patients and without one-to-one follow-up. The others were effective in reducing falls and/or improving knowledge and were mostly studies with personalized interventions, carried out by nurses and mediated by educational technologies.
Conclusion: educational interventions are effective for preventing falls in the home, hospital and nursing homes. Studies have shown a reduction in fall rates, improved knowledge and engagement in prevention strategies.

DESCRIPTORS: Accidental falls. Accident prevention. Health Education. Health Promotion. Nursing care. Review.

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EFETIVIDADE DE INTERVENÇÕES EDUCATIVAS PARA PREVENÇÃO DE QUEDAS: REVISÃO SISTEMÁTICA

RESUMO

Objetivo: avaliar a efetividade de intervenções educativas para prevenção de quedas implementadas em ambiente hospitalar, domiciliar e instituições de longa permanência para idosos.
Método: revisão sistemática, realizada a partir da questão norteadora: qual a efetividade de intervenções educativas isoladas para prevenção de quedas em adultos e idosos desenvolvidas em estudos experimentais? A busca ocorreu nas bases de dados eletrônicas: Scopus, PubMed/PMC, Web of Science, CINAHL, SciELO, Cochrane e EMBASE. O fator de exposição foi a intervenção educativa sobre prevenção de quedas, e como desfechos: redução de taxas de queda, melhora do conhecimento, percepção e adesão aos cuidados preventivos de pacientes adultos e idosos. Incluíram-se apenas ensaios clínicos randomizados, em todos os idiomas e publicados entre 2011 e 2020.
Resultados: identificaram-se 1.474 artigos, dos quais foram incluídos 16. Quatro estudos não apresentaram efetividade relacionada à prevenção de quedas. Como características comuns, estes estudos foram realizados com pacientes idosos e sem acompanhamento presencial. Os demais revelaram eficácia sobre a redução de quedas e/ou melhora do conhecimento e eram majoritariamente estudos com intervenções personalizadas, realizadas por enfermeiros e mediadas por tecnologias educativas.
Conclusão: intervenções educativas são eficazes para prevenção de quedas em ambiente domiciliar, hospitalar e instituições de longa permanência para idosos. Os estudos mostraram redução de taxas de quedas, melhoria do conhecimento e engajamento em estratégias de prevenção.

DESCRITORES: Acidentes por quedas. Prevenção de acidentes. Educação em saúde. Promoção da saúde. Cuidados de enfermagem. Revisão.

EFECTIVIDAD DE LAS INTERVENCIONES EDUCATIVAS PARA LA PREVENCIÓN DE CAÍDAS: REVISIÓN SISTEMÁTICA

RESUMEN

Objetivo: evaluar la efectividad de las intervenciones educativas para la prevención de caídas implementadas en un hospital, entorno domiciliario e instalaciones de atención a largo plazo para ancianos.
Método: revisión sistemática, basada en la pregunta orientadora: ¿cuál es la efectividad de las intervenciones educativas aisladas para la prevención de caídas en adultos y ancianos desarrolladas en estudios experimentales? La búsqueda se realizó en las bases de datos electrónicas: Scopus, PubMed/PMC, Web of Science, CINAHL, SciELO, Cochrane y EMBASE. El factor de exposición fue la intervención educativa en la prevención de caídas, y como resultados: reducción de las tasas de caída, mejora del conocimiento, percepción y adherencia a la atención preventiva para pacientes adultos y ancianos. Solo se incluyeron ensayos controlados aleatorios, en todos los idiomas y publicados entre 2011 y 2020.
Resultados: se identificaron 1474 artículos, de los cuales se incluyeron 16. Cuatro estudios no mostraron efectividad relacionada con la prevención de caídas. Como características comunes, estos estudios se realizaron con pacientes ancianos y sin seguimiento presencial. Los otros fueron efectivos para reducir caídas y/o mejorar conocimientos y fueron en su mayoría estudios con intervenciones personalizadas, realizadas por enfermeras y mediadas por tecnologías educativas.
Conclusión: las intervenciones educativas son eficaces para prevenir caídas en el hogar, el hospital y las instalaciones de atención a largo plazo para los ancianos. Los estudios han demostrado tasas reducidas de caídas, mejor conocimiento y participación en estrategias de prevención.

DESCRIPTORES: Accidentes por caídas. Prevención de accidentes. Educación en salud. Promoción de la salud. Atención de enfermería. Revisión.

INTRODUCTION

Falls are events that occur when a person inadvertently falls on the floor or at a lower level during displacement, or when he is unbalanced and needs support for support, even if he does not reach the floor[1]. Although most falls-related injuries are not fatal, approximately 37.3 million cases require medical attention each year[1]. They can also cause significant pain and discomfort to patients, affect confidence in moving, lead to loss of independence and serious long-term health problems[2].

Faced with this setting, falls have become the focus of health care and are becoming increasingly important in the face of the negative impacts on the functionality of people who fall and on the direct and indirect costs to health systems[3]. Prevention strategies should emphasize education, training, creating safe environments, prioritizing research related to the topic and establishing effective policies to reduce risks[1].

Consistent systematic reviews have shown that falls can be prevented, through isolated or combined interventions[2,4]. The main intervention categories include vitamin D supplementation at home and nursing homes (NH), exercise and assistive technologies in subacute hospital settings, interventions in the social environment and health education at home and hospital[4].

Health education is defined as combinations of learning experiences designed to help individuals and communities to improve their own health, through knowledge or changes in attitudes[5]. For fall prevention, adult and senior education should include information about this event, available support services and goal planning. It also highlights the importance of adapting interventions to the level of education and the physical, intellectual and cultural limitations of patients[6].

In addition, educational interventions offer numerous advantages, such as involving patients in discussions about prevention strategies, improving awareness and perception of risks, self-efficacy and, consequently, adherence to preventive care. Moreover, they are economical, easily adapted to the environment and the people for whom they are intended and do not require changes in the routines of health services[6–7].

National and international experimental studies highlight that health education has been increasingly valued by adult patients. Participants who received educational interventions on falls prevention showed improvement in knowledge, in the perception of risks, in adherence to changes in the home environment and in the reduction in hospitalization rates and falls with injuries[8–11].

However, studies on the benefits of isolated educational interventions are still scarce. Systematic reviews on this topic have addressed the effects of these interventions combined with other strategies, such as exercises, assistive technologies, medication reviews and psychological counseling. Furthermore, they are aimed at preventing falls at home in specific groups of patients, such as the elderly[2], with multiple sclerosis[12] and people affected by stroke[13].

In this context, it becomes relevant to know, gather and synthesize evidence on the effects of isolated educational interventions, aimed at preventing falls of adult and elderly patients in hospitals, the home environment or NH, as falls are common in these places and can result in increased mortality and morbidity. Therefore, the results of this review may help health professionals, researchers, policy makers and other caregivers to have an overview of these interventions, their procedures, benefits and application settings.

Thus, this review aimed to assess the effectiveness of educational interventions for preventing falls implemented in hospitals, homes and NH.

METHOD

This is a systematic review, described according to the Guideline Preferred Reporting Items for Systematic Reviews and Meta-Analyzes (PRISMA)[14]. The elaboration process followed the following steps: research question definition; conceptualization of eligibility criteria; search for potential eligible studies; assessment of eligibility of studies (screening of studies by summary and title, and later by reading the full text); extraction of relevant data; assessment of risk of bias; presentation and discussion of synthesis of results[15].

The Population, Interest, Context (PICo) strategy was used to guide the construction of the research question, in which P=adult and elderly patients, I=isolated educational interventions and Co=experimental studies. Thus, this study was based on the following question: what is the effectiveness of isolated educational interventions for preventing falls in adults and the elderly developed in experimental studies?

The search was carried out independently and concurrently, by two researchers, during July 2020. This process took place in relevant databases/portals that had an impact on the health context, namely: Scopus; PubMed/PMC, Web of Science, CINAHL, SciELO, Cochrane and EMBASE.

To carry out the searches, the controlled descriptors present in the Health Sciences Descriptors (DeCS) and Medical Subject Headings (MeSH) were used, synonyms of the descriptors were also added, available in the controlled vocabularies. Due to the access characteristics of selected databases, different strategies were used in order to achieve a broad search, as shown in Chart 1.

Chart 1 – Search strategies, according to the database/portal. Fortaleza, CE, Brazil, 2020.

Database	Search structures
EMBASE	(falls OR “acidental falls” OR falling OR “fall risk” OR “falls prevention” OR “accident prevention”) AND (“health education” OR “health promotion” OR “patient education” OR “educational technology” OR “instructional technology”) AND (“clinical trial” OR “clinical trials (topic)”)
PuBMed	(“acidental falls” OR “falls prevention” OR “accident prevention”) AND (“health education” OR “patient education” OR “educational technology” OR “instructional technology”) AND (“clinical trial” OR “clinical trials as topic”)
Scopus	
Web of Science	(falls OR “acidental falls” OR “fall risk” OR “falls prevention” OR “accident prevention”) AND (“health education” OR “health promotion” OR “patient education” OR “educational technology” OR “instructional technology”) AND (“clinical trial” OR “clinical trials as topic”)
CINAHL	
Cochrane	
SciELO	(falls OR “acidental falls” OR “accident prevention”) AND (“health education” OR “health promotion” OR “patient education” OR “educational technology” OR “instructional technology”)

For the selection of articles, complete Randomized Clinical Trials (RCT), in all languages, that assessed the effects of isolated educational interventions, i.e., that were not combined with other strategies for fall prevention, carried out in a hospital, home or NH environment, with adult patients (including over 18) years), of both sexes, with the outcome of reducing fall rates, improving knowledge, awareness and patient involvement in preventive care were included. The time interval from 2011 to 2020 was defined, considering the update of international patient safety goals of the Joint Commission International (JCI) in 2011, which highlights the reduction of risk of injury to patients resulting from falls as a goal[16].

Quasi-experimental articles that did not adequately answer the research question were excluded.

After surveying the studies, duplicate publications were identified using the Mendeley reference management program, and then the eligibility assessment process began, with the studies being screened by reading titles and abstracts. In this stage, articles that did not fit the pre-established criteria were excluded. In the second stage, a complete reading of the articles included in the screening was carried out to confirm the eligibility.

It is noteworthy that the study selection process was carried out independently, by two researchers, if there was disagreement about eligibility, all it took was only one reviewer to judge the eligible article to insert it in the next step. At the end of this process, a sample of 16 articles was obtained.

For data extraction, information of interest for the selected studies was previously defined, which was obtained using a specific form of authorship. Data on the author, date of publication, type of study, participants, intervention, control, measures of effect, outcome, follow-up time and losses were collected.

Two researchers independently assessed the risk of bias. To critically assess the included studies, a Cochrane bias risk assessment tool was used for randomized studies, which is structured in a set of domains, with a focus on different aspects of the study design. Within each domain, there are a series of questions that aim to obtain information about the characteristics of the study that are relevant to the risk of bias. A judgment proposal on the risk of bias resulting from each domain is generated by an algorithm, based on the answers to the signaling questions. Judgment can be of low, high and partial risk, expressed as some concerns or uncertain risk[17].

For analysis and synthesis of the reviewed articles, the following steps were taken: extraction of quantitative data; synthesis of outcomes; summary of measures of effect; presentation of descriptive data in tables and the flow of selection of articles in figure[15]. After analysis, the articles were categorized according to the effectiveness related to fall prevention.

RESULTS

1,474 articles were retrieved from the selected databases, 24 articles were repeated,1,415 did not meet the eligibility criteria in the screening. Thus, 35 studies were read in full and, after this stage, a final sample of 16 was chosen. The selection process can be observed in detail in the flowchart of the systematic review, in Figure 1.

Studies' characteristics

The 16 articles included come from international journals, published in English (n=15) and Korean (n=1). Scopus was the database that retrieved the largest number of articles, followed by EMBASE and SciELO. Publications in Australia (n=8), the United States (n=4), Korea (n=1), Chile (n=1), Malaysia (n=1) and Japan (n=1) prevailed. The 16 studies involved approximately 7,643 patients, with a predominance of elderly women, with elementary and high school education. The follow-up time for interventions ranged from one to 12 months and the average time for each session was from ten minutes to two and a half hours.

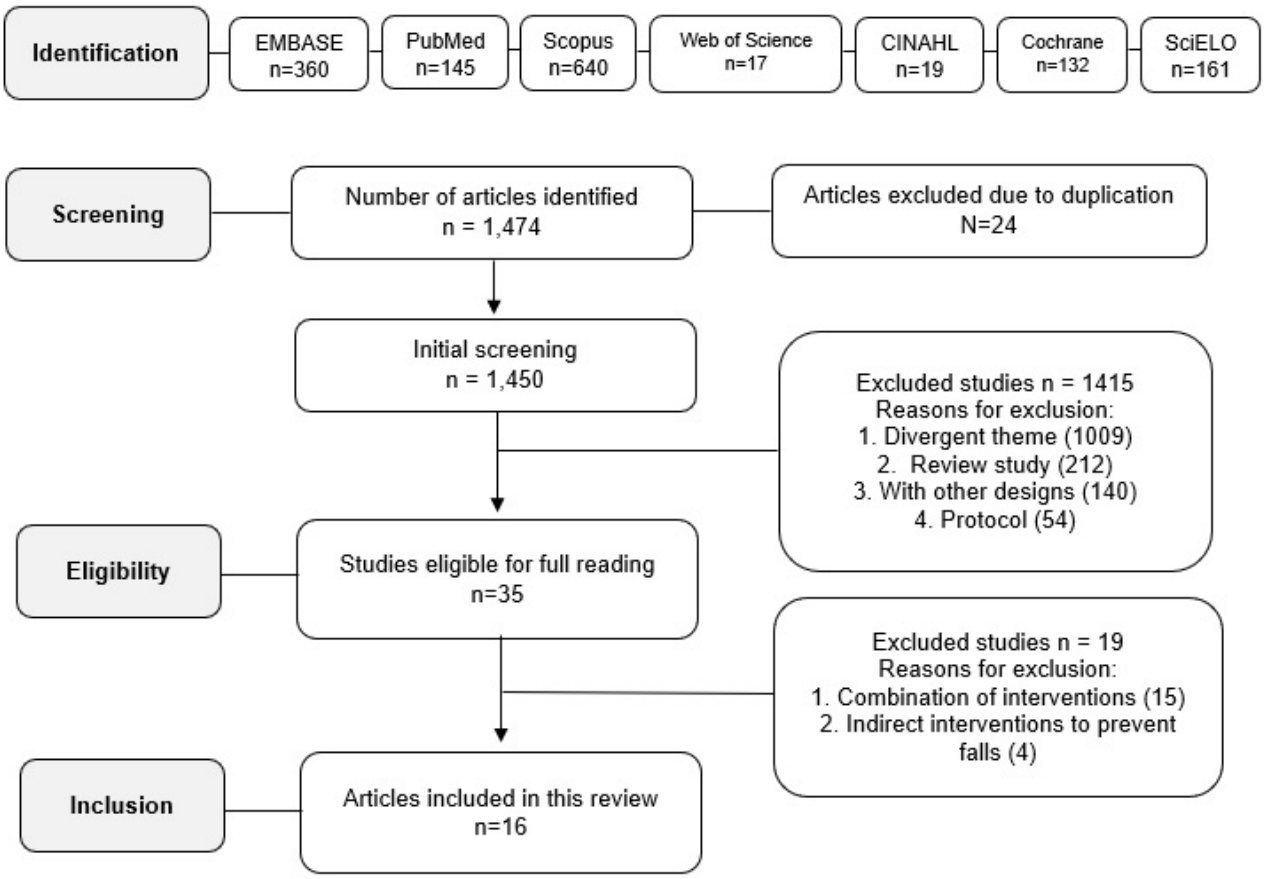

Figure 1 – Flowchart for inclusion of studies. Fortaleza, CE, Brazil, 2020.

To facilitate an analysis of educational interventions, the most important methodological aspects are presented in Chart 2.

Chart 2 – Characterization of studies according to the information from the interventions performed. Fortaleza, CE, Brazil, 2020.

Studies	Sample/ Losses	Locations	Educational interventions	Number of sessions/ Duration	Comparator	Result measures	Main results
Mora Pinzon M, et al., 2019[9]	29 Latin elderly people/17%	Community institution	Educational group sessions, with discussions on fall prevention strategies.	Eight/ six months	Randomized single-arm clinical trial	Fall Behavioral Risk Scale (RcQ); Timed Up and Go (TUG); Adoption of individual protection behaviors.	In six months: there was a significant improvement in the mean of RcQ (p <0.001); In the TUG, there was no improvement (p=0.07); 57.9% continued to exercise, 94% adopted safer walking strategies and 67% performed at least one safety recommendation at home.
Hill, et al., 2015[18]	3,606 elderly people/ none	Hospital	Personalized follow-up of fall risk prevention, using videos (DVD) and leaflets to record goals.	Three to five/ 12.5 months	Usual care	Audit of notification of cases of falls in the hospital.	There were fewer falls (p=0.003) and falls with injuries (p=0.06) in IG.
Potter, et al., 2014[19]	132 patients with cancer/ 42%	Hospital	Video fall prevention instructions and information leaflet. Delivery of a copy of a DVD video to be shown at home after discharge.	Free/ three months	Standard hospital video and information leaflet	Fall registration calendar; Fall Risk Awareness Questionnaire (FRAQ); Aware Fall Risk Scale.	Improvement in the Aware Fall Risk Scale (p <0.01); There were no differences in the FRAQ scores between the study groups (p=0.49); IG was more likely to report episodes of falls with injuries (p <0.05) and to make changes at home (p <0.05).
Taylor et al., 2017[20]	22 elderly people/8,3%	Home	Personalized education on fall prevention at home, with simulation of the identified environmental risk and practical guidelines to correct it.	Three/ six months	Widespread fall risk education	Confidence and Balance Scale; Observation based on forms created by the authors.	Best score on the confidence scale, with personalized environmental recommendations (p <0.05); Significant difference in the average of adherence to preventive care with personalized education (69%) compared to generalized (37%).
Harper et al., 2017[21]	412 elderly people/8,2%	Hospital	Brief educational intervention with individual discussion on risk of falling.	One/ six months	Usual care	Fall risk screening; Functional capacity; Self-report on the occurrence of falls; Hospital records.	Falls occurred in both groups during follow-up (OR 0.81, 95% CI 0.53 - 1.25, p=0.34); IG had fewer hospital admissions (p=0.002) and improved physical function (p=0.007).

Chart 2 – Cont.

Studies	Sample/ Losses	Locations	Educational interventions	Number of sessions/ Duration	Comparator	Result measures	Main results
Park et al., 2019[10]	124 elderly people/ 29%	NH	Group and individual education on goal setting, role of caregiver and nurse. Demonstration of prevention strategies through videos.	Six/ six months	Usual care	Morse Fall Scale; Numbers of notification of falls per 1,000 patients/day.	Lower rate of falls in IG; Number of falls per 1,000 patients/day went from 3.38 before the intervention to 1.69 after three months (p=0.044) and decreased from 3.26 to 0.76 after 6 months of intervention (p=0.049).
Troncoso et al., 2019[11]	154 elderly people/16,8%	Home	Personalized home visit on fall prevention, with a risk management plan for falls and telephone follow-up.	Five/ five months	Usual care	Subjective awareness of fall risk; Calendar for registration of falls.	There was a difference in the means of perceiving the risk associated with walking (IG=13.83 and CG=12.40) and the presence of objects or furniture (IG=4.31 and CG=2.64); In IG, 7.9% suffered at least a fall in the five-month period and in CG 27.7% fell (p=0.004).
Ang et al., 2011[22]	1,822 patients adults/ none	Hospital	Educational session, with interventions according to participants' risk factors; First, the specific fall risk was identified and then strategies were provided to reduce the specific risk of patients.	One/ eight months	Usual care	Incidence of falls in the hospital.	Fall incidence rates were 1.5% (95% CI 0.9–2.6) in CG and 0.4% (95% CI 0.2–1.1) in IG.
Barker et al., 2019[23]	523 elderly people/17,7%	Home	Educational program with home fall risk assessment; Telephone guidance, coaching, goal setting and support for evidence-based risk factor management.	Three to four/two months	Usual care	Hospitalization rates Occurrence of fractures; Quality of life and deaths per person/ year, during the 12-month study period.	There was no difference in injuries due to falls (p=0.374); The fracture rate was significantly lower in IG (p=0.03); There were no significant differences in other secondary outcomes between groups.

Chart 2 – Cont.

Studies	Sample/ Losses	Locations	Educational interventions	Number of sessions/ Duration	Comparator	Result measures	Main results
Naseri et al., 2019[24]	390 elderly people/ 25%	Hospital	Educational intervention with individual and personalized discussion using leaflets and videos; Formulation of goals for post-discharge care, based on patient preferences.	One one-to-one session and three phone backups/six months	Usual care	Receiving formal or informal assistance to assist in patient care; Katz index; Lawton and Brody Scale; Practice of exercises.	There was no difference in engagement in preventing falls (p=0.3); Participants' dependency levels remained high during follow-up; The proportion of all participants who exercised after hospital discharge increased by 30% (p=0.05).
Hill et al., 2011[25]	1206 elderly people/ 87%	Hospital	IG 1 - individual education with a self-directed multimedia program on fall prevention, consisting of a DVD and a written handout; IG 2 - complete educational program, with multimedia educational package and additional monitoring by a health professional.	One/six months	Usual care	Falls occurred for six months after discharge.	CG had the lowest rates of falls (3.62/1,000 person-days), compared to the group with only materials (5.36/1,000 person-days) or the full program group (4.40/1,000 person-days) morning).
Hill et al., 2019[26]	390 elderly people/ 2%	Hospital	Individualized education, with printed materials and video with information on falls and specific prevention for the post-discharge period.	Seven/ six months	Usual care + education program on aspects of positive aging.	Falls rate in the six months after hospital discharge; Rate of harmful falls and proportion of participants who suffered one or more falls in that period;	There were no differences in the rates of falls between CG and IG (5.9/1,000 patients/day), in the six months after hospital discharge; 164 participants fell, 79 fell once (IG=43; CG=36), 46 fell twice (IG=26; CG=20) and 39 fell more than twice (IG=22; CG=17).
Schepens et al., 2012[27]	68 elderly people/ 22%	Home	IG 1 - presentation of vignettes, with specific daily situations, narrated in the first person and which included risks of falls; IG 2 - the same intervention as IG 1 was carried out including setting goals and strategies for preventing falls.	One/ One month	No intervention	Identification of situations with risks of falling during pre- and post-test.	The number of fall risks identified in the post-test was significantly higher than the number identified in the pre-test for IG 1 (p=0.004), IG 2 (p=0.002), but not for CG (p=0 , 96); IG 1 identified more risks of falling than CG (p=0.029) as well as IG 2 (p=0.007).

Chart 2 – Cont.

Studies	Sample/ Losses	Locations	Educational interventions	Number of sessions/ Duration	Comparator	Result measures	Main results
Hill et al., 2013[28]	50 elderly people/ 4%	Hospital	Delivery of written and video materials, followed by individual discussion sessions, with educators beside patients.	Two sessions and a phone backup/One month	Usual care	Involvement in fall prevention strategies in the month after discharge; Self-awareness risk and knowledge about fall prevention strategies after hospital discharge.	IG was significantly more experienced, confident and motivated to be involved in fall prevention strategies after receiving health education (p <0.01); One month after discharge, 87.5% participants in IG agreed that knowledge levels increased (p=0.01).
Ueda et al., 2017[29]	60 elderly people/ 13.3%	Home	Individualized education aimed at changing habits according to individual risks; Exercise guidance.	One/ One month	Intervention on exercises to prevent falls	Occurrence of falls recorded by patients in a calendar provided by the researcher.	No falls occurred in IG (n=25) during follow-up; Two participants (7.7%) fell in CG (n=26); IG had 75% fewer falls than CG.
Kuhlens-chmidt et al., 2016[30]	91 adult patients/ none	Hospital	Video application developed by the researcher; Education with printed leaflet on risks of falling; Discussion with the research nurse.	One/ Not reported	Hospital standard education leaflet	Perceived fall risk and willingness to ask for help.	There was a difference in the proportion of patients who perceived themselves to be at high risk for pre- and post-intervention falls (p=0.01); No change was seen in the confidence or willingness to ask for help in the intervention group.

DVD: Digital Video Disc; IG: Intervention Group; CG: Control Group; OR: Odds Ratio; CI: Confidence Interval.

As for the population included in the studies, there was a preponderance of the elderly, only three studies[19,22,30] reported the inclusion of adult patients over 18 years old, which were carried out in a hospital setting of acute and oncological care.

Seven articles described participnats' level of education[9,11,18,24–26,28,30], with a predominance of individuals who completed elementary and high school. There were no associations between the level of education and the results in preventing falls.

In some publications, cognitive assessment criteria were adopted for the inclusion of patients, especially with the elderly. The most used instrument for cognitive screening was the Mini Mental State Examination (MMSE), with the adoption of the average cutoff point of 23 points[18,23]. The risks for falls were assessed using instruments specific to the study site, using the Lawton and Brody Scale, Katz index and Hendrich II's model of risk of falling[1020,22]..

Regarding sample loss, the rates ranged from no loss to 87% loss of the sample. Regarding randomization, the studies included in this review used standardized techniques, from the use of computational algorithms to the use of sealed envelopes. It is emphasized that the study by Harper[21] describes, in the method, quasi-randomization, however, it was included because it presents three basic criteria to be considered RCT, which are: randomization, control and intervention[31].

Concerning educational interventions, most took place in the form of discussion and individual counseling with a patient. Printed resources were used, such as leaflets and calendars to record falls[3,25–26], audiovisual materials, such as videos[19,26–27,30] and telephone support[23].

Among the aspects addressed in educational interventions, the following stand out: fall prevention practices, based on the assessment of specific risks[10,20,22], guidance on physical exercises[9], prevention strategies in home and public environments[11,27], intrinsic and extrinsic risk factors of patients and setting goals[23–24].

There was a predominance of personalized interventions, in which researchers previously assessed patients' risk factors, using an instrument or observation of the environment, and after this analysis, the intervention took place based on individual needs[10,20,22–24]. In three RCTs, generalized interventions were applied, which were the same for all participants in the intervention group[9,19,21].

With regard to treatment groups, one of the included studies had a single arm[9]. In another, two arms received health education, which were compared with a group that did not[27]. Most interventions were compared in parallel with usual care, however, some studies have also applied health education in the control group[19–20,29–30].

Studies included in this review reported having used theoretical framework to support the educational intervention, such as Health-Behavior Change Theory[24,26], Situated Learning Theory and Attention, Relevance, Confidence, and Satisfaction Model[27], Imogene King's Theory of Goal Attainment[10] and Health Belief Model[28].

Assessment of the effectiveness of educational interventions

We chose to present the results according to effective interventions for preventing falls and those that were not effective in preventing this event. Thus, this topic is divided into two categories: effective educational interventions for preventing falls and non-effective educational interventions for preventing falls.

Effective educational interventions to prevent falls

In this review, 12 studies presented effective educational interventions in fall prevention. Of these, the majority consisted of personalized programs, only three studies carried out generalized educational interventions, i.e., standardized for all participants[10,19,21].

In studies with a generalized approach, an intervention was carried out with individual discussion, mediated by educational technologies, such as leaflets[10,21] and videos in DVD format[19]. Regarding the results, there was a decrease in the number of falls in the six-month follow-up period (RR=0.33; 95% CI=0.096-1.13)[10] e (OR=0.81; 95% CI=0.53-1.25)[21]. In the study by Potter *et al*[18]., the treatment group showed significant improvement, over time, in awareness of risk of falling ($p < 0.05$) and in knowledge ($p < 0.01$).

For personalized approaches, performed in the hospital environment, instruments for assessing the risk of falling and interviewing patients were used. RCTs in eight hospital rehabilitation units examined the effectiveness of individualized falls prevention education for patients, supported by training and feedback to the team. Sending feedback provided information about the goals that patients set, the barriers they perceived, and the ability to engage in fall prevention strategies. The results showed fewer falls (p=0.003) and fewer falls with injuries (p=0.06) in IG[18].

Still in the hospital environment, a study assessed the effectiveness of multiple educational intervention in preventing falls in acute care, patients included were at increased risk for falls. The educational session was carried out based on the specific risk of falling during hospitalization, thus, the professional could provide strategies to reduce the specific risk. The findings showed lower rates of falls in IG, with 0.4% (95% CI=0.2-1.1), compared to 1.5% (95% CI=0.9-2.6) in CG[22].

Another study applied educational intervention based on the perceived fall risk. Initially, about a third of patients considered themselves to be at low fall risk, despite nurses' classification as high risk. After individualized health education, a significant difference was observed in the proportion of patients who perceived themselves to be at high risk (p=0.01) [30].

Other studies recruited patients during hospitalization and followed up at home after discharge. In both, patients' risks were assessed to personalize health education[28–29]. Ueda *et al*[29]. used residential floor plans for guidance on external environmental risks in IG and found that there were 75% less falls compared to CG. Hill *et al*[28]. provided printed and video materials on fall prevention care after discharge, which resulted in participants significantly more likely to plan and perform daily activities safely (OR=3.80; 95% CI=1.07 -13.52; p=0.04) and more likely to complete other preventive behaviors, such as an exercise program (OR=2.76; 95% CI=0.72-10.50; p=0.14).

Personalized interventions in the home environment applied health education, through individual counseling[20] and home visits[11]. In both studies, guidance was provided within the home based on the risks observed by the health professional. At the end of the follow-up, there was an association between intervention and adherence to recommendations for fall prevention ($p < 0.05$)[20]. In one of the studies, IG showed a decrease in risk factors related to surfaces (p=0.01), the environment (p=0.08), intrinsic factors (p=0.01) and the presence objects or furniture (p=0.01)[11].

Research carried out in the community had the educational intervention of viewing five videos selected by software, based on information collected in a previous interview. The vignettes presented settings of environments familiar to patients, with first-person narration. Knowledge was assessed by identifying the risks present in the stickers. After the intervention, participants showed greater gains in knowledge ($p < 0.001$)[27].

A study conducted at a NH also showed that a personalized and individual fall prevention program was able to reduce falls in the six-month follow-up period. The findings showed a lower number of falls in IG (p=0.049), compared to CG (p=0.368)[10].

In view of this, it is possible to list differentials of effective personalized interventions, such as holding more than one health education session and using comprehensive teaching strategies mediated by educational technologies. In addition to a targeted approach to the prevention of extrinsic and intrinsic risks and strengthening the motivation of patients in the adoption of preventive care.

Ineffective educational interventions to prevent falls

Of the 16 articles included in this systematic review, four did not present significant results for fall prevention[23–26]. Ineffective studies also used personalized educational interventions. However, some limitations of the intervention, specificities of the population and external factors may have influenced these results.

A study with telephone support intervention, called RESPOND, observed a reduction in the occurrence of falls (1.15 in the RESPOND group and 1.83 in the control group), however, in most of the variables analyzed, there was no significant change in hospitalizations (p=0.152) and presentations in an emergency room (p=0.653). It is noteworthy that this program was aimed only at four risk factors for falls, focused on strength, vision, sleep and bones. In addition, the authors justified the ineffectiveness of the intervention due to the particularities of the population, since the participants had several comorbidities: one in three had a heart problem; one in two, diabetes or arthritis; one in ten, stroke; and almost two out of three were taking four or more prescription drugs. Thus, the broader health problems in this population may have required interventions in addition to those included in the RESPOND[23].

Two RCTs that used personalized educational interventions and setting goals for follow-up after discharge were not effective in reducing falls at home. The results showed an absence of significant differences between the groups in the involvement in fall prevention strategies (OR=1.3; 95% CI=0.7-2.1; p=0.3), completion of house changes (OR=1.2; 95% CI=0.7-1.9; p=0.4) and exercise (OR=1.3; 95% CI=0.7-2.2; p=0.03)[24]. There were also no significant differences in the rates of falls between the intervention and control groups (OR=1.09; 95% CI=0.78-1.52; p=0.61) or the proportion of participants who fell one or more times (OR=1.37; 95% CI=0.90-2.07; p=0.14)[26]. In the aforementioned studies, interventions may not have provided sufficient guidance and resources aimed at strengthening patients' motivation to initiate and maintain the desired prevention strategies after discharge[24,26].

Another study tested two intervention groups, one with a self-directed multimedia program, with only materials, and a complete educational program, with additional monitoring by a trained health professional. The results showed that the intervention had no protective effect after discharge, with no significant result detected in the rates of falls (p=0.20), harmful falls (p=0.83), rates of falls that require hospitalization (p=0.27) or risk of falling in both intervention groups, compared to the usual treatment group. This result can be justified by the fact that the participants who received education at the hospital are aware of what a fall is and, consequently, more at ease to report them[25].

Assessment of risk of bias

The method of generating sequence and concealing the allocation was not clear in some studies, as well as blinding the assessment of results for the established outcomes. In addition, many studies showed the potential for high risk of bias, due to the self-report method for investigating falls. The risk of bias is exemplified in Chart 3.

Chart 3 – Methodological quality of the included randomized controlled trials, using the Cochrane risk of bias tool. Fortaleza, CE, Brazil, 2020.

Studies	Risks of bias					
	Domain 1 Sequence generation	**Domain 2** Effect attributed to the intervention	**Domain 3** Incomplete results data	**Domain 4** Result measurement	**Domain 5** Reported result	**General RoB***
Mora Pinzon et al., 2019[9]	High risk	Low risk	Low risk	High risk	Low risk	High risk
Hill et al., 2015[18]	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk
Potter et al., 2014[19]	Uncertain risk	High risk	Low risk	Low risk	Low risk	High risk
Taylor et al., 2017[20]	Uncertain risk	Low risk	Low risk	High risk	Low risk	High risk
Harper et al., 2017[21]	Uncertain risk	High risk	Low risk	Uncertain risk	Low risk	High risk
Park et al., 2019[10]	Low risk	Low risk	Low risk	Uncertain risk	Low risk	Uncertain risk
Troncoso et al., 2019[11]	Uncertain risk	Low risk	Low risk	Uncertain risk	Low risk	Uncertain risk
Ang et al., 2011[22]	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk
Barker et al., 2019[23]	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk
Naseri et al., 2019[24]	Uncertain risk	Uncertain risk	Low risk	High risk	Low risk	High risk
Hill et al., 2011[25]	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk
Hill et al., 2019[26]	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk
Schepens et al., 2012[27]	Low risk	Uncertain risk	Low risk	Low risk	Low risk	Uncertain risk
Hill et al., 2013[28]	Low risk	Low risk	Low risk	Low risk	Low risk	Low risk
Ueda et al., 2017[29]	Low risk	Uncertain risk	Low risk	Low risk	Low risk	Uncertain risk
Kuhlenschmidt et al., 2016[30]	Low risk	High risk	Low risk	Low risk	Low risk	High risk

DISCUSSION

The results showed that although health education on falls prevention is recommended at an international level, there are few studies that specifically address this intervention separately from other elements[1]. The vast majority of research applies interventions with multiple components, mainly associated with the practice of exercises[32].

In this sense, the studies included in this review assessed the unique effects of educational interventions for fall prevention, which were predominantly directed at the elderly population in a hospital environment. However, during hospitalization, patients can be involved in risky situations, regardless of age. Thus, health education becomes important for all age groups, since there may be incompatibility between the perceived and the actual fall risk during hospitalization[33].

In general, educational interventions to prevent falls occurred in moments of individual discussion and, for this, studies used educational technologies to mediate this process and make learning a more dynamic experience[2426].. The most used materials were leaflets and videos, which were applied by professionals at the study site[2528]. or delivered to be used at home after hospital discharge[19].

A study carried out in eight rehabilitation hospitals in Australia provided age-appropriate learning activities for patients, as well as specific educational content about falls. The content was focused on encouraging patients to interact with health professionals, who could reinforce the information passed on. The presentation of audio and video on screens, in the hospital environment, through headphones, made it possible to serve patients with visual and hearing impairments. This may have increased the adoption of fall prevention strategies, as fall rates have been reduced across entire sectors[18].

In addition to providing reliable information, educational technologies must be suitable for the target audience. Users' goals, behaviors, preferences, context and lifestyle must be considered to design an effective intervention that uses educational technology. Thus, personalization implies adapting the delivery of the intervention to a specific user of the health service[34]. Previous systematic review confirms the need for a personalized approach to educational interventions[35].

A study carried out with 430 elderly people in Australia adopted some different approaches, in comparison to the other falls prevention interventions. Goal setting by telephone, motivational interview and message coaching were adopted[23].

Another important aspect in the interventions was the establishment of goals during health education. This element was associated with the effectiveness of the actions and is configured as a promising strategy to support patients to improve self-care, motivation and self-efficacy[10–11,24,27].

The domain and experience of the researcher on the subject worked are also fundamental to stimulate the achievement of goals and behavioral strategies for fall prevention[7,36]. In this sense, the importance of health education is carried out by specialized health professionals.

Personalized educational interventions reduced the rate of falls, when compared to generalized intervention. Improving the applicability of health-related content, adapting it to public education, has been an effective strategy to encourage the desired behavioral changes. Therefore, it can be useful in promoting fall prevention behaviors[37].

The importance of specific diagnostic assessment for the planning of individualized interventions to prevent falls is highlighted. For this, nursing can use appropriate tools based on scientific evidence, such as Nursing Diagnoses that can be used in association with Nursing Outcomes (NOC) and the Nursing Interventions Classification (NIC). In this way, it is possible to set goals and personalize interventions[38].

The use of theoretical frameworks to support interventions facilitated the development of personalized strategies[10,24,26]. The Health-Behavior Change Theory was the most used and aimed to: increase capacity (knowledge and awareness about fall risk and fall prevention); intensify motivation to

support fall prevention strategies; help participants to identify opportunities (social and environmental) to implement strategies and address barriers during the post-discharge period[26].

Regarding the effectiveness of educational interventions in reducing fall rates, improving patient perception and knowledge, as well as engaging in prevention strategies, it was shown that four studies included did not show positive effects of health education.

One of the studies that was not effective, in which the effects of educational interventions by telephone were tested, had limitations related to the profile of the participants, with multiple comorbidities, and the fact that the educational program did not emphasize such conditions. Additionally, participants received, on average, a home visit and six phone calls, during the six-month intervention period. This dosage may have been too low to modify the complex health problems that can lead to falls[23]. Therefore, it is more appropriate that educational interventions for fall prevention should use a one-to-one approach and monitoring, considering the professional's personal contact with patients.

Another limiting factor was the inclusion of an older population, which may mean that the results are more relevant for a more fragile population. In addition, no data were collected on variations in receiving assistance in life activities during follow-up, which means that the amount of assistance that influenced the results of the falls could not be quantified. Balance was also not measured as a risk factor[25].

Studies have shown that intervention with a home visit and management plan has improved home security conditions, through an approach geared to the specific needs of the person and their family. This process favored the active role of the user and placed the health team as a facilitator and companion of care[11,20].

Still in relation to the studies that obtained significant efficacy in fall prevention, in six of them, the professionals responsible for carrying out the interventions were nurses. In other studies, interventions were facilitated by physical therapists, occupational therapists and doctors. These findings support the nurse's role as an educator and reinforce the importance of the multiprofessional team being involved in the educational process.

Fall prevention is a major challenge that requires the active involvement of several areas of care. This multiprofessional collaboration can reduce the likelihood of falls, through the complete assessment of risks, and the implementation of individualized preventive measures, including several areas of knowledge[39]. The importance of team training is also highlighted, in order to guarantee the success of educational programs for fall prevention, based on the planning of actions and the appropriate choice of educational methods.

Thus, it is essential to analyze and provide scientific evidence on health education for fall prevention, which can be used during care aimed at patient safety in the hospital and home environment. Thus, it is possible to benefit from decision-making regarding patient education and the best way to implement it[7].

Most of the included studies had an uncertain risk of bias. Much information was not well described, mainly in the domain of effect attributed to the intervention, due to the lack of information about the blinding of the outcome evaluator and the results are due to self-report. This limitation suggests that improvements in reporting are needed.

The limitations are related to the heterogeneity of the studies, which made it impossible to carry out a meta-analysis, which means that the results need to be interpreted with caution. Although educational interventions are essentially heterogeneous, the influence of differences between the included studies must be considered. Several of the studies included a small number of participants and presented less robust data analysis, limiting the validity of the findings.

CONCLUSION

Educational interventions are effective for preventing falls in the home, hospital and NH environment, resulting in reduced rates, improved knowledge and engagement in prevention strategies. As for the practice settings, it was observed, in the hospital environment, a predominance of effective interventions aimed at offering personalized guidance, mediated by printed and video educational technologies, in addition to brief individual educational sessions, with a specific risk reduction strategy approach of patients.

At home, group actions were carried out, home visits with demonstration of risks of falls present in the residence and presentation of strategies to modify them. At NHs, individual and group educational intervention was found to be effective, with practical demonstrations of how to prevent falls through video.

Based on the exposed results, this study offers implications for professionals, by offering theoretical support based on scientific evidence to guide the choice of health education as a tool for preventing falls. For researchers, the need to update systematic reviews and possible meta-analyzes on these results is emphasized, as new data are published constantly. It also emphasizes the importance of future cost-effectiveness assessment of interventions for services. For managers and policy makers, educational interventions are indicated as effective means for preventing falls, due to the low or no cost for carrying out and potential adherence of patients in health services.

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