

Surveillance and fall prevention in the elderly

João André¹, Maria Margarida Goes²[0000-0001-6017-6874],
Henrique Oliveira³[0000-0001-5180-2036] João Vítor Vieira⁴[0000-0002-3905-4802],
Margarida Santos⁵[0000-0002-9191-0135]

¹Hospital José Joaquim Fernandes, Beja, Portugal

²Polytechnic Institute of Beja, Beja, Portugal

³Telecommunications Institute, Lisbon, Portugal

⁴Polytechnic Institute of Beja, Beja, Portugal

⁵Salt Clinic Center, Póvoa de Varzim, Portugal

hjmo@lx.it.pt

Abstract. Falls in the elderly are one of the main causes of death that occur in this population group and there are multiple factors that can contribute to this, greatly affecting their autonomy and quality of life. Therefore, nursing interventions are essential to prevent this type of event. **Objective:** Evaluate the efficiency of external hip protectors on preventing falls in the elderly people. **Methodology:** Integrative Literature Review, using the PICO methodology, which included the formulation of an initial research question, research in scientific databases, analysis and interpretation of selected articles, as well as the synthesis and presentation of the results obtained. This review also considered the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) recommendation. The queries were performed under the “CINAHL Complete” database. **Results:** With the methodology applied, a final set of six studies were obtained, which do not sustain the efficiency of external hip protectors on the prevention of falls in the elderly. **Conclusion:** There is no scientific evidence that the external hip protectors are beneficial in reducing the number of falls in the elderly people. Focused interventions in many risk factors are more advantageous, comparatively to simple interventions. It is suggested the realization of more research studies relatively to this topic.

Keywords: External Hip Protectors; Falls; Prevention, Elderly; Nursing Interventions.

1 Introduction

Human aging corresponds to a slow, gradual and an inevitable process leading to several morphological, functional, biochemical and psychological changes, which can contribute to the increased vulnerability and incidence of chronic diseases. The chronic diseases can be silent or symptomatic, compromising the quality of life as well as the functional and cognitive capacity of the elderly, often leading to acute episodes of their health condition, usually associated with cardiac, respiratory and cerebrovascular problems or falls-related injuries [1]. Falls are one of the main causes of death in the elderly population. Falls are considered an unintentional movement of the body to a lower position than the initial one, with multifactorial causes, which affect postural stability and consequently the autonomy of the elderly, as well as their quality of

life [2]. On the other hand, falls also has negative psychological effects on the elderly, causing them to feel ashamed, to lose confidence in themselves and, consequently, to potentiate their fears.

The family caregivers, in turn, also suffer from this event, as they start to ensure a significant part of the care that the dependents need, which of them are of great complexity and intensity. This entire situation requires some readjustment of the family dynamics, leading to an increase of its emotional, physical and economic burden.

In preventing falls, several risk factors must be considered, as the disability caused by the event will influence the family environment of the elderly, due to the levels of dependence that will arise when the functional limitations occur. This topic should be considered as a public health problem, and it will be increasingly necessary to implement measures aiming to reduce the occurrence of falls in the elderly population.

According to [3], to promote the prevention of falls, it is essential to consider the complexity of the several factors that involves this type of event and not to devalue the independence capacity of the elderly to perform their activities of daily living (ADL). The same author also states that financial investments are the "engine" for preventive measures to be implemented in the context of falls, with the aim of preserving the functional capacity of the elderly and allowing a better quality of their lives.

2 Objective

To evaluate the effectiveness of external hip protectors in the prevention of falls in the elderly.

3 Methods

3.1 Ethical aspects

This is a secondary study for which the Ethics Committee has not been asked for an opinion. The formulation of the problem fulfilled the principles of clarity, precision, objectivity, allowing the results to be assumed as a contribution to nursing care, with benefits for the elderly in a hospital context. The extraction and analysis of data from the studies used were developed in defense of the principle of respect for the results obtained by these researchers. The referencing of the authors met the standards of good academic and scientific practice.

3.2 Type of Study

An integrative literature review was chosen, with the purpose of knowing the "state of the art", about the research topic and, therefore, to contribute to the understanding and incorporation of the findings of this study in clinical practice. The methodological procedures used involved the following steps: 1) formulation of the research question; 2) definition of inclusion and exclusion criteria of the studies; 3) definition of the information to be extracted from the studies; 4) evaluation of the included articles; 5) presentation and discussion of the results and 6) synthesis of the knowledge found.

3.3 Methodological procedures

For the selection of articles and formulation of the research question, the PI[C]OD methodology was used: Target population (P); intervention (I); comparison (C); outcome - *outcome* (O); and type of study - *design* (D). The formulation of the research question serves as a guideline during the integrative literature review to achieve the previously established objective. For this reason, the following question was formulated: "In the *public hospital* patients, is there evidence to suggest that external hip protectors (*intervention*) can contribute to a reduction in the risk of falls (*outcomes*)?".

The EBSCOhost platform was the chosen support platform for the implementation of the previously formulated question and subsequent collection of the respective scientific publications. The search terms used were: "*elderly*", "*aged*", "*older*", "*elder*", "*geriatric*", "*falls prevention*", "*preventing falls*", "*prevent falls*", "*reduce falls*", "*hip protectors*", "*hip pads*", "*hip savers*" and "*hip protective underwear*". Using the use Boolean operators "*AND*" and "*OR*", the descriptors (search terms) were organized as follows:

“[(*elderly*) OR (*aged*) OR (*older*) OR (*elder*) OR (*geriatric*)] AND
[(*falls prevention*) OR (*preventing falls*) OR (*prevent falls*) OR (*reduce falls*)] AND
[(*hip protectors*) OR (*hip pads*) OR (*hip savers*) OR (*hip protective underwear*)]”

As for the inclusion criteria, articles in which the methodology focused on the research theme considered in this article were chosen, in order to answer the formulated research question, those published in scientific journals and peer-reviewed, with availability of full text, written in full in English or Portuguese languages, published between January 2009 and March 2019, available in the CINAHL Complete database.

Twenty-six articles were identified, where 7 of them were eliminated from the list because they were considered duplicates, resulting in a total of 19 articles. For the selection of the articles, it was necessary to interpret the title and the respective abstract, to understand if they met the inclusion and exclusion criteria. Furthermore, if the subject of the article was not clear, it was read in full, so that no article on the list that answered the research question was excluded. Thus, the process of selecting the articles was organized according to two phases: (i) 1st phase, it was based on reading the titles and their abstracts, in which 8 articles were chosen, as the others were excluded because they did not present any relationship with the topic under discussion; (ii) 2nd phase, they were read in full, resulting in a final set comprising 6 scientific publications (see Fig. 1).

For an in-depth and critical analysis of the methodological quality of the selected articles, they were evaluated based on the levels of evidence of Centre for Evidence – Based *Medicine* [4].

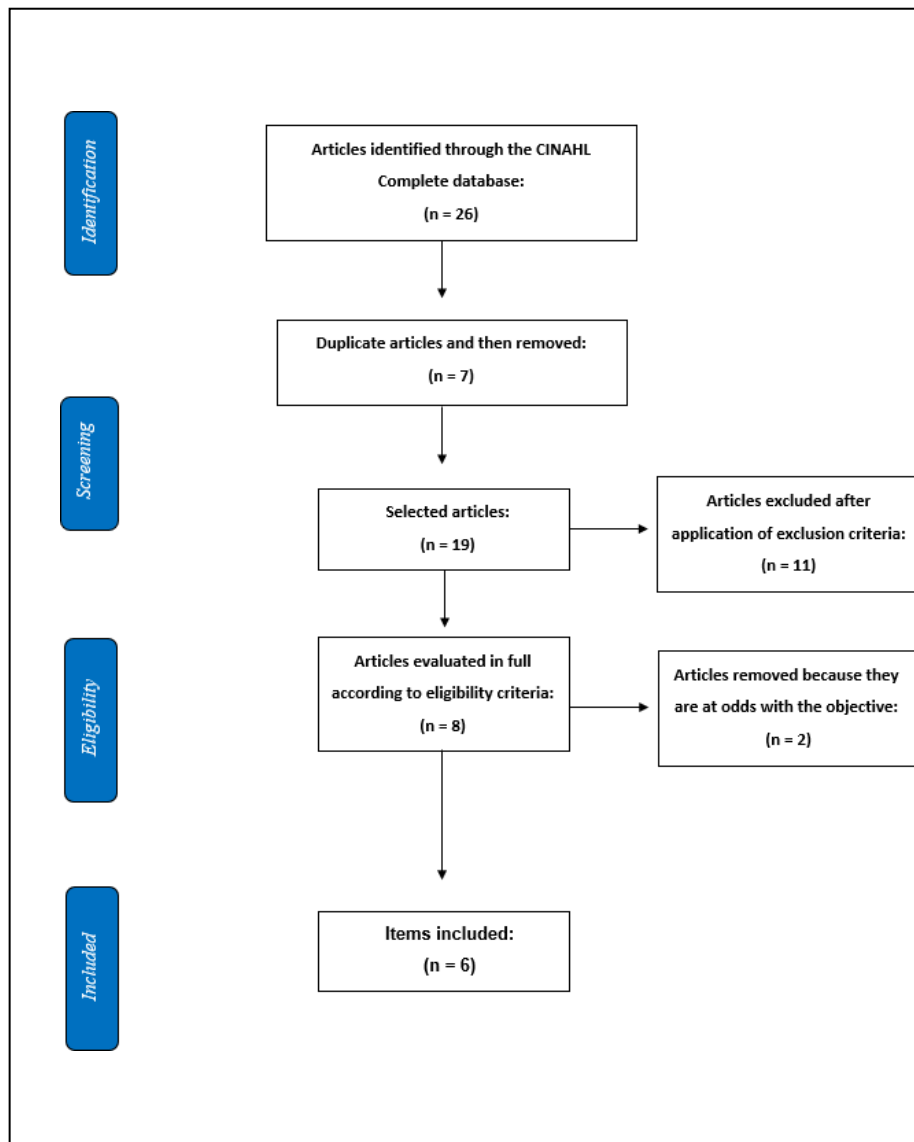


Fig. 1. PRISM flow diagram.

4 Results

After the analysis of the selected articles, the results of the integrative literature review are presented in Table 1.

Table 1. Results of the Integrative Literature Review.

References	Type of Study / Population	Objectives	Results	Study Limitations	NE/QM
[4]	Cohort Study / Health professionals (n=37) and the elderly (n=68) of a long-term care (LTC) residents	-Evaluate the attitudes of caregivers towards the use of PEQ at different times. -Describe the elderly's support to protective equipment. -Evaluate the differences in the characteristics of: (i) elderly who chose to wear the protector and elderly who refused to use; (ii) elderly who have joined and have not joined.	<ul style="list-style-type: none"> • 85% of the elderly agreed to use the PEQ. After 8 months, only 29% continued to use the equipment. • The health professionals considered that this withdrawal was caused by: pain, discomfort and lack of perception of the elderly about the usefulness of this equipment. • This study reveals that nurses have a fundamental role: in the evaluation of the situation of the elderly and their characteristics and in education about the usefulness of using PEQ. • Most of the nursing team, in both shifts, considers that the use of PEQ is feasible, important, beneficial and not time-consuming. • The profile of the elderly is considered a determining factor in the equipment's adhering (if the elderly is disoriented, there is a greater probability of refusal). • PeQ had no beneficial effect in reducing the number of hip fractures. • The study considers that the nursing team needs to have instructed for the appropriate use of the protector, because it influences their attitudes, and may have a clinical impact. 	-Small sample. -The elderly was not asked about disadvantages of the use of PEQ. -Requires further scientific validation of this equipment.	2B/B

[5]	SLR (included 20 ECAs)	-Assess the effectiveness of interventions in reducing the number of falls.	<ul style="list-style-type: none"> • In 4 ECs that intervened multi-factorially and in 3 that acted in a risk factor: there was a significant reduction in the rate of fall, recurrent fall and percentage of elderly who suffered fractures at the femur level. • Effective programs were considered: (i) individual assessment structured with safety recommendations; (ii) multidisciplinary program that includes strategies related to the context and specific for the elderly; (iii) intervention in multiple factors that predispose to the fall (education, adapted surrounding environment, balance, resistance training and PEQ); (iv) use of calcium supplements with vitamin D or just vitamin D; (v) review of prescribed medicines; (vi) multifactorial intervention (analysis of the evolution of the risk of fall and performance in general and specific interventions). 	<ul style="list-style-type: none"> -Heterogeneous population in articles. -Inconsistent results. -Different nomenclatures. -Cost versus efficacy was not assessed. 	1A/A
[6]	Cohort Study / Health professionals (n=39) and the elderly (n=27) of two long-term care (LTC) residents	<ul style="list-style-type: none"> -Observe the perceptions of the population in the decision to use the PEQ. -Identify the factors that influence their use. 	<ul style="list-style-type: none"> • The elderly expressed concern about the physical level of the equipment and questioned the need to use it. • The elderly felt that they had no choice but to use the PEQ, being the cause of this, the concern and the insistence of health professionals to persuade the elderly to use the equipment. • The study reveals that the decision-making capacity and the environment where the elderly are integrated influences the aid's. 	<ul style="list-style-type: none"> -More than 75% of the elderly had cognitive impairment. 	2B/B
[7]	SLR (included 10 MA)	-Identify the most beneficial intervention in the prevention of falls.	<ul style="list-style-type: none"> • 9 MA included interventions in long-term care (LTC) resident and 2 include measurements at hospital level. • In the units, scientific evidence is very inconsistent regarding physical exercise as a prevention of falls. Other interventions (vitamin D, PEQ, nutritional supplements or medication) also showed no benefit. • There is evidence that a multifactorial intervention leads to a reduction in the number of falls. 	<ul style="list-style-type: none"> -Limited number of MAs analyzed. -Results obtained through different evaluation methods. -Possibility of data overlap. 	1A/A

[8]	Cohort Study / Elderly (n=62000) long-term care (LTC) residents	-Evaluate the effectiveness of the implementation of the program (gym classes, evidence on falls and their prevention, adaptation of the environment, review of chronic medication, prescription of vitamin D, PEQ and education) with reassessment after 3 - 9 years.	<ul style="list-style-type: none"> • In general, the results were negative. • The gym classes were only attended by elderly with adequate cognitive and physical status (only 13.5%), with variable efficacy according to physical status and exercise intensity. • The PEQ had no benefit in reducing the fracture rate. These results may have been due to lack of adherence, uniform opinion about the benefit of these equipment and conflicts of interest between brands. 	<ul style="list-style-type: none"> -High turnover of health professionals. -Reduced fidelity of training program components. -Low standardization of employees' daily priorities. -Little investment in the implementation of drop prevention. 	2B/B
[9]	Cohort Study / Elderly (n=1923) long-term care (LTC) residents	-Evaluate the efficacy of PEQ in reducing the risk of fracture in institutionalize elderly (long-term care residents).	<ul style="list-style-type: none"> • PEQ scans were used about 60% of the times there were falls. • There was a higher tendency to use these protectors in elderly males, with cognitive impairment, heart diseases, debilitated, under anxiolytics and with urinary and/or intestinal incontinence. • PEQ led to an 18% reduction in fracture risk. 	<ul style="list-style-type: none"> -Limitation in the identification of the causes of falls. -Uncertainty when determining data accuracy. 	2B/B

5 Discussion

After analyzing the chosen articles, we highlight the lack of scientific evidence on which interventions that in fact prevent falls, in particular the one that addresses the use of external hip protectors. This topic has been studied by researchers and a right and uniform answer has not yet been found, so this topic should be the subject to further studies.

The scientific articles considered present some differences, namely in terms of the methodology used to assess the effectiveness of the interventions used. However, all assume common answers and highlight the lack of evidence about each intervention.

According to [5], nurses place external hip protectors and consider them important in preventing fall. On the other hand, in addition to the pain and discomfort they felt, the elderly did not believe in its effectiveness and considered it as a barrier in the performance of their ADL. After 8 months, there was no clear evidence that the external hip protector was effective in reducing the risk of hip fractures due to a fall event. In general, no benefit was identified in the incidence rate of hip fractures in relation to the use of this equipment. However, the use of these protectors should not be ignored, as it has resulted in the reduction of other types of injuries.

The authors in [8] state that there is no agreement regarding the physical exercise and vitamin D supplementation, as simple interventions, to reduce the consequences resulting from falls. In addition, there is no scientific evidence that the use of external hip protectors and medication are an option for the prevention of falls. Although the results are quite limited, multifactorial intervention is the ideal method for the prevention of falls in long-term care (LTC) resident and hospitals.

Corroborating the previous idea, the authors in [6] state that, due to the small number of studies included, there are inconclusive results in relation to multifactorial or individual interventions, as there has been no significant positive effect on the number of falls. Multifactorial intervention in people who are LTC residents seems more beneficial in preventing falls. The authors state that a careful approach is needed because programs that aim to reduce the number of falls can be ineffective or leading to some opposite effects.

The authors in [10] state that LTC residents with established risk factors for falls were more likely to accept and adhere to the use of hip protectors, e.g., those with wandering behavior, cardiac dysrhythmia, who presented some moderate to severe health cognitive impairment, or bladder incontinence, in which the use of these devices have been shown to be effective in preventing hip fractures. The research work also mentions the scarcity of research on dissemination and implementation strategies that promotes the adherence of external protective hip protectors by the elderly.

For the authors in [7], adhering to external hip protectors is not a complex process. However, they state that it is very important to recognize the very fine balance between the elderly preferences and what are the most appropriate fall preventing measure that need to be adopted in each case. To accomplish this, they recommend that qualified people (social assistants, physiotherapists, occupational therapists, or psychologists) intervene with this target population, so that they accept their limitations and vulnerabilities and assume behaviors that protect them from possible injuries.

According to the authors in [9], the lack of resources was the main reason why the implementation of their program did not bring true benefits. They recommend a greater investment to ensure a real change in the measures and processes to be implemented in LTC residents, or even the adoption of an entirely new set of measures, about the use of hip protectors in the prevention of fractures caused by a fall event.

6 Conclusions

Fall prevention is a situation that involves caregivers, family members and health professionals. It is considered that the risk of falls is a diagnosis that must be made by the nursing team, which must adopt the necessary interventions aimed at preventing falls. From the assessment of the elderly regarding the risk of falls, nursing team should implement actions aimed at reducing or even avoiding fall events [11].

Considering the impact that falls can have, there is a need to develop a specific and appropriate plan for each elderly, which include associated preventive strategies. From the analysis of the articles published to date, it was noticed that the prevention of falls is a very complex and multifactorial process. The various authors concluded that there is no evidence (based on clinical practice) of the benefit in the prevention of falls, through interventions that act on only one risk factor.

After analyzing the results and methodological limitations of the studies presented, no significant scientific evidence was found that currently recommends the use of external hip protectors, since they do not have a significant impact on reducing the number of falls. This theme is extremely important, so it is necessary to carry out further studies, to create plans/protocols that are beneficial in the prevention of falls at hospital level.

References

1. Goes, M., Lopes, M.J., Oliveira, H. et al. A Nursing Care Intervention Model for Elderly People to Ascertain General Profiles of Functionality and Self Care Needs. *Sci Rep* 10, 1770. <https://doi.org/10.1038/s41598-020-58596-1>.
2. Sabino, L. (2018). Prevention of the Risk of Fall in hospitalized elderly: contributions of the Nurse Specialist in Rehabilitation Nursing [Master's Thesis, University of Évora].
3. Luzardo A., Junior N., Medeiros M., Wolkers P. & Santos S. (2018). Repercussions of hospitalization by fall of the elderly: health care and prevention. *Brazilian Journal of Nursing*, 71(2), 816-822. <http://dx.doi.org/10.1590/0034-7167-2017-0069>
4. Centre for Evidence-Based Medicine. (2009). Oxford Centre for Evidence-based Medicine—Levels of Evidence. <http://www.cebm.net/index.aspx?o=1025>
5. Milisen, K., Coussement, J., Boonen, S., Geeraerts, A., Druyts, L., van Wesenbeeck, A., Abraham, I., & Dejaeger, E. (2011). Nursing staff attitudes of hip protector use in long-term care, and differences in characteristics between adherent and non-adherent residents: A survey and observational study. *Journal of the American Medical Directors Association*. 48(2), 193-203. <https://doi.org/10.1016/j.jnurstu.2010.07.008>
6. Neyens, J., van Haastregt, J., Dijcks, B., Martens, M., van den Heuvel, W., de Witte, L., & Schols, J. (2011). Effectiveness and Implementation Aspects of Interventions for Preventing Falls in Elderly People in Long-Term Care Facilities: A Systematic Review of RCT's.

- Journal of the American Medical Directors Association. 12 (6), 410-425. <https://doi.org/10.1016/j.jamda.2010.07.018>
7. Sims-Gould, J., McKay, H., Feldman, F., Scott, V., & Robinovitch, S. (2014). Autonomy, Choice, Patient-Centered Care, and Hip Protectors: The Experience of Residents and Staff in Long-Term Care. *Journal of Applied Gerontology*. 33(6). 690-790.
 8. Stubbs, B., Denkinger, M., Brefka, S., & Dallmeier, D. (2015). What Works to prevent falls in older adults dwelling in long term care facilities and hospitals? An umbrella review of meta-analyses of randomized controlled trials. *Journal of the American Medical Directors Association*. 81(3), 335-342. <https://doi.org/10.1016/j.maturitas.2015.03.026>
 9. Roigk, P., Becker, Schulz, C., König, H.-H., & Rapp, K. (2018). Long-Term evaluation of the implementation of a large fall and fracture prevention program in long-term care facilities. *BMC Geriatrics*. 18, 233 <https://doi.org/10.1186/s12877-018-0924-y>
 10. Korall, A., Feldman, F., Yang, Y., Cameron, I., Leung, P.-M., Sims-Gould, J., Robinovitch, S. (2019). Effectiveness of Hip Protectors to Reduce Risk for Hip Fracture from Falls in Long-Term Care. *Journal of the American Medical Directors Association*. 20(11), 1397-1403. <https://doi.org/10.1016/j.jamda.2019.07.010>
 11. Machado T., Oliveira, C., Costa, F., & Araújo, T. (2009) Assessment of the presence of risk for fall in the elderly. *Electronic Journal of Nursing*. 11(1), 32-38. Available in: <http://www.fen.ufg.br/revista/v11/n1/v11n1a04.htm>