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Constructing and Validating the Intervention Practices and Behaviors Scale for Preventing Falls among the Institutionalized Elderly [Version 1, 3 Approved with Reservation]

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Abstract

Objective: Constructing a multidimensional scale to evaluate intervention practices and behaviors for preventing falls among the elderly living in long-term care institutions and determining their psychometric features.

Methods: Methodological study. In addition to reviewing the literature and referring to experts, in-context observation took place to design the scale. The sample consisted in 152 assistants from 6 nursing homes.

Results: The constructed and validated scale is multidimensional, consisting of 4 dimensions that have good Cronbach's alpha values: 1) Application Practices and Behaviors of the Safety Measures/Guidelines (α=0.936); 2) Fall Prevention Practices and Behaviors During Elderly Care (α=0.942); 3) Fall Prevention Practices and Behaviors Related to the Physical Environment (α=0.933); and 4) Fall Prevention Behaviors and Practices Related to Elderly Information and Education (α=0.924).

Conclusion: The scale shows good psychometric features and it may be used in research and clinical practice to evaluate caregivers' practices and behaviors.

Keywords
Falls; Elderly; Behaviors; Caregivers; Psychometry

Introduction

Accidents with the elderly population are a challenge, not only because they represent the fifth cause of death above 65 years, but also because of comorbidities [1,2] chronic pain [1], resulting temporary and permanent disabilities, with adverse effects on functionality, constituting a significant contributory factor for dependence in this age group, increasing economic and human costs [3].

In Great Britain, an elderly person dies every 5 hours as a consequence of a fall, and 30% of the population over 65 years of age and 32% to 42% over 75 years of age fall at least once a year [4]. In the USA, 34% of those living in rest homes experienced at least a fall within the last 180 days and 9% within the last 30 days [4].

The incidence is higher than that of older residents, because an elderly person who arrives at a long-term care facility enters an unknown environment [5], she/he does not know the staff, something which makes risk identification and control a greater challenge among the new residents [5] and decreases confidence, thus increasing risk [6]. On the other hand, the institutionalized population is less independent and more frequently affected by chronic diseases when compared to community-dwelling individuals [7]. Physical space and the very presence of employees make the environment different from the household and they may become increased risks in themselves [7].

In order to control the incidents that can result in a fall, it is worth equipping professionals with knowledge and skill to assess and control risk factors and fall episodes [3]. This implies that, in addition to understanding the intrinsic risk factors, environmental and behavioral factors observed in the genesis of fall episodes are studied.

In our case, this need goes through the practices developed and the behaviors exhibited by caregivers of the institutionalized elderly.

Since no instruments were identified to evaluate this phenomenon, this research aimed to construct and validate a multidimensional scale of intervention practices and behaviors for preventing falls among the institutionalized elderly.

Methods

To achieve the objectives, a methodological study has been carried out.

Sample

The target population consisted in caregivers from facilities for the elderly in the Lisbon region, Portugal. As for sample size and considering that it was intended to conduct a factor analysis to validate the construct, since the scale is multidimensional and the largest dimension had 21 items, we follow the authors indicating that the sample size should be 5 to 10 individuals per item and larger than 100 individuals [8,9].

A total of 232 instruments were distributed to institutions that agreed to participate in this study, with 152 responses (65.52%). Thus, the sample consisted in 152 caregivers, all of them women, who work in 6 nursing homes in the Lisbon region.

Instrument

The data collection instrument consisted of two parts: the first included sociodemographic and professional data and the second included the scale constructed to evaluate caregivers intervention practices and behaviors for preventing falls among the institutionalized elderly.

This multidimensional scale consists of 4 dimensions: 1. Application Practices and Behaviors of the Safety Measures/ Guidelines; 2. Fall Prevention Practices and Behaviors During Elderly Care; 3. Fall Prevention Practices and Behaviors Related to the Physical Environment; and 4)Fall Prevention Behaviors and Practices Related to Elderly Information and Education.

Literature review, observation and recording of work routines in an institution, and interviews with professionals allowed us to know the context and define the items to be placed on the scale. The latter seeks to determine the frequency with which a caregiver believes to have provided a certain fall prevention intervention for the institutionalized elderly, using a Likert-type scale whose 5 answer options are: never; few times; sometimes; many times; and always.

Once the first version of the scale and its dimensions were constructed, we resorted to a group of experts in the area under study and in the area of design and construction of measuring instruments to validate its content. A pre-test was also performed with 23 caregivers from a long-term care institution for the elderly. This allowed us to examine the form and content of instruments, namely in relation to clarity, comprehensibility of items, and average filling time [10].

Due to interpretability issues, 2 items were reformulated. The entire instrument took, on average, 15 minutes to be filled.

Procedures

Expert opinion was asked to the Ethics Committee of the Portuguese Catholic University to carry out this research, which was approved.

Data collection was conducted through a questionnaire without researcher presence. To ensure anonymity, two 'ballot boxes' were placed at one room in the institution, one to put the consent form and the other to put the instruments. These 'ballot boxes' were opened 15 days later.

Results

Respondents' average age was 47.0±10.3 years; they pursue the profession, on average, for 13.1±8.35 years and work in the institution for 11.9±8.19 years.

In order to make it easier to read the results, we show the construct's fidelity and validity for each dimension.

The initial version had 64 items, distributed into 4 dimensions, and after determining the psychometric features, they were organized into 4 dimensions and 54 items.

The criteria for excluding items were:

a. Low Pearson's correlation coefficient (r<0.20).

b. Items with α values higher than the Cronbach's alpha global value [8,9].

c. For factorial analysis in main components, we used Varimax-type orthogonal rotation, and factor extraction with values of their own greater than one. Cattell, or scree plot, graph was used to prove the number of factors to be retained (which, due to space constraints, were not included in this study), and the Kaiser-Keyer-Olkin (KMO) test and Bartlett's index were used to assess the quality of correlations between variables and test the factorial matrix validity [8,9].

d. For statistical processing purposes, non-responses were replaced by the average value of valid cases in the variable, whenever in all the questionnaire items the percentage of 'non-responses' was 3%, i.e. less than 10% [8].

Dimension Application Practices and Behaviors of the Safety Measures/Guidelines

Fidelity

This scale dimension has a 0.936 Cronbach's alpha value for 11 items.

Total correlation without the item varies between 0.643 and 0.798 and the Cronbach's alpha coefficient value, if the item was excluded, varies between 0.927 and 0.934, values lower than the overall alpha, confirming that the scale is reliable to apply to the study sample (Table 1).

Table 1: Pearson's correlation of items in Dimension 1 and Cronbach's alpha of items with the total, without the item. Lisbon, 2013.

Number and content of items	Pearson's correlation of the total without the item	Cronbach's α without the item
1. I only decide the preventive measures to be applied after identifying the risk factors	0.704	0.931
2. I know the resources existing in the institution that allow us to prevent falls	0.785	0.927
3. I use the resources that allow the elderly to remain safe	0.778	0.928
4. I use safety measures in the various fall-risk situations	0.793	0.927
5. I select fall prevention measures according to the identified risk factors	0.753	0.929
6. In everyday work, I deploy measures to prevent falls	0.669	0.932
7. I think about the techniques I use in my interventions	0.732	0.929
8. I try to be perseverant in choosing the best fall prevention measures	0.723	0.930
13. I am attentive to the elderly fall prevention strategies	0.798	0.926
52. I apply nurses' guidelines on fall prevention measures	0.643	0.934
53. I try to solve problems that put the elderly safety at risk	0.681	0.931
Total alpha 0.936		

Construct validity

As observed in Table 2, studying the factorial analysis showed that the 11 items are grouped only into a factor that explains 61.744% of variance. It is worth noticing that all commonality values are higher than 0.50, i.e. they account for at least 25% of the variance [8].

Table 2: Main components matrix, after Varimax rotation, of the 11 items in Dimension 1. Lisbon, 2013.

Number and content of items	H^2	F1
1. I only decide the preventive measures to be applied after identifying the risk factors	0.572	0.736
2. I know the resources existing in the institution that allow us to prevent falls	0.690	0.819
3. I use the resources that allow the elderly to remain safe	0.689	0.830
4. I use safety measures in the various fall-risk situations	0.703	0.825
5. I select fall prevention measures according to the identified risk factors	0.642	0.779
6. In everyday work, I deploy measures to prevent falls	0.531	0.710
7. I think about the techniques I use in my interventions	0.629	0.806
8. I try to be perseverant in choosing the best fall prevention measures	0.611	0.767
13. I am attentive to the elderly fall prevention strategies	0.704	0.838
52. I apply nurses' guidelines on fall prevention measures	0.485	0.671
53. I try to solve problems that put the elderly safety at risk	0.535	0.702
Kaiser-Meyer-Olkin Measure		0.919
Bartlett's sphericity test=1,125.296; p<0.001		

Dimension Fall Prevention Practices and Behaviors During Elderly Care

After determining the psychometric features (Table 3), this dimension remained with 15 items (it lost 6), distributed into two factors, as presented below.

Table 3: Pearson's correlation of items in Dimension 2 and Cronbach's alpha of items with the total, without the item. Lisbon, 2013.

Number and content of items	Pearson's correlation of the total without the item	Cronbach's α without the item
23. When I bring the elderly person up, before putting her/him in the standing position, I sit her/him down on the bed for a few seconds, with her/his feet flat on the floor	0.774	0.936
24. I check whether the elderly person has her/his feet flat on the floor before putting her/him in the standing position	0.805	0.936
25. I sit the elderly people with balance changes down on couches/chairs with side armrests	0.771	0.937
29. I schedule regular visits to health facilities for incontinent elderly people	0.691	0.939
30. I schedule regular visits to health facilities for the elderly with gait difficulties	0.713	0.938
31. I help the elderly with walking difficulties to go to the bathroom	0.753	0.937
33. I keep the urinal/trawler accessible to the elderly at night	0.579	0.942
34. I put rails in the bed of the elderly who are confused/agitated	0.742	0.937
35. I use restraint belts (in the waist) in the agitated/confused elderly when they are sitting down	0.727	0.938
37. I help the elderly with balance changes to walking, dressing/undressing	0.790	0.936
54. I keep the technical aids (wanderer, Canadian, cane) within the elderly reach	0.658	0.939
15. I choose safe clothes	0.678	0.939
16. I choose to use closed shoes with non-slip sole	0.607	0.941
14. I choose right shoes for the elderly	0.664	0.940
51. When the elderly person asks for help to carry out an activity, I do it promptly	0.680	0.939
Total alpha 0.942		

Table 4: Analysis of the main components in Dimension 2 with Varimax rotation and Kaiser normalization. Lisbon, 2013.

Number and content of items	H2	F1	F2
23. When I bring the elderly person up, before putting her/him in the standing position, I sit her/him down on the bed for a few seconds, with her/his feet flat on the floor	0.668	0.717	
24. I check whether the elderly person has her/his feet flat on the floor before putting her/him in the standing position	0.798	0.841	
25. I sit the elderly people with balance changes down on couches/chairs with side armrests	0.668	0.723	
29. I schedule regular visits to health facilities for incontinent elderly people	0.558	0.586	
30. I schedule regular visits to health facilities for the elderly with gait difficulties	0.571	0.598	
31. I help the elderly with walking difficulties to go to the bathroom	0.756	0.826	
33. I keep the urinal/trawler accessible to the elderly at night	0.396	0.540	
34. I put rails in the bed of the elderly who are confused/agitated	0.630	0.767	
35. I use restraint belts (in the waist) in the agitated/confused elderly when they are sitting down	0.619	0.719	
37. I help the elderly with balance changes to walking, dressing/undressing	0.809	0.858	
51. When the elderly person asks for help to carry out an activity, I do it promptly	0.670	0.809	
54. I keep the technical aids (wanderer, Canadian, cane) within the elderly reach	0.551	0.718	
14. I choose right shoes for the elderly	0.837		0.869
15. I choose safe clothes	0.812		0.840
16. I choose to use closed shoes with non-slip sole	0.734		0.830

Fidelity

The 15 items in this dimension have Pearson's correlation values of the total without the item higher than 0.579 and Cronbach's alpha values higher than 0.936 and lower than or equal to 0.942 (total value), something which means that, in terms of internal consistency and homogeneity, this dimension shows good features, as observed in Table 3.

Table 5: Pearson's correlation of items in Dimension 3 and Cronbach's alpha of items with the total, without the item. Lisbon, 2013.

Number and content of items	Pearson's correlation of the total without the item	Cronbach's α without the item
17. I adapt the elderly's room space in order to favor her/his mobility	0.698	0.928
18. I remove obstacles that make walking in the room difficult	0.701	0.928
19. I adjust the bed height again at night, so that it is lower	0.589	0.931
20. I keep the bed wheels locked	0.567	0.931
21. I keep the chair locked whenever it is not moving	0.671	0.928
26. I check whether the bathroom floor is not slippery/wet several times during the work shift	0.692	0.928
27. Before hygiene care, I make sure the floor is not slippery	0.671	0.928
28. Before the elderly go to W.C., I make sure the floor is dry	0.648	0.929
32. I keep the side support bars in the bathroom in the position to use	0.609	0.930
39. I keep personal belongings within the elderly reach	0.500	0.932
40. I keep the bedside table within the elderly reach	0.550	0.931
41. I check if material is safe	0.736	0.927
42. I put the clothes that will be dressed in an easy access place for the elderly	0.638	0.929
47. I keep the circulation areas clear	0.773	0.927
48. I make sure that the circulation areas are well lit	0.746	0.927
43. I check whether the bathroom light is on at night	0.628	0.930
49. I make sure, at night, that the bell is within the elderly reach	0.607	0.930
50. I make sure, at night, that the room light is within the elderly reach	0.603	0.930
Total alpha		0.933

Table 6: Analysis of the main components in Dimension 3 with Varimax rotation and Kaiser normalization. Lisbon, 2013.

Number and content of items	H^2	F1	F2	F3
17. I adapt the elderly's room space in order to favor her/his mobility	0.663	0.733		
18. I remove obstacles that make walking in the room difficult	0.755	0.732		
19. I adjust the bed height again at night, so that it is lower	0.621	0.591		
20. I keep the bed wheels locked	0.542	0.699		
21. I keep the chair locked whenever it is not moving	0.648	0.731		
26. I check whether the bathroom floor is not slippery/wet several times during the work shift	0.617	0.656		
27. Before hygiene care, I make sure the floor is not slippery	0.784	0.737		
28. Before the elderly go to W.C., I make sure the floor is dry	0.694	0.767		
32. I keep the side support bars in the bathroom in the position to use	0.539		0.587	
39. I keep personal belongings within the elderly reach	0.460		0.651	
40. I keep the bedside table within the elderly reach	0.647		0.682	
41. I check if material is safe	0.744		0.772	
42. I put the clothes that will be dressed in an easy access place for the elderly	0.644		0.736	
47. I keep the circulation areas clear	0.748		0.729	
48. I make sure that the circulation areas are well lit	0.689		0.678	
43. I check whether the bathroom light is on at night	0.562			0.588
49. I make sure, at night, that the bell is within the elderly reach	0.828			0.845
50. I make sure, at night, that the room light is within the elderly reach	0.827			0.858

Construct validity

The 15 items of factorial analysis with Varimax rotation are organized into 2 factors and they explain 67.17% of the variance (42.89% for the first factor and 24.89% for the second). The factor that explains the maximum variance is related to processes of the musculoskeletal system, both to promote mobility and to restrict it. The second factor is related to dressing and putting shoes on.

Although the second factor has only 3 items, it was decided to keep it, since in the literature review it became clear that

a significant percentage of the elderly fall because of inappropriate clothing and footwear.

Some items (26, 28, 32, 33, 37, 39) had a 'load' on both factors, as the difference was >0.1, we chose to leave them in the factor where they weighed the most (Table 4).

The KMO value was 0.909 and that of the Bartlett sphericity test was 1,903.086; p<0.001 confirms the quality of this analysis.

Dimension Fall Prevention Practices and Behaviors Related to the Physical Environment

Fidelity

The third dimension has a 0.933 Cronbach's alpha value, for the 18 items that constitute it, and 2 items were excluded (Table 5).

The total-item correlation that varies between 0.500 and 0.773 and the Cronbach's alpha coefficient value, if the item was excluded, varies between 0.927 and 0.931.

Construct validity

For factorial analysis, this dimension has a KMO value regarded as good, KMO=0.874, as well as the Barttlet test p<0.001 (X^2=1,903,195). The 18 items were organized into 3 factors that explain 66.74% of the variance (26.643% for the first factor, 23.98% for the second, and 16.11% for the third).

The 1st factor groups the set of items referring to the practices and behaviors performed by assistants that aim to maintain space and equipment in safe conditions (Table 6).

The 2nd factor adds the set of items referring to the practices and behaviors that allow us to prevent falls related to the elderly accessibility to spaces and materials (Table 6).

The 3rd factor refers to maintenance practices and behaviors towards the lighting and signaling devices (Table 6).

Dimension Fall Prevention Behaviors and Practices Related to Elderly Information and Education

Fidelity

This dimension has an α=0.924 for the 9 items that make it up, two less than its initial version. The total-item correlation varies from 0.627 to 0.790. The effect of each item on the scale was also calculated, i.e. the Cronbach's alpha coefficient value if the item was excluded, varying between 0.910 and 0.921, and none of the items has Pearson's correlation values lower than 0.20 and Cronbach's alpha values higher than 0.924 (overall value), something which shows that this dimension on the scale has good psychometric features (Table 7).

Table 7: Pearson's correlation of items in Dimension 4 and Cronbach's alpha of items with the total, without the item. Lisbon, 2013.

Number and content of items	Pearson's correlation of the total without the item	Cronbach's α without the item
9. I try to warn the elderly about the risk for falls	0.767	0.912
10. I explain to the elderly the risk factors for falls	0.745	0.914
11. I inform the elderly with risk for falls on the preventive measures appropriate to her/his situation	0.745	0.914
12. I encourage the elderly to adopt safe behaviors	0.804	0.910
22. I explain to the elderly how to get out of bed	0.726	0.915
36. I encourage the elderly to walk	0.627	0.921
44. I encourage the elderly to use the guardrails in corridors/stairs	0.790	0.911
45. I inform the elderly about using the bell	0.689	0.917
46. I inform the elderly about using the presence light	0.662	0.921
Total alpha		0.924

Table 8: Analysis of the main components in Dimension 4 related to the elderly information and education with Varimax rotation. Lisbon, 2013.

Number and content of items	H2	F
9. I try to warn the elderly about the risk for falls	0.691	0.820
10. I explain to the elderly the risk factors for falls	0.657	0.795
11. I inform the elderly with risk for falls on the preventive measures appropriate to her/his situation	0.659	0.798
12. I encourage the elderly to adopt safe behaviors	0.737	0.855
22. I explain to the elderly how to get out of bed	0.622	0.793
36. I encourage the elderly to walk	0.491	0.716
44. I encourage the elderly to use the guardrails in corridors/stairs	0.703	0.832
45. I inform the elderly about using the bell	0.559	0.741
46. I inform the elderly about using the presence light	0.534	0.709
Bartlett=861, 782; p<0.001		

Construct validity

The 9 items in this dimension use the Kaiser rule and enable the definition of two factors. However, as content and interpretation criteria, we have chosen to force only one factor. Considering the values for KMO=0.914 and the significance in Bartlett's sphericity test (p<0.001), we may claim to be before a good factorial analysis [8], where all variables are significantly correlated. A single factor accounts for 61.745% of the total variance (Table 8). The final dimensions on the scale score as follows: Application Practices and Behaviors of the Safety Measures/Guidelines (11-55 points); Fall Prevention Practices and Behaviors During Elderly Care (15-75 points); Fall Prevention Practices and Behaviors Related to the Physical Environment (18-90 points); and Fall Prevention Behaviors and Practices Related to Elderly Information and Education (9-45 points).

Discussion

The constructed and validated scale has good properties. The maximum score represents the continuous (always) maintenance of a set of safety practices and behaviors that allow us

to introduce in clinical practice the evidence of what is a fall prevention measure with the elderly living in institutions.

Employee education on fall prevention and risk assessment is a practice pattern [11]. Any preventive program should encourage active participation of the elderly and caregivers, by providing oral and written information on preventive measures [3]. We believe that before introducing the programs, the assistants' practices and behaviors should be monitored to adapt the program to the team's needs or to the professional individual needs, as well as to evaluate its very effectiveness.

Some researchers report that, in order to prevent falls, it is necessary to assume that all residents are at risk of falling, repeating the fall, suffering injury, or dying as a consequence of the latter, only in this way we achieve an adequate approach, which must have three levels: organizational; each unit/professional; and the elderly [11].

When constructing the scale we presented, we felt the need for team commitment and we believe that a nurse is the professional best positioned to be the manager of this process [12], so the first dimension evaluates the team's practices and behaviors when applying the safety measures/guidelines, according to the perception of caregivers.

In the context of the second dimension, the way how equipment and activities are organized may not allow continuous surveillance of all elderly people in all spaces, including the street, but being alert to the elderly strategies implies a work of continuous surveillance of the independent elderly or those with partial dependence and replacement of the elderly in her/his self-care whenever she/he cannot perform it her/himself.

Not exhausting preventive measures, bed height adjustment, the use of non-slip socks, adequate lighting, and the use of hip protectors [13], vitamin D supplements, increased monitoring and ensuring frequent toilet visits, in the case of incontinent elderly people [14], has a beneficial effect to reduce the prevalence of falls.

The very observation and surveillance should be included in fall prevention programs in institutions for the elderly [12,15]. There is also evidence that interventions combining multiple components and developed in multidisciplinary teams can effectively reduce the number of falls [15].

A measure widely used in Portuguese institutions that has no proven efficacy is the use of restriction, which has to be considered in detail and discussed with family members and employees [15]. An alternative to physical restriction is lowering beds and wearing hip protectors [14].

Nevertheless, these interventions do not exhaust the identification of needs for preventive measures and DAA education and the intervention that a nurse must provide to these professionals in order to change caregivers' unsafe practices and behaviors [12].

The third dimension reports on fall prevention practices and behaviors related to the physical environment. Physical environment and space organization in long-term institutions represent a multiplicity of risk factors [15], the mere fact of being different from home increases danger [7]. Thus, in addition to identifying the elderly with a high risk for fall [15] and using prevention protocols, the physical environment, the furniture, must be adapted to ensure safety [16].

The fourth dimension addresses communication as a central element in a fall prevention program [3]. Improving communication between residents and professionals on preventive measures and health promotion can ensure that adequate and specific interventions are developed in order to reduce the incidence of falls [3]. Health professionals should observe and incorporate knowledge and experience provided by people who have experienced a high risk of falls and how they control risk [18]. The practitioner responsible for the prevention program should be proactive in promoting and introducing international care guidelines in nursing homes, especially with regard to preventive measures [3].

Education, supervision, and leadership, coupled with evidence-based policies and procedures, have a positive impact on care for residents [3], because improving the quality of programs implies improving attitudes and behaviors and understanding the organization's characteristics that influence these attitudes and behaviors [19].

Conclusions

mong all the focuses of attention, for the health area in general and for nursing in particular, falls have been a calamity for which a solution is urgently needed, as it is the milestone that prevents the long-awaited active aging combined to quality of life.

This phenomenon has been regarded as a rising public health problem. In the case of fall prevention, research conducted in recent years has indicated that it is possible to reduce its incidence by introducing a fall-risk assessment scale and individualized interventions, aimed at the identified risk.

Research at the international level has identified risk factors and fall prevention measures for the elderly living in long-term institutions, but the evidence is less significant than that for the community-dwelling elderly, and study results are not consensual in relation to the various risk factors and interventions, something which indicates the need for further research.

The constructed and validated scale shows good psychometric features, and this allows its use in clinical practice, education, and research to determine the best caregivers' practices and behaviors in order to prevent the occurrence of falls.

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