Rate of accidental falls in institutionalised older people with and without cognitive impairment halved as a result of a staff-oriented intervention

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Abstract

Objective: to evaluate the impact of a staff-oriented intervention on the number of accidental falls in residents with and without cognitive impairment.

Design: clustered randomised controlled trial.

Methods: ten nursing wards from 7 nursing homes were randomised in a control (5 wards) and intervention (5 wards) group. The nurses from the intervention group received multi-faceted training about the occurrence of accidental falls, risk factors for falls and possible environmental modifications. For each fall they were asked to record the relevant risk factors, to keep a fall diary and to evaluate fall causes and possible preventive actions. For all residents, cognition and mobility were evaluated using a Mini-Mental State Examination (MMSE) and a Timed Up and Go Test (TUGT). Fall rates were recorded in an identical way for 6 months before and after the start of the intervention.

Main outcome measures: primary outcome measure was the number of participants with at least one accidental fall requiring an intervention by a physician or a nurse during each period of recording. Secondary outcome was the number of falls for each participant during each period of recording.

Results: the relative risk of falling at least once in people of the intervention versus the control group adjusted for the pre-intervention results was 0.46 (95% CI: 0.26-0.79). There was no difference between residents with and without cognitive impairment or impaired mobility. In those falling at least once, the difference between the average number of falls in the two intervention arms was not significant ($P = 0.10$).

Conclusion: a simple staff-oriented intervention had a substantial effect on the frequency of accidental falls.

Keywords: accidental falls, elderly, dementia, staff-oriented intervention

Introduction

Falls are a major cause of disability and mortality in the elderly, and therefore, represent an important health problem [1–3]. The findings of Oliver et al. [4] suggest that despite the pressing importance of preventing falls and fractures in hospitals and care homes, the evidence is inconclusive for multi-faceted interventions in care homes and single interventions (except hip protectors) in either setting in reducing fall rates, risk of falling or fracture rates.

Together with, for example, poor gait and impaired balance, dementia is known to be an independent risk factor for falling [5]. Nevertheless, studies on prevention programs for this population are rare.

We aimed to determine the effectiveness of an intervention program on the fall incidence among institutionalised elderly people with and without cognitive impairment. The intervention consisted of education of the nursing team, the use of fall diaries and a critical analysis of causes and possible preventive actions.

Participants and methods

Design

A clustered randomised clinical trial with the wards as the units of intervention.

Patients

Seven nursing homes were invited and agreed to participate in this study. Nursing wards were randomly assigned to the control or intervention group using computer software. In four nursing homes there was only either an intervention...
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group or a control group because these were smaller nursing homes with one charge nurse. In three homes, a total of six wards were randomised within the homes. Both the intervention group (n = 210) and the control group (n = 169) contained five nursing wards. All conscious residents were eligible for the study.

Due to the normal turnover of residents in a nursing home, the residents during the baseline and post-intervention period were not completely the same. For our analysis, this was acceptable as the randomisation, intervention and outcome measurement were primarily related to the ward and not the individual resident.

**Intervention**

The study consisted of three phases (Figure 1). In the pre-intervention phase (6 months) accidental falls were retrospectively recorded using the standard nursing files.

The intervention phase (6 weeks) started in the intervention group with multi-faceted training for the nursing staff on risk factors for falls and possible environmental or behavioural modification, reinforced by reminders. We organised the training at moments of low staff occupation, e.g. afternoon, evening. Therefore, most nurses could be present at the training. Nurses, who were not able to come, received copies of the slides and were contacted to ask if they had any questions. Nurses who started working after the start of the intervention were not addressed separately. Nurses kept a fall diary and for each fall they were asked to list the risk factors and possible interventions to prevent subsequent falls with a similar cause. A more detailed questionnaire concerning fall risk factors, chronic medication and co-morbidity was completed for each elderly person in the intervention group. These actions were not performed in the control group. Both the elderly people in the intervention group and those in the control group were evaluated for cognition and mobility by a Mini-Mental State Examination (MMSE) [6] and a Timed Up and Go Test (TUGT) [7]. In the post-intervention phase (6 months) fall rates were collected again for a period of 6 months, again using the standard nursing files, and the results were retrospectively recorded from these files, identical to baseline measurement.

**Measures**

The MMSE [6] was administered as a screening instrument for cognitive impairments. It probably is the most widely used measure of cognitive function. In the MMSE, different domains are assessed: orientation in time and place, remembering three words, attention and calculation, recall of

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**Figure 1. Flowchart.**

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Nursing wards participating in the study (n = 10 wards)

Randomisation

Intervention group (n = 5 wards) (n = 210 patients)

Allocation 1 February 2004

Lost to follow-up (n = 0 wards)

Pre-intervention phase 1 August 2003 – 1 February 2004

Intervention (n = 5 wards) Excluded from analysis (n = 0 wards)

Analysed (n = 5 wards) Excluded from analysis (n = 203 patients)

Post-intervention phase 15 March 2004 – 15 September 2004

Control group (n = 5 wards) (n = 169 patients)

Lost to follow-up (n = 0 wards)

No intervention (n = 5 wards) Excluded from analysis (n = 0 wards)

Analysed (n = 5 wards) Excluded from analysis (n = 158 patients)
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three words, language and visual construction. The maximum score is 30 points, indicating excellent cognitive function. A cut-off score <23 was used to select participants with cognitive impairment [8].

In the TUGT [7], the person is observed while he rises from an arm chair, walks 3 m, turns, walks back, and sits down again. Time is registered, and more than 16 s to complete this task is abnormal [9]. The same test is completed a second time in combination with a cognitive task; both tasks should be performed simultaneously [10]. For this task a person should be able to understand the assignment, to plan and perform an action, he needs good stability and balance and good neuro-motorical condition.

Risk factors for falling that were considered were: degree of independency (for toilet use, continence and mobility), the use of walking aids (cane or walker), use of restraints, gait (unsteady), cognitive state, continence, medical diagnoses, medication, falls in the last 6 months.

Outcome

Primary outcome measure was the number of participants with at least one accidental fall during each period of recording. Secondary outcome was the number of falls for each participant during each period of recording. Only falls with medical consequences were taken into account, i.e. fall accidents for which a medical intervention was necessary (nursing, doctor examination, medication, stitches, etc.)

Analysis

The intervention was directed at the nurses working in the nursing homes and not at the elderly living there. In both the control and the intervention group, some elderly people died during the study. It can be assumed this did not influence the results at the departmental level. The intervention effect was measured using simple and multivariate logistic regression. The interactions between the effect of the intervention, and mobility and cognitive state were taken into account. In this study, the ward was the unit at which the randomisation, intervention and analysis were completed. However, nursing wards were included in the model as a separate variable (fixed effect), as the intervention took place at group level and the outcome measurement was at the individual level. Comparison of the number of falls between groups was performed using t-test. Data on residents who were not able to perform the MMSE and TUGT were excluded in the specific analysis for the influence of the MMSE and TUGT, but included in the basic analysis.

Ethical aspects

Informed consent was obtained from all staff members and residents or their representatives. The study was approved by the ethical review board of the medical school of the Catholic University of Leuven.

Results

Three hundred and seventy-nine persons from 7 nursing homes agreed to inclusion. At entry in this study the intervention group consisted of 210 residents from 5 wards, 157 women and 53 men. The mean age was 83.12 years (SD = 8.0). In the control group an entry consisted of 169 residents from 5 wards, 128 woman and 41 men. The mean age was 84.3 years (SD = 8.0). The average number of persons per ward in the intervention group was 42 and it was 33.8 in the control group.

The MMSE was performed by 330 residents (49 missing because they were not able to perform the test), with an average score of 15.72, which lies under the cut-off point of 23. In the intervention group, 152 (80.4%) residents scored below the cut-off point of 23, while 37 residents scored above that. In the control group, 99 (70.2%) residents scored below the cut-off point of 23, while 42 residents scored above that. One hundred and seventy-three residents performed the TUGT, and 166 the TUGT cognitive. Residents who were not able to stand up independently were excluded from the TUGT. In 7 residents only the simple TUGT was assessed because of tiredness. The average score of the TUGT was 28.1, for the TUGT cognitive 35.3. Both are above the cut-off point of 16. One hundred and twenty-one (70%) and 136 (82%) residents respectively, showed impaired mobility (TUGT <16). In the intervention group, for the TUGT, 18 residents scored below the cut-off point, while 49 (73.1%) scored above. In the control group, 34 residents scored below the cut-off point, while 72 (67.9%) residents scored above. During the follow-up period, again 361 persons were included, 203 in the intervention group and 158 in the control group.

Intervention effect

During the baseline measurement in the intervention group, 44 residents out of a total of 210 fell at least once (21%). In the control group, 20 residents out of the 169 experienced at least one fall (12%). During the post-intervention period, 28 out of the total of 203 in the intervention group residents (14%) fell at least once (Table 1). In the control group, 38 residents out of 158 (24%) experienced at least one fall.

The crude relative risk of falling at least once in the post-intervention period was 0.57 (0.37–0.89).

In those falling at least once, the difference between the average number of falls in the two intervention arms was not significant (P = 0.10).

After controlling for the baseline results by multiple logistic regression, the odds ratio (OR) of the number of residents with at least one fall during the post-intervention period in the intervention versus control group was 0.46 (95% CI = 0.26–0.79). There was no interaction between the intervention effect and the MMSE, TUGT or cognitive TUGT results (Table 1). After controlling for both the intervention group and the baseline results the OR was 0.22 (95% CI = 0.07–0.64).
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Table 1. Number of residents with at least one fall during the 6-month post-intervention period

<table>
<thead>
<tr>
<th>At least one fall during the post-intervention period</th>
<th>No falls during the post-intervention period</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intervention group</td>
<td>28 (14%)</td>
<td>175</td>
</tr>
<tr>
<td>Control group</td>
<td>38 (24%)</td>
<td>120</td>
</tr>
<tr>
<td>Total</td>
<td>66 (18%)</td>
<td>295</td>
</tr>
</tbody>
</table>

Total 361

Crude relative risk = 0.57 (95% CI: 0.37–0.89).

Multivariate analysis:

- Falls in the pre-intervention phase: OR = 0.46 (95% CI: 0.26–0.79)
- Falls in the pre-intervention phase + score on MMSE: OR = 0.47 (95% CI: 0.25–0.85)
- Falls in the pre-intervention phase + score on TUGT: OR = 0.47 (95% CI: 0.20–1.06)
- Falls in the pre-intervention phase + score on TUGT cogn: OR = 0.53 (95% CI: 0.22–1.23).

Table 2. Factors causing the fall

<table>
<thead>
<tr>
<th>Frequency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loss of balance</td>
</tr>
<tr>
<td>Stumbling</td>
</tr>
<tr>
<td>Removed fixation</td>
</tr>
<tr>
<td>No use of walking aid</td>
</tr>
<tr>
<td>Standing independently</td>
</tr>
<tr>
<td>Unknown</td>
</tr>
<tr>
<td>Sitting next to bed/chair</td>
</tr>
<tr>
<td>Being confused</td>
</tr>
<tr>
<td>Insufficient lighting</td>
</tr>
<tr>
<td>No fixation</td>
</tr>
<tr>
<td>Fell out of wheelchair</td>
</tr>
<tr>
<td>Medication</td>
</tr>
<tr>
<td>Different floor levels, loose objects on the floor</td>
</tr>
<tr>
<td>No supervision</td>
</tr>
<tr>
<td>Taking a walk with another elderly</td>
</tr>
<tr>
<td>None or improper footwear</td>
</tr>
<tr>
<td>Being in a hurry</td>
</tr>
<tr>
<td>Person unties fixation</td>
</tr>
<tr>
<td>Wet floor</td>
</tr>
<tr>
<td>Other elderly</td>
</tr>
<tr>
<td>General decline</td>
</tr>
<tr>
<td>Standing independently for a short while</td>
</tr>
<tr>
<td>Influence of alcohol</td>
</tr>
<tr>
<td>Influence of sleeping pills</td>
</tr>
<tr>
<td>Poor vision</td>
</tr>
<tr>
<td>Refuses fixation</td>
</tr>
</tbody>
</table>

In residents with at least one fall during the post-intervention period, there was no significant difference in the average number of falls between residents of the intervention (average = 1.7) and the control (average = 1.7) group.

Circumstances

The frequency of fall occurrence was equally spread over the 7 days of the week. There were, however, more falls around 6 pm: 22.5% of all falls took place between 5 and 8 pm. (See Appendix 1 in the supplementary data on the journal’s website http://www.ageing.oxfordjournals.org.)

More than half of the fall accidents took place in the rooms of the participants. Living room, corridors and toilets were also places with a high fall risk. Walking or standing without help caused 56 out of 143 (39%) fall accidents. Getting out of a wheelchair, 20, and standing up from the toilet, 19, gave similar risks on fall accidents (14 and 13%, respectively). Getting out of bed or an armchair was cited by 31 out of 143 (21.7%) as the activity during the fall accident. Ten out of the 143 (7%) occurred during walking or standing with help (7%). Three (2%) fall accidents occurred during washing and dressing, 4 (2.8%) during walking with a walker.

Half the fall accidents had no consequences. Ice, ointment or bandages were needed in 20% of the fall accidents. A physician’s visit was necessary in 13% of the falls, and technical interventions such as stitches or radiology in 5% of the falls. Hospitalisation was required in 2% of the fall accidents.

Causes

Nurses cited loss of balance and stumbling most often as possible causes for fall accidents in the intervention group (see Table 2).

Preventive measures

According to the nurses in 72% of the falls the situation did not need any environmental or procedural changes to prevent a subsequent fall accident. Restraining was considered a useful measure to prevent another fall accident in 10% of the cases only. (See Appendix 2 in the supplementary data on the journal’s website http://www.ageing.oxfordjournals.org.)

Discussion

According to our study results, this intervention leads to a 50% reduction of the number of residents who experience at least one fall. A simple intervention causes a substantial decrease in the number of residents who fall. The effect is statistically significant and is not affected by person characteristics, such as mobility or cognitive impairment. This is one of the first intervention studies to try to diminish the fall incidence in elderly by interventions directed at the nurses and not directly at the elderly.

After the studies of Jantti [11], Savage [12] and Shaw [13], this is only the fourth intervention study concerning elderly people with cognitive impairment. It is therefore, an original study with a clear effect that is comparable to the results of Savage and Matheis-Kraft [12]. Our results have a high generalisability because of the spread over 10 nursing wards and 7 nursing homes.

In this type of study there is always a Hawthorne effect. During the baseline period nurses were not informed of the fact that recording was taking place. During the intervention period, both the intervention and the control groups were
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A great many fall accidents occur around 6 pm. A fall diary prompts nurses to consider reasons for fall accidents. The intervention was directed at the nurses and not at nurses. A simple intervention can result in a clear decrease in the number of residents falling, in elderly people both with and without mobility problems or cognitive impairment.

Information about falling was retrieved from the clinical files by a researcher who was external to the nursing home staff. This was always the same researcher and blinding for the intervention status of the ward was impossible. We do not assume, however, that this may have caused any bias as the data was formally and routinely written down in the files and only had to be transcribed to the research files.

Briefly the main part of the intervention was the fall diary, which prompted nurses to consider reasons for each fall accident.

From the data in the fall diaries we can conclude that a great many fall accidents occurred around 6 pm. This is often a moment of low staff occupation. The phenomenon known as sundowning could also be significant [14]. Sundowning is the occurrence or exacerbation of behavioural symptoms of Alzheimer’s disease in the afternoon and evening [14]. At least half the fall accidents took place in the residents’ rooms, most often when they were standing up or walking without help. Loss of balance and stumbling are considered to be possible causes. Half the fall accidents had no consequences; in 2% of cases hospitalisation was required. It is striking that most fall diaries do not mention a change in policy. Fixation is most often considered an appropriate measure.

We can conclude that a restricted intervention directed at nurses can result in a clear decrease in the number of residents falling, in elderly people both with and without mobility problems or cognitive impairment.

Key points

• A simple intervention can result in a clear decrease in the number of residents falling, both with and without mobility problems or cognitive impairment.
• The intervention was directed at the nurses and not directly at the elderly.
• A fall diary prompts nurses to consider reasons for fall accidents.
• A great many fall accidents occur around 6 pm.

Acknowledgements

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Conflict of interest

There is no conflict of interest among any of the authors.

Supplementary data

Supplementary data for this article are available online at http://ageing.oxfordjournals.org.

References


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