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Hip protectors improve falls self-efficacy

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Abstract

Objectives: to investigate the effect of use of external hip protectors on subjects' fear of falling and falls self-efficacy (belief in their own ability to avoid falling).
Design: randomized controlled trial.
Setting: aged-care health services in Sydney, Australia.
Participants: 131 women aged 75 years or older, who had two or more falls or one fall requiring hospital admission in the previous year and who live at home. Sixty-one subjects were in the intervention group and 70 in the control group.
Intervention: use of external hip protectors and encouragement to use the protectors by an adherence nurse.
Measurements: at the time of enrolment into a wider study examining the effect of hip protectors on hip fractures, participants recruited at home completed an assessment of fear of falling and falls efficacy as measured by the Falls Efficacy Scale and the Modified Falls Efficacy Scale. At 4-month follow-up, these scales were readministered by an observer who was not aware of the allocation of the participant to intervention or control groups.
Results: fear of falling and falls self-efficacy, as measured by the Falls Efficacy and Modified Falls Efficacy Scales, were similar at baseline in both groups. Fear of falling was present at follow-up in 43% of subjects using hip protectors and 57% of the control group ($\chi^2 = 2.58$, $P = 0.11$). Hip protector users had greater improvement in falls self-efficacy at follow-up as measured by the Falls Efficacy Scale ($t = 2.44$, $P = 0.016$) and the Modified Falls Efficacy Scale ($t = 2.08$, $P = 0.039$).
Conclusion: hip protectors improve falls self-efficacy. As users of hip protectors feel more confident that they can complete tasks safely, they may become more physically active and require less assistance with activities of daily living.

Keywords: *falls self-efficacy, fear of falling, hip protectors*

Introduction

Fear of falling has an adverse influence on the quality of life and level of function in older people. Associations with fear of falling have been demonstrated for conditions such as balance limitation and impaired vision, as well as psychological factors and a history of falls [1–4].

Fear of falling can be conceptualized as a dichotomous state (afraid of falling or not) or it can be assessed using the concept of 'self-efficacy' which refers to an individual's belief in his or her capability to complete an activity [5]. Tinetti defined fear of falling as "low perceived self-efficacy at avoiding falls during essential, non-hazardous activities of daily living" [2].

Fear of falling commonly develops after a fall and may be associated with persistently impaired gait and mobility [6]. Fear of falling has been investigated as an outcome in intervention studies with variable results [7–11].

Hip protectors have been shown to reduce

significantly the incidence of hip fracture in older people in nursing homes [12, 13]. These devices are held over the greater trochanter of the femur in modified underwear. They prevent hip fracture by reducing the force transmitted to the greater trochanter in a fall [14].

We hypothesized that the use of hip protectors, and contact with a nurse who encouraged adherence with their use, would lead to a reduction in fear of falling and improved falls self-efficacy.

Method

The Community Hip Protector Study has been conducted with the co-operation of older women at high risk of hip fracture who live in their own homes (rather than residential aged-care facilities) in an urban area of Sydney, Australia. Older women who had contact with an aged-care health service and met inclusion criteria were invited to participate in the study. Inclusion criteria were: age over 74 years; two or more falls, or one fall requiring hospital treatment, in the last year; at least one hip without prior surgery; ability to speak English; and, in the opinion of the study nurse recruiting the subject, having cognitive function sufficient to give informed consent and being likely to continue to live at home for at least 3 months and to survive for at least 1 year. Ethical approval for the study was obtained from the relevant human research ethics committees in northern Sydney.

We randomly allocated participants to intervention (use of hip protectors and contact with the 'adherence' nurse) and control groups using stratification by the presence or absence of cognitive impairment and whether recruited from home or hospital. Randomization was in blocks of variable sizes which were unknown to the research nurses who enrolled participants. Randomization took place after we had obtained written informed consent and baseline data from each study participant, using a numbered and sealed opaque envelope containing allocation details which was opened by the research nurse enrolling the participant.

As well as demographic details and information about health status and medications, cognitive status [15], functional independence [16] and health service use, the research nurse assessed the subject's fear of falling using her answer of yes or no to the question 'are you afraid of falling?', the Falls Efficacy Scale (FES) [2] and the Modified Falls Efficacy Scale (MFES) [17]. The authors of the MFES reversed the direction of the FES and scored each item from 0 to 10 (instead of 1–10 as originally described). We used this convention for our administration of both the FES and MFES. The FES measures confidence in the ability to perform nine indoor activities and simple shopping without falling. The MFES adds four additional outdoor activities. The ranges of scores are 0–100 for the FES and 0–140 for the MFES. Generally subjects gave a score of 0, 5 or 10 for each item. Thus, a change in FES or MFES score of 10 is equivalent to a person changing from not at all confident to completely confident in one activity of daily living (or changing from not at all confident to fairly confident in two activities of daily living).

We told participants randomized to the intervention group that they would be encouraged to wear hip protectors for 2 years (the duration of the main study) and that a nurse would visit in a few days to supply and fit the protectors. Two adherence nurses were employed to supply and fit the protectors and to encourage adherence with their use. One of the investigators (S.E.K.) worked with these nurses to define an adherence strategy that would be individually modified for each participant. The adherence nurses aimed to encourage the participants to wear the hip protectors at all times when out of bed during the day, and at night if needing to go to the toilet more than once. They also discussed likely effects of use of the protectors, with attention to details that had emerged in a previous study examining possible barriers to their use [18]. Laundering of the protectors was discussed and contact details given for the nurse. Where possible, a family member or friend was involved in the discussion. Participants were told that the nurse would be in contact with them to check if they were wearing the protectors, and three face-to-face contacts (usually visits to the participant's home) were scheduled in the first 4 months of the study. If the participants were not adhering, additional telephone contacts or visits were arranged at the discretion of the adherence nurse. Approximately one-third of participants required additional contact because of limited adherence.

Subjects in the intervention group were issued with four pairs of hip protectors. These consist of hip protector shields (made of polypropylene encased in compressed polystyrene) held over the trochanters by elasticized underwear with pockets permanently holding the shields. Safehip hip protectors (supplied by Sahvatex A/S, Denmark) were used. These hip protector shields were designed to divert force from a fall onto the trochanter to the soft tissues of the thigh [14].

Recruitment for the Community Hip Protector Study began in May 1996. Forty-eight percent of potentially eligible women approached during the first year of the study agreed to participate. This paper presents data from the first 144 subjects (69 intervention and 75 control subjects) recruited in their homes. Subjects have also been recruited to the Community Hip Protector Study while hospitalized following falls but we have restricted the present analysis to participants recruited from home because those recruited immediately after a fall that had led to hospitalization would be expected to have a greatly increased fear of falling.

Follow-up assessments, 4 months after recruitment, of fear of falling, FES and MFES were completed by observers who were not aware of the allocation of the subject. These observers had no role in the study other than to assess these outcomes. Five percent of participants inadvertently disclosed to the observer the group to which they had been allocated. Assessments were performed at home except for four women interviewed by telephone because they had moved out of area or declined a home visit.

Sample size calculations indicated that 63 subjects per group would be needed to detect a difference between groups of 6.2 points on the FES (about half a standard deviation with $P < 0.05$ and power of 0.80). Thus, the power of the study was based on responses to the FES rather than the simple yes/no fear of falling question.

Differences between the intervention and control groups were assessed using a χ^2 test for categorical data (fear of falling), a *t*-test for mean differences in change in FES or MFES which were approximately normally distributed, and the Mann–Whitney–Wilcoxon rank sum test for falls self-efficacy (FES and MFES) at follow-up that were not normally distributed. Significance testing was two-tailed with $P < 0.05$ accepted as statistically significant. We performed all analyses on an intention to treat basis and by means of the SAS/STAT package.

Results

At entry to the study, there were no meaningful differences between the intervention and control groups in age [mean 83.8 years (SD 5.5) in the intervention group, mean 82.3 years (SD 4.9) in the control group] or in other background characteristics (Table 1). In addition, there was no significant difference in fear

Table 1. Baseline characteristics of intervention and control groups

Characteristic	No. (and %) of subjects: Intervention ($n = 61$)	Control ($n = 70$)
Fracture history		
Hip	12 (20%)	17 (24%)
Other	42 (69%)	40 (57%)
No. of falls in past year		
1	17 (28%)	24 (34%)
2	21 (34%)	25 (36%)
3	12 (20%)	8 (11%)
>3	11 (18%)	13 (19%)
History of stroke	7 (11%)	11 (16%)
Barthel score		
100	43 (70%)	45 (64%)
95	11 (18%)	14 (20%)
90	3 (5%)	3 (4%)
<90	4 (7%)	8 (12%)
No. of errors in mental state questionnaire[a]		
0	38 (62%)	37 (53%)
1	7 (11%)	19 (27%)
2	6 (10%)	10 (14%)
>2	10 (17%)	4 (6%)
Self-rated health		
Excellent	4 (7%)	4 (6%)
Very good	15 (25%)	13 (19%)
Good	25 (41%)	27 (39%)
Fair	13 (21%)	25 (35%)
Poor	4 (6%)	1 (1%)
Age at leaving school (years)		
<14	5 (8%)	6 (9%)
14–15	21 (35%)	37 (53%)
16–18	35 (57%)	27 (38%)
Living alone	49 (80%)	59 (84%)

[a]Possible range of errors 0–10.

Table 2. Scores at baseline and at 4-month follow-up on the falls efficacy scales in the intervention and control groups

Variable	Falls efficacy scale			Modified falls efficacy scale		
	Intervention ($n = 61$)	Control ($n = 70$)	*P* value	Intervention ($n = 61$)	Control ($n = 70$)	*P* value
Median (interquartile range)						
Baseline	90 (70–95)	90 (75–95)		105 (85–125)	105 (85–125)	
Follow-up	93 (80–100)	83 (65–90)	0.027[a]	120 (100–135)	110 (80–130)	0.054[a]
Mean (standard deviation)						
Baseline	79.9 (20.7)	80.4 (21.2)		102.1 (31.0)	100.8 (31.1)	
Follow-up	87.0 (16.5)	78.8 (22.0)	0.016[b]	114.9 (25.0)	103.5 (32.7)	0.039[b]

[a]Comparing follow-up scores in the two study groups with the Mann–Whitney–Wilcoxon rank sum test.
[b]Comparing mean change in scores (follow-up minus baseline) between groups with a two-sample *t*-test.

of falling or falls efficacy as measured by the FES or MFES (Table 2). Fear of falling was common, with 56% of subjects answering that they were afraid of falling.

By 4-month follow-up six participants (4.2%) had died. Of the remaining subjects, seven (4.9%) declined to answer the fear of falling question or complete the FES and MFES. The remaining 131 (61 intervention and 70 control) provided fear of falling, FES and MFES data for analysis.

Improvement in FES and MFES scores was statistically significantly greater in the intervention group than in the control group over the 4 months of the study. Users of hip protectors had greater mean improvement in falls self-efficacy at follow-up as measured by the FES [+7.1 points *versus* −1.6 points for the control group ($t = 2.44$, $P = 0.016$)] and the MFES [+12.8 *versus* +2.7 ($t = 2.08$, $P = 0.039$)]. The mean and median FES and MFES scores at baseline and at 4-month follow-up are shown in Table 2.

The percentage of subjects who stated that they were afraid of falling at follow-up was 43% in the hip protector group and 57% in the control group ($\chi^2 = 2.58$, 1 d.f., $P = 0.108$; Table 3). From this absolute risk reduction of 14%, the number of subjects that need to be treated [17] to prevent one subject expressing a fear of falling is seven.

We calculated the relative risk of answering 'yes' to the question 'are you afraid of falling?' by treatment group. We also dichotomized the FES and MFES near the baseline median score. Table 3 shows relative risks for having low scores at follow-up.

Adherence with the use of hip protectors was not complete, but only 8% of subjects were completely non-adherent. Omission of the data from non-adherent subjects did not alter the association of falls self-efficacy with use of hip protectors (data not shown).

Discussion

Use of hip protectors and contact with a nurse who encouraged adherence were associated with an improvement in falls self-efficacy for domestic and instrumental activities of daily living. We regard the overall improvement in scores on the FES and MFES

Table 3. Relative risk (RR) and 95% confidence interval (CI) of fear of falling at 4-month follow-up

Variable	Group		
	Intervention ($n = 61$)	Control ($n = 70$)	RR[a] (95% CI)
Afraid of falling (yes)			
Baseline	34 (56%)	40 (57%)	
Follow-up	26 (43%)	40 (57%)	0.75 (0.53–1.06)
Falls efficacy scale (<90)			
Baseline	29 (49%)	33 (47%)	
Follow-up	20 (33%)	38 (54%)	0.68 (0.50–0.93)
Modified falls efficacy scale (<100)			
Baseline	23 (38%)	28 (41%)	
Follow-up	15 (25%)	26 (37%)	0.83 (0.66–1.05)

[a]Based on follow-up figures.

of approximately 10 points as clinically important differences. The women studied were a frail elderly group, most of whom were fearful of falling. This reflects the inclusion criteria for the study that aimed to recruit women at high risk of falling and hip fracture.

These findings suggest that users of hip protectors feel more confident that they can complete daily domestic and outdoor activities safely. As a consequence they may be more physically active and require less assistance with activities of daily living. The continuing hip protector study will examine this issue. The more limited association between use of hip protectors and falls efficacy in outdoor activities of daily living may reflect inadequate statistical power because many of the subjects were unable to complete instrumental activities of daily living, such as travelling on public transport, and hence found it difficult to judge falls self-efficacy in these situations.

The use of an observer who was unaware of the group to which the subject had been allocated should reduce bias in outcome assessment. This blinding was maintained in most subjects as there was an instruction given to subjects not to disclose whether they used hip protectors when a phone call was made to arrange the follow-up home visit and interview. The analysis is presented based on intention to treat, but exclusion of non-adherent subjects did not markedly change the results. Adherence in this study appears higher than reported by others [19, 20]. However, this information was obtained at 4 months—which is an early point in the study, as subjects in the study have been asked to wear hip protectors for 2 years.

Subjects readily replied to the direct question about whether or not they were afraid of falling. However some subjects required considerable explanation to understand the visual analogue scale used in the FES and MFES questionnaires. Multiple factors contributed to this, but mild cognitive impairment was present in some subjects.

Asking subjects who were unable to perform some of the outdoor activities of daily living that form the MFES to answer in terms of how they thought they would feel if able to perform these tasks may have reduced the sensitivity of the MFES in the group of women studied.

The intervention group received visits from adherence nurses, who encouraged adherence to the use of the hip protectors. It is possible that these visits may have lessened fear of falling and improved falls efficacy. The study is being conducted in northern Sydney, an advantaged area on usual sociodemographic indices. The results should be generalized only cautiously to other areas and to settings where subjects may have to purchase hip protectors. Subjects were provided with the hip protectors free of charge for the research study and cost has been identified as a possible barrier to hip protector use [18].

While the major aim of hip protector use is to reduce the incidence of hip fracture, the association of use of hip protectors and improvement in falls self-efficacy is welcome. This may improve quality of life and could improve other health outcomes.

Key points

- In this study of older women living at home who had fallen in the previous year, 57% were afraid of further falls.
- The use of hip protectors improved falls self-efficacy (subjects' belief in their own ability to avoid falling).
- Falls self-efficacy improved most in personal aspects of activities of daily living.

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