Acceptability and compliance with hip protectors in community-dwelling women at high risk of hip fracture

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Objectives. To determine acceptability and compliance with hip protectors in women at high risk of hip fracture who are living independently in the community.

Methods. Women aged 65 yr and over referred for open access bone densitometry who had femoral neck osteoporosis and a high risk of falling were asked to wear hip protectors.

Results. Eighty five women fulfilled the inclusion criteria of whom 32 (38%) found the hip protectors acceptable and agreed to participate. Reasons given by the remaining 53 (62%) for not finding the hip protectors acceptable included discomfort on wearing, dislike of their personal appearance with the hip protectors on, and disagreement about their fracture risk. Participants were more likely to have a family history of osteoporosis (47 vs 26%, respectively) and hip fracture (16 vs 8%) compared with non-participants. At 12 months only about half of the subjects were wearing hip protectors daily.

Conclusions. Our findings suggest that only a minority of community-dwelling women at high risk of hip fracture will wear hip protectors to reduce fracture risk. Their use should be restricted to highly motivated women who should be carefully identified.

KEY WORDS: Hip protectors, Hip fracture, Community care, Osteoporosis, Compliance.

Hip fractures are common and associated with increased morbidity and mortality [1, 2]. The majority of hip fractures result from a combination of osteoporosis and falling [3, 4]. The risk of hip fracture can be reduced using drugs to treat osteoporosis [5–8], but reducing falls is more difficult, in part due to the complex aetiology of falls. However, the damage that a fall causes can be limited by the use of energy shunting/absorbing hip protectors, which are designed to divert direct impact away from the greater trochanter of the hip to the surrounding soft tissue and muscles. Studies of frail institutionalized women show that hip protectors can reduce the rate of hip fracture [9]. However, it remains unclear whether independent community-dwelling women will find hip protectors acceptable and adhere to their use. In this study, we report the acceptability and compliance with hip protectors in women at high risk of hip fracture who are living independently in the community. We were able to determine reasons why women found hip protectors unacceptable and examined differences between those women who chose to participate and those who did not.

Patients and methods

Ethical approval was obtained from Merton & Sutton Local Research Ethics Committee. The Osteoporosis Unit at St George’s Hospital is an open access service and patients are referred from the surrounding community by family practitioners according to established referral criteria [10]. For the purposes of this study, women were considered to be at high risk of hip fracture if they were: (i) aged 70 yr and over, (ii) had osteoporosis at the femoral neck (WHO criteria 1994) [11] and (iii) had one or more fall-related factors (described below). Bone densitometry was measured by dual-energy X-ray

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Absorptiometry at the lumbar spine (LS) and femoral neck (FN) using a Lunar DPX device (Lunar Corp., Madison, WI, USA). Daily calibration measurements using an external phantom were performed and monitored for machine drift. No significant drift was noted during the study period. Precision was calculated by the method of Gluer et al. and at our centre is 1.3% for the lumbar spine and 1.8% for the femoral neck.

Fall risk assessment was performed as previously described. The tests used have a direct relationship to hip fracture and were: (i) binocular corrected visual acuity (VA), measured using a Snellen chart, (ii) ability to perform four tandem gait steps (heel–toe walking) and (iii) ability to do five stand-ups without arm use.

Women with femoral neck osteoporosis and one or more of the fall risk factors were then given counselling about osteoporosis and falls. Their bone density scans were shown to them and they were given literature about osteoporosis and hip fracture (from the National Osteoporosis Society, UK). The patients were also given the opportunity to try the hip protectors on if they wished.

Those women who consented to participate were issued with diary cards and three pairs of hip protectors (Safehip®, Robinson Healthcare, Chesterfield, S40 1YF, UK). They were asked to wear the hip protectors every day, particularly during waking hours. The diary cards allowed for patients to record the number of hours per day that hip protectors were worn. Patients were asked to return these cards monthly by post. If diary cards were not returned, patients were contacted by phone on two occasions 1 week apart. If this did not result in the diary card being returned, final contact was made to see if the patients wanted to continue to participate. If patients did not wear hip protectors for short periods (less than 2 weeks) for whatever reason, then restarted wearing, we assumed that they were still compliant when analysing the data. Longer periods of not wearing hip protectors were analysed as discontinuation of wear.

Data are presented as mean (s.d.) unless stated. The significance of differences between groups was tested using Student’s t-tests or \( \chi^2 \)-tests where appropriate. A P value of less than 0.05 was considered statistically significant.

**Results**

Over an 8-month period, 300 women aged 70 and over were referred by their family practitioners for bone densitometry, of whom 85 had femoral neck osteoporosis and one or more fall-related factors. All of these women were Caucasian. Of these 85 women, 32 (38%) found the hip protectors acceptable and agreed to participate. Reasons given by the remaining 53 (62%) for not finding the hip protectors acceptable were numerous: 18 (34%) said the hip protectors were uncomfortable; 13 (25%) disliked their personal appearance with the hip protectors on or felt they would not like how they looked with them on; seven (13%) disagreed with the assessment of increased risk of hip fracture; four (8%) disliked the appearance of the actual hip protectors; three (5%) were unable to put the hip protectors on independently and eight (15%) had a variety of miscellaneous reasons.

![Fig. 1. Percentage of individuals wearing hip protectors over time.](image)
women were awake for 14–16 h/day and wearing hip protectors for 8–10 of those hours.

**Discussion**

In this study we have investigated the acceptability and compliance with wearing hip protectors in women at high risk of hip fracture living in the community. We found that after counselling about their risk of hip fracture, 38% of these high-risk women agreed to wear hip protectors. Thereafter there was a gradual reduction in compliance, so that after 12 months half of the women who found the hip protectors initially acceptable were wearing the hip protectors for over 8 h/day. The main reason eligible women found the hip protectors unacceptable was due to discomfort, which is not unexpected. However, we were surprised that the patient's negative perception of how they would look whilst wearing the hip protectors (without even trying them) and their lack of agreement of fracture risk were the next two most common causes of lack of acceptability.

Previous hip protector studies have focused on institutionalized older individuals, as residing in an institution is associated with a higher incidence of hip fracture compared with those living in the community [14–16]. However, whilst the incidence of hip fracture is high in institutionalized individuals, the majority of fractures actually occur in community-dwelling individuals. Thus, in a recent Dutch population-based study of individuals who sustained a hip fracture, approximately 75% of individuals in the 70–79-yr age group were living independently in the community as were about 50% of 80–89-yr olds [16]. Similarly, a New Zealand study showed that 58% of hip fractures were sustained by people living in private residences, compared with 42% living in institutions [15]. Therefore, where community-dwelling individuals have been identified as being at high risk of fracture, it seems reasonable to consider all potential interventions to reduce fracture risk, including hip protectors.

Comparison of acceptability and compliance in the present study with previous studies of hip protectors is difficult because of different study methodology and outcome criteria. All the previous studies [9, 17–23] have been conducted in nursing homes with study durations varying from 12 weeks to 12 months. The primary endpoint in the majority was hip fracture reduction, although two were assessing compliance prior to larger studies [21, 22]. One important characteristic was that a large number of individuals in these homes (who by virtue of their residence in the homes were at high risk of hip fracture) were excluded from entry for a variety of reasons apart from refusal to consent. Examples of exclusion criteria include dementia [22], mobile only in a wheelchair [19] and assessed as not being at risk of falling [23]. Also the definition and reporting of compliance varied. Thus three studies reported overall compliance of 24% [20], 44% [18] and 48% [9] throughout the study. Other studies have reported between 36 and 74% compliance at periods of 12 weeks to 12 months depending on the duration of the study [19–23]. Other than death or leaving the nursing homes, reasons for non-compliance included dementia [16], being bedridden and skin irritation [18], feeling too hot or difficulty in putting on the hip protectors [22], and refusal to continue without specific reasons [9, 23]. In one study, explanations for not using protectors centred on a perceived lack of personal risk (as for some patients in our study) even in subjects with a previous hip fracture [17]. Reasons why the hip protectors were not initially acceptable and subsequent refusal to comply with wearing were not always given [19].

The only statistical difference between participants and non-participants (those who found the hip protectors unacceptable) in our study was that non-participants were about 2 yr older (Table 1). Experience of previous fractures were similar (47% in the participants vs 51% in the non-participants). Previous hip fractures were twice as common in participants compared with nonparticipants (16 vs 8%, respectively) and a family history of osteoporosis was more common in participants than non-participants (47 vs 26%, respectively), but as the number of patients was small, neither differences reached statistical significance. The number of falls in the last year and presence of fall risk factors were similar. We advised our patients to wear hip protectors during the day, as the majority of hip fractures occur during daylight hours [15, 24–27]. This is because we thought that asking these older patients to wear hip protectors at night would reduce compliance (as previously shown) [21]. Previous studies either asked for hip protector wear throughout the 24 h or did not specify.

Whilst we believe the findings of this study can be generalized to other centres which provide open access bone densitometry to the community, the findings are probably only applicable to the specific hip protector studied as the protectors vary in design. Other limitations include the bias of returning the diary cards and the reinforcement that contact with the Osteoporosis Unit could have on compliance. Potentially, if women were issued the hip protectors and then no further contact took place, compliance may be lower. Other important issues are that to date there has been no study to show that hip protectors are effective in reducing hip fractures in this population (i.e. community-dwelling women) and therefore calculation of cost–benefit is unfeasible. None the less, guidelines for the management of osteoporosis do recommend that hip protectors be considered in those at increased fall risk [28].

In summary we have shown that only a minority (38%) of community-dwelling women at risk of hip fractures find hip protectors acceptable. Apart from discomfort, we found that negative perception of personal appearance with the hip protectors on and the appearance of the actual hip protectors were important to women who did not wish to wear them. Changes in design may improve this, as could different ways of
counselling to explain the risk of hip fracture to older women. This is important because whether individuals will find an intervention such as drug treatment or a hip protector acceptable and comply with use will depend on the complex interaction between personal perception of risk, side-effects of the intervention and the ability to administer the intervention. Our findings suggest that only a minority of community-dwelling women at high risk of hip fracture will wear hip protectors to reduce fracture risk. Their use should be restricted to highly motivated women who should be carefully identified.

References