

# Hip Protector Compliance: A 13-Month Study on Factors and Cost in a Long-Term Care Facility

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**Objective:** To determine if a high compliance rate for wearing external hip protectors could be achieved and sustained in a long-term care population.

**Study Design:** A 13-month prospective study of day time use of external hip protectors in an at-risk long-term care population.

**Setting:** One hundred-bed not-for-profit long-term care facility.

**Participants:** Thirty-eight ambulatory residents having at least 1 of 4 risk factors (osteoporosis, recent fall, positive fall screen, previous fracture).

**Intervention:** The rehabilitation department coordinated an implementation program. Members of the rehabilitation team met with eligible participants, primary caregivers, families, and other support staff for educational instruction and a description of the program. The rehabilitation team assumed overall responsibility for measuring and ordering hip protectors and monitoring compliance

**Results:** By the end of the third month, hip protector compliance averaged greater than 90% daily wear. The average number of falls per month in the hip protector group was 3.9 versus 1.3 in non-participants. Estimated total indirect staff time was 7.75 hours. The total cost of the study (hip protectors and indirect staff time) was \$6300

**Conclusions:** High hip protector compliance is both feasible and sustainable in an at-risk long-term care population. Achieving high compliance requires an interdisciplinary approach with one department acting as a champion.

The cost of protectors could be a barrier to widespread use. Facilities might be unable cover the cost until the product is paid for by third party payers. (*J Am Med Dir Assoc* 2003; 4: 245–250)

**Keywords:** hip protectors; compliance; falls; costs and cost analysis; long-term care facilities

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**H**ip fractures exact a heavy financial and human toll in the United States. More than 250,000 individuals sustain a hip fracture each year. Nearly 20% of those individuals die from complications of the fracture within 1 year, another 25% seek long-term placement, and less than half fully recover.<sup>1–8</sup> Over \$5 billion is spent annually in direct and indirect hip fracture costs.<sup>9–11</sup>

Ninety percent of hip fractures occur in individuals over the age of 70.<sup>12,13</sup> Close to 2 million elderly, with a mean age of 84 years, reside in long-term care facilities. An estimated million reside in the community with similar functional and medical impairments. This population of frail, at-risk elders has the highest potential for future hip fractures.<sup>14,15</sup>

Several factors that potentially increase the risk for hip fracture have been identified. They include osteoporosis, low body mass index, and, most

importantly, a sideways fall on the greater trochanter of the proximal femur.<sup>16–20</sup> Multidimensional programs designed to reduce hip fractures has been reported, and most include reducing falls and fall risk factors, increasing bone density and muscle strength, and improving gait and balance.<sup>21</sup> However, some recent meta-analyses have reported limited statistical power to detect the effectiveness of specific strategies or programs to prevent falls and fractures.<sup>22,23</sup>

Use of an external hip protection system that covers the greater trochanter of the proximal femur has been shown reduce the incidence of hip fractures.<sup>24–30</sup> Yet, low compliance remains a major obstacle in the effective use of hip protector systems.<sup>24,28,30–32</sup> This 1-year study was undertaken to determine if moderate to high levels of hip protector compliance could be achieved and sustained in a long-term care facility.

## METHODS

### Subjects

Subjects were residents of The Masonic Home, a not-for-profit, 100-bed long-term care facility in Central Massachusetts. Eligible residents were ambulatory, with or without the use of an assistive device. High-risk residents were identified as having at least one of the following criteria:

1. Diagnosis of osteoporosis (T-score <2.5)
2. History of one or more falls within the past 6 months
3. History of prior fracture
4. Positive falls screen on admission for residents admitted within the previous 3 months

Fifty-six long-term care residents met the criteria for participation in the hip protector compliance study. The enrolment period was continued from September 2001 through the end of December 2001 and ran through September 2002.

### Study Design

All eligible participants were invited to attend a 1-hour educational session conducted by the medical director, the director of rehabilitation, and a physical therapist. This session explained the use of hip protectors, the potential risks and benefits, and the objectives of the study. At that time, any interested individuals were invited to participate and consent was obtained. Residents who agreed to participate at the initial meeting were measured for hip protectors (see "Equipment" section). For eligible residents with a diagnosis of dementia or other cognitive impairment, families received a letter explaining the use of the hip protectors, the potential risks and benefits, and the objectives of the study. Families of those residents were given the option of having the resident participate in the study, and consent was obtained from the appropriate family member. The medical director, the director of rehabilitation, and the physical therapist were also available to answer individual questions at any time.

One-hour in service education sessions by the rehabilitation department were provided to all licensed nursing and Certified Nurse Aide (CNA) staff on the use of hip protectors, their potential benefits, the number of protectors each resident would receive, and how and when they should be worn. Although these sessions were not mandatory, most of the nursing staff did attend. The rehabilitation department met separately with those individuals unable to attend the sessions to explain the study.

Laundry and housekeeping were in-serviced separately by the director of rehabilitation on the hip protector product, and the handling and laundering instructions (no bleach). They were informed of the total number of protectors that would be circulating through the department.

### Equipment

A local Massachusetts manufacturer of soft hip protectors, the HipSaver™ Company, Inc., was contracted to provide product. They were selected based on extensive discussions of various models, including results from the PACE Programme (Programme for All-Inclusive Care of the Elderly) in East Boston, which had successfully used this hip protector model over 2 years.<sup>33</sup> The Hip Saver Company in Canton, Massachusetts, was also selected because of close proximity to study site and the ability to provide comprehensive customer service.

The hip protector company provided in-service education to the department of rehabilitation on measuring residents for proper size, ordering, and laundering requirements. They provided a sizing chart, and all subjects were subsequently measured and fitted by the rehabilitation department for the proper-sized protector (there were 4 possible sizes). A hip measurement was performed around the widest circumference of the pelvic region.

After discussions with the nursing, rehabilitation, and laundry departments, it was determined that 4 sets of protectors would be dispensed to each resident to ensure that a protector would be available when needed. The rehabilitation staff was responsible for ordering the protectors and marking them with the resident's name before distribution. The nursing staff was responsible for distribution and storage of nursing units. The cost of each hip protector, at the beginning of the study, was \$30.

### Tracking Compliance

For the purposes of this study, any individual who wore hip protector at least once and was able to be monitored a minimum of 9 months was included. It was felt that a longitudinal follow up was essential to determine if consistent wearing of the hip protectors could be maintained over time. Only daytime hip protector use was evaluated (i.e., use the time the resident was dressed in the morning until were in bed for that night). Nursing staff received the protectors and distributed them to the appropriate residents. Those with activities of daily living deficits were given reminders by the CNAs and staff assistance in donning the protectors when needed.

Percent compliance was measured monthly by dividing the total days hip protectors were worn by the number of days in the month. Nursing tracked daily compliance on a log created and kept in the medication administration record (MAR) on the medication cart. At the time of medication pass, the CNA reported to the nurse whether the resident had worn the hip protector for that day. The nurse noted this in the study log. Nursing was interviewed monthly by a representative from the rehabilitation department to obtain ongoing compliance data in the study subjects. The rehabilitation department reviewed monthly tracking record and recorded monthly compliance for each resident. Compliance data was recorded for a total of 13 months.

**Table 1.** Demographic Characteristics

Average Age (y)	89
Mode	93
Percent Female	75%
Medicare	86%
Medicaid	92%
1 Risk Factor	39%
2 ≥ Risk Factors	61%

**RESULTS**

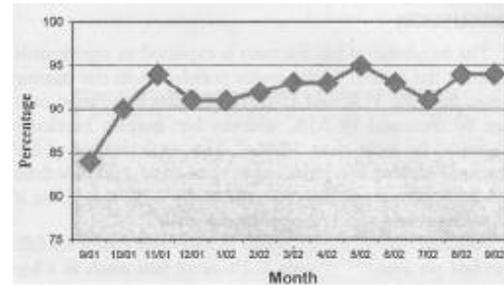
Fifty-six long-term care residents met the inclusion criteria for the study. Five residents agreed to participate when initially approached by the medical director, but refused to be measured and were not considered to be in the study. Six residents died, and an additional 7 had a significant change in condition to nonambulatory status well before the 9-month minimum could be completed. These 2 subgroups were not included in the data. Thirty-eight residents completed at least 9 months of the 13-month trial, with a mean follow up of 11.9 months. Data was collected on a total of 38 residents.

The average age of study participants was 89.5 years, with a mode of 93 years. Seventy-five percent of the participants were women, and 78% had a primary diagnosis of dementia. Ninety-two percent of participants were on state medical assistance (Medicaid) and 86% had Medicare coverage for part A expenses. More than half of the participants had 2 or more risk factors, and approximately one third had only one risk factor (Table 1). The total number of medications per resident did not change significantly during the study. The total scheduled psychoactive medications averaged one medication per participant (Table 2).

During the 13-month study period, a total of 206 falls occurred in the facility, averaging 15.8 falls per month or approximately 1.5 falls per resident per year. One hundred twenty-six of the falls (61%) involved 34 of the 38 study participants, or one-third of the total 100-bed nursing facility population (average occupancy, 98.9). Mean number of falls per participant was 3.9, compared with 1.3 falls for those not in the study. There were 2 hip fractures in the facility in the year before the start of the study. There were no hip fractures in the facility during the 13-month intervention. There were 5 non-hip fractures during

**Table 2.** Prestudy Average Medications

Average Medications per Participant per Day	Start of Study	End of Paired Study	Paired t-test	P Value
Total Medications	7.75	8.06	-0.551	0.59
Cardiac Medications	1.14	1.17	-0.177	0.86
Total psychoactives	0.94	1.08	-0.154	0.13
Antidepressants	0.47	0.53	-0.81	0.42
Antipsychotics	0.22	0.25	-1.43	0.16

**Fig.1** Percent hip protector compliance from September 2001 through September 2002

the study, 2 fractures (clavicle, humerus) in 1 individual. Three of the 4 individuals who sustained a non-hip fracture were in the study group. Two subjects sustained fractures during the night (pelvis, rib) when they were not scheduled to wear the hip protectors. The other subject sustained a forearm fracture from a fall. She was wearing hip protectors at the time of the fall. By the third month of the study, average compliance exceeded 90%, and this was sustained for the remainder of the study (Fig. 1).

CNAs were interviewed by the rehabilitation staff in cases of non-compliance and were asked why hip protectors were not being worn. Most often, CNAs reported that the individuals were not wearing the hip protectors because of acute illness (not expected to get out of bed that day) or possibly a result of laundry issues (occasional difficulty getting protectors back from laundry on Mondays, according to CNA). Another reason given was that the resident was going out see a specialist (medical or surgical), where the use of hip protectors was felt to be an added burden during the appointment. By the third month of the study, residents (those not requiring help with activities of daily living) appeared to consider the protectors part of their daily dressing routine and for the most part, only required minimal cues from CNAs. Two participants wore hip protectors regularly for the first month of the study, but reported that they were not comfortable. Despite size changes, these subjects elected not to continue the hip protectors but were counted in the compliance data.

Staff time spent in the initial phase of the study on educational sessions for the residents and staff was 7.75 hours, for estimated indirect cost of approximately \$500. Total cost for the hip protectors for the 49 participants who agreed to be measured was \$5880, for a total direct and indirect cost \$6300 for the study. None of the 6 deaths was related to a fall, and was not related to the use of hip protectors. The average time that hip protectors were worn by the 7 subjects who had a change in condition was 1.8 months (range, 1-4 mo). Average compliance for this group was 55% (range 35—75%). The average time that hip protectors were worn the 6 subjects who died was 3 months (range, 0—7 mo). The average compliance was 93% (range, 67—100%).

## DISCUSSION

The incidence of hip fractures is expected to significantly outpace the growth of the senior population in the coming years. Between 1970 and 1997, the Finnish population over age 50 increased by 53%, whereas hip fracture incidence increased by more than 169%.<sup>34</sup> The total number of hip fractures worldwide is predicted to more than quadruple from 1.6 million to more than 6.2 million by 2050 if nothing is done to prevent this potential health crisis.<sup>34</sup>

Although the incidence of falls in long-term care is 1.5 falls per bed per year,<sup>24,35,36</sup> only 1—2% of all falls result in a hip fracture.<sup>37,38</sup> Studies have shown that the major causal factor for hip fracture is an impact to the greater trochanter, in which the impact energy of a fall exceeds the average fracture threshold of the proximal femur.<sup>16-20</sup> In addition, studies have demonstrated that osteoporosis, low body mass index, and height of a fall are independent risk factors for hip fracture.<sup>16-20</sup>

Successfully reducing hip fracture rates requires an inter disciplinary process in which all risk factors are addressed. To date, efforts to reduce falls, improve gait and balance, and increase body mass index have met with only partial success. Treatment of osteoporosis with antiresorptive medications might only increase femoral neck density by 2% per year,<sup>39</sup> which might not be sufficient for fracture reduction in long-term care residents whose average life expectancy is approximately 24 months.<sup>15</sup> One preventive strategy that could potentially reduce the impact energy of a fall to the greater trochanter is the use of external hip protectors, an external padding system that both absorbs and shunts energy away from the proximal femur. Studies have demonstrated the effectiveness of hip protectors, with one estimate that hip fractures could be reduced by 60% in those wearing the device, and up to 80% if all residents wore the protectors.<sup>28</sup>

Two recent studies have questioned the efficacy of hip protectors. In a randomised, controlled trial with 18 months of follow up, Meyer showed a relative reduction in hip fracture of more than 40%, but at borderline significance.<sup>30</sup> van Schoor randomised a mixed group of community-dwelling elderly and nursing facility residents in a 16-month study.<sup>40</sup> No statistical difference between the control and study groups was realized. However, the authors noted a 23% non-significant reduction in hip fractures in individuals who wore the hip pads, as well as a lower fracture rate per fall in the study group.<sup>41</sup>

The definition of compliance is not standardized, making comparisons between studies problematic. Several studies report compliance only at the time of a fall, as opposed to reporting total number of days of fracture protection per patient. Lauritzen et al. base their compliance reporting on fall registers, ie, the number of times the resident was wearing the hip protectors at the time of the fall with a compliance rate of 24%.<sup>24</sup> Two other studies using similar compliance measures had rates of 46% and 54%, respectively.<sup>25,30</sup> Harada, using a case-controlled observation method,

noted a compliance rate for complete and incomplete wear in 88 subjects of 70% and 17% respectively.<sup>26</sup> vanSchoor, using a self-reporting mechanism, found compliance of 4 months and 37% at the end of 12 months.<sup>40</sup>

The reasons for low compliance in these studies are described in detail; however, study design could be one factor. Individuals are often asked to wear hip protectors without staff having had detailed education regarding their use. The lack of staff understanding and support could have been a factor in some studies. Hip protectors are most likely to of benefit with maximum daily wear. Based on Parkkari's framework, a structured educational program for both staff and patients was instituted in this study. The intent was to have staff support and encourage the use of the hip protectors. In addition, the concept of daily wear count was used in determining compliance. Each day the CNA provided feedback on hip protector wear, which was documented in the MAR. This was felt to be a more accurate assessment of total hip protector wear and fracture prevention. In our study, residents with significant change in condition or decline in functional status had lower compliance than the other subjects (55%). One explanation for the low compliance in this group is that when patients become acutely ill, staff determines other care is to be of higher priority. Also, when patients spend more time in bed, for example when acutely ill, CNAs might elect not to use hip pads. This specific topic might require dedicated in-service education.

Based on the results of this study, it appears that relatively high compliance is feasible and potentially sustainable in a long-term care facility. Compliance after the third month did not drop below 90%. This could have been attributable in large part to the rehabilitation department's role as a champion as well as the formal educational component of study. There were 2 individuals included in the compliance who could not wear the hip protectors as a result of poor fit. Despite repeated attempts to optimise fit, the individuals complained of discomfort. If we exclude these 2 subjects the data, average daily compliance exceeded 95%.

Failure to achieve higher compliance in the first 3 months could have been the result, at least in part, of issues with laundering of the protectors. Because of limited laundering, on the weekends, especially for the incontinent residents who needed frequent changes, clean hip protectors might not have always been available on Monday mornings. This was solved by providing those residents with 2 additional sets of protectors. One positive finding was that CNAs who received the educational session would often call the rehabilitation department to obtain hip protectors before getting residents out of bed, if none were available in the patient's room. The CNAs reported occasionally borrowing unused/unopened hip protectors from other residents in an emergency, rather than getting a resident out of bed without them. For continent residents, 3 sets of hip protectors might be sufficient. However, incontinent residents might need more than 4, depending on the frequency of laundry

services. Previous studies have not always reported the number of pads dispensed per resident. In some studies, only 2 or 3 protectors per resident were used. It is possible that the higher compliance rate in this study was, in part, related to the relatively high number of pads dispensed to each resident.

Kannus estimated that 42 individuals would need to be treated for 1 year to prevent one hip fracture<sup>28</sup>. Given the compliance and number of users in the current study, approximately 1—2 hip fractures per year could be prevented. This could represent a potential cost savings to Medicare of approximately \$20—40,000 (Fallon Community Health Plan, unpublished data).<sup>11,42</sup>

One major barrier to the use of hip protectors is the cost of the product. Until Medicare and Medicare + Choice programs provide external hip protectors as a covered benefit, either facilities or residents/families will be responsible for purchasing the protectors. Given the current budget crisis in many states, long-term care facilities are likely to face reductions in per diem rates. As of March 1, 2003, Massachusetts has reduced Medicaid payments to nursing facilities by over 2%, with possible further reductions. Facilities are faced with trying to maintain quality of care despite decreased revenue, and might be less likely to offer hip protectors to high-risk residents, unless they perceive some indirect benefits to the facility as well as to the resident. Some of those indirect benefits might include improved facility quality ratings, fewer reports of hip fractures to state authorities, and improved state survey results with regard to fall prevention. As more studies demonstrate the effectiveness of external hip protectors in preventing hip fractures in targeted populations, state or federal regulations might change to require hip protectors for certain high-risk, long-term care residents.

## CONCLUSION

High compliance rates for hip protectors in an at-risk, long-term care population are feasible. Success depends in part on whether there is broad-based acceptance by support staff, especially CNAs, who can make the hip protectors an integral part of the daily routine for each resident. The process also requires a champion, a person or team, to assume accountability not only for measuring compliance, but also for attending to small details such as measuring, ordering, marking, and storing the hip protectors. In this study, the department of rehabilitation provided the leadership and accountability to sustain the program. Elder advocates and lobbyists need to inform federal and state governments of the potential benefits of hip protectors. Pending further research, insurers should be encouraged to provide them as a covered benefit to targeted, high-risk patients.

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