The Use of Hip Protectors in Long-Term Care Facilities: A Survey of Nursing Home Staff

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Abstract

Objectives—To determine the level of exposure to hip protectors and barriers to their use in nursing homes.

Design, Setting, and Participants—We conducted a written survey of 160 staff (including administrators) in 5 nursing homes in the Hamilton-Wentworth region, Ontario, Canada.

Measurements—The results of primary analyses were expressed as percentage of respondents.

Results—Among respondents of respective institutions, the rate of prior exposure to hip protectors varied from 40.9% to 100.0% and the rate of prior experience applying these devices varied from 14.3% to 80.0%. The most frequently cited main barriers to the use of hip protectors in long-term care facilities included physicians not thinking to prescribe them, expense, lack of evidence of benefit in this population, wearer discomfort, and wearer removal. A lack of staff time to apply these devices was rarely cited. The majority of staff believed that nursing home residents with a prior history of fracture, those who fall frequently, or those who are unsteady on their feet should wear hip protectors.

Conclusions—The exposure of surveyed nursing home staff to hip protectors was variable but most agreed that residents who are at increased risk of hip fracture should wear them. Some identified barriers to the use of hip protectors in long-term care facilities were physicians not

thinking to prescribe them, expense, lack of evidence of benefit in this population, wearer discomfort, and wearer removal. Such barriers need to be addressed for hip protector implementation strategies to be successful in nursing homes.

Keywords

Hip protectors; hip fracture; nursing home

Hip fracture is an important source of morbidity in elderly nursing home residents. The annual incidence of hip fractures in long-term care facilities for the elderly is approximately 4% (range 2.3% to 6%).¹⁻⁴ The incidence of hip fracture in nursing home residents is between 2.4 and 10.5 times that of community-dwelling peers of similar age.⁵⁻⁹ Much of the excess risk of hip fractures in elderly nursing home residents is attributed to other risk factors,⁵ such as high rates of falls,^{4,10} osteoporosis,^{1,2,11} vitamin D insufficiency,¹² and dementia.¹ Dementia is associated with an increased risk of falls¹³ and hip fracture.^{1,14-16} The economic cost of hip fractures in nursing home residents is high.^{3,17} Thus, the development of strategies to decrease the rate of hip fractures in elderly nursing home residents should be an important priority for nursing home administrators, health care providers, and health policy makers.

One intervention that has been proposed to decrease the risk of hip fracture in nursing homes is provision of external hip protectors. Hip protectors are specialized external medical devices worn over the greater trochanters; hip protectors contain shields that either absorb energy or shunt force away from the hip at the time of impact from a fall.¹⁸⁻²⁰ In a recent systematic review and meta-analysis of randomized trials, we determined that hip protectors significantly decrease the risk of hip fracture in populations composed exclusively of nursing home residents.²¹ This benefit has not been observed in other meta-analyses in which non-nursing home populations were included.^{22,23} Of note, hip protectors are generally applied by staff in nursing homes in contrast to self-application in other settings, potentially accounting for the differences in efficacy of these devices in different settings. The effectiveness of hip protectors in decreasing the risk of hip fracture is limited by generally poor acceptance and adherence with these devices.²¹⁻²⁸ The effectiveness of any hip protector intervention program in long-term care facilities is dependent on the compliance of not only residents, but also the care staff. Thus, the experience and opinions of nursing home staff on hip protectors are important to understand. The objective of this study is to determine the level of exposure to hip protectors and barriers to their use by surveying staff (including administrators) in 5 Ontario long-term care facilities.

METHODS

Design and Participants

We conducted a written survey of nursing home staff in 5 nursing homes in the Hamilton-Wentworth region of Ontario, Canada, in late 2005 and early 2006. A questionnaire was developed by a multidisciplinary panel including representatives of the fields of medicine, geriatrics, nursing, kinesiology, rheumatology, and epidemiology. All nursing home staff at participating institutions were invited to attend an informal session at their workplace and

complete the written questionnaire. Questionnaires were also provided to nursing home administrators at these institutions. A study coordinator was present at each session and answered any questions about the survey. A pair of hip protectors was also displayed at the sessions. Permission was obtained from nursing home administrators for involvement of the institution in the study. Individual participant consent was implied by completion of the survey. The study was approved by the McMaster University Ethics Review Board. At the conclusion of the study, we shared our key study findings with staff and administrators at formal presentations held in each participating institution.

Statistical Analyses

The primary analysis was a description of the percentage of staff of each home who indicated that they had previously seen a hip protector; a negative response, lack of any response, or a “don’t know” response to this question was considered negative. A secondary analysis was an estimate of the percentage of staff in each home who had previously applied a hip protector to a nursing home resident; negative responses were classified in the same manner as for the primary outcome. Other secondary descriptive analyses included rates and percentages for responses to questions with categorical results. Continuous data from Likert scale responses (with responses ranging from 1 = strongly disagree to 7 = strongly agree) were described by respective institutional means (with 95% confidence interval [CI]). Missing responses for the Likert scale questions were excluded. Pooling of numerical responses to Likert scale questions from institutions was performed using random effects models and expressed as means with 95% CI (SPSS 12.0, Chicago, IL).

RESULTS

The data were collected from 160 staff (including 19 administrators) in 5 institutions. The majority of respondents described their job as a health care aide (56.9%, 91/160), whereas 26.9% of respondents (43/160) described themselves as registered nurses or registered practical nurses. Three of the institutions were not-for-profit and 2 were for-profit. The number of residents per institution ranged from 61 to 378. The rate of prior exposure to hip protectors varied from 40.9% to 100.0% among staff of respective institutions; the rate of prior experience applying these devices in a nursing home setting ranged from 14.3% to 80.0%. Of note, the institution with 100% exposure and 80% experience level with hip-protector application had a policy of encouragement of use of hip protectors. In the 4 institutions in which less than half of staff had any prior exposure to hip protectors, the majority of respondents did not know how long it would take to apply these devices to a nursing home resident. In the only institution in which all staff had previously seen hip protectors and 80.0% (16/20) had experience applying them (institution 5), 50.0% (10/20) of respondents suggested that it takes less than 5 minutes to apply these devices, 35.0% (7/20) indicated it takes 5 to 10 minutes, 10.0% (2/20) indicated it takes 11 to 15 minutes, and 5.0% (1/20) did not know; 80.0% (16/20) of respondents from this institution indicated that only 1 staff member was required to apply hip protectors. Furthermore, 80.0% (16/20) of respondents from this institution suggested that 2 to 3 such devices are required per wearer per year. A lack of prior experience with use of these devices limited the response rates and

the availability of any meaningful information on the practicalities of the day-to-day use of these devices from other institutions.

We asked participants, on a scale of 1 to 7 (1 = strongly disagree, 7 = strongly agree), if they agreed with a statement suggesting that hip protectors have been shown to decrease the risk of hip fracture. In general, most respondents who answered the question believed that hip protectors decrease the risk of hip fracture, with a pooled mean value of 5.3 (95% CI 4.9, 5.8) (including a total of 72 responses from the 5 institutions).

We asked respondents to select one main reason why hip protectors are not used more often in long-term care homes. The choices that were provided included (a) lack of evidence of benefit in long-term care residents, (b) removal of the devices by residents, (c) frequent complicating skin ulcers or infections, (d) frequent soiling of the garment, (e) inadequate staff time for application of hip protectors, (f) excessive expense, (g) families discouraging use of the devices, (h) resident complaints of discomfort, (i) resident complaints about appearance, (j) physicians not thinking to prescribe them, or (k) previous negative experiences with hip protectors. The most frequently cited main barrier identified in each institution was physicians not thinking to prescribe them (8/25, 32.0% in institution 1 and 7/17, 41.2% in institution 2), expense (5/16, 31.3% in institution 3, and 7/24, 29.2% in institution 4), and lack of evidence of benefit in this population (8/24, 33.3% in institution 4) (excluding nonresponses and multiple responses). In the institutions, in which all staff had previously been exposed to hip protectors, the most commonly cited barriers among respondents were wearer discomfort, wearer removal, and expense (3/13, 23.1% each). A lack of staff time to apply these devices was cited as a barrier by only one respondent from a single institution.

We asked participants which long-term care residents should wear hip protectors (choices shown in Table 1). The majority of staff in all respective institutions believed that nursing home residents with a prior history of fracture, those who fall frequently, or those who are unsteady on their feet should wear hip protectors (Table 1). Fewer than 10% of respondents in respective institutions suggested that all nursing home residents should wear hip protectors or that incontinent residents should wear hip protectors, respectively.

DISCUSSION

There is evidence that hip protectors can decrease the risk of hip fracture in nursing home residents.²¹ Yet acceptance and adherence with hip protectors is generally poor in nursing home settings,^{21–29} with compliance rates ranging from 34% to 68% in randomized trials.²¹ In several observational European studies, the compliance with these devices was also poor, ranging from 30%²⁴ to 43% (at 12 months).²⁸ However, in a 13-month observational study from a nursing home from the United States, compliance averaged greater than 90% in daily wear in high-risk residents (those at high risk of fall or fracture).³⁰ In a study of Norwegian nursing home residents, reasons for discontinuation of hip protectors were side effects, distaste, difficulties with clothing, or simply not wanting to continue.²⁸ In a survey conducted in Finnish homes for the aged, improvements in flexibility and material strength of hip protectors were suggested.³¹ Furthermore, concerns were raised in the Finnish study

with respect to the use of these devices in residents wearing diapers.³¹ In this survey of nursing home staff and administrators in 5 Canadian facilities, we learned that the rate of exposure and use of these devices was highly variable among institutions. Moreover, staff generally believed that such devices could be effective in decreasing the risk of hip fracture and favored their use in high-risk residents (such as those with frequent falls or prior fractures). Practical barriers to the use of hip protectors in long-term care facilities identified by the staff were physicians not thinking to prescribe them, expense, lack of evidence of benefit in this population, wearer discomfort, and wearer removal. The lack of staff time to apply the devices was rarely cited as a major barrier.

The lack of prescription of hip protectors by physicians may suggest that some physicians caring for nursing home residents are either not aware of the existence of hip protectors or doubt their benefit. Limited physician awareness and lack of confidence in effectiveness of hip protectors in preventing hip fracture have recently been identified in a study of Japanese orthopedists.³² In a recent systematic review, the benefit of hip protectors has been questioned, particularly when non-nursing home populations are studied.^{22,23} Some of the staff that we surveyed also indicated that they did not perceive a benefit of hip protectors. However, the staff surveyed in our study generally agreed that residents at high risk of falls or fracture should be offered these devices. The use of hip protectors in nursing home residents at high risk of falls or fractures has also been advocated by some experts.³³

Some limitations of this study included a relatively small sample size of participants and institutions, sampling of nursing homes from a limited geographic area, limited response rates to questions, and opinions generated by staff unfamiliar with the devices. However, the strengths of our study are that we targeted both personal care staff and administrators, we surveyed nursing home staff from multiple institutions, and that there was representation from institutions with both high and low rates of hip protector use.

In terms of future research directions, it is important to confirm our findings in other nursing homes from a wider geographic area. A survey of geriatricians and nursing home physicians should also be undertaken to explore opinions on the effectiveness and feasibility of various hip fracture prevention strategies in nursing homes. Furthermore, research exploring nursing home residents' (and their families') opinions about fracture prevention strategies should be performed. We would also encourage clinical trialists and industry to take a more active role in examining the benefits of future fracture prevention strategies in this growing and often understudied segment of the population.

CONCLUSION

The exposure of nursing home staff to hip protectors is highly variable among nursing homes; however, in nursing homes with policies encouraging the use of hip protectors, rates of exposure and experience with these devices may be higher. Many nursing home staff members believe that residents who are at increased risk of hip fracture should wear hip protectors. However, multiple barriers to the use of hip protectors in long-term care facilities exist, including physicians not thinking to prescribe them, expense, lack of evidence of benefit in this population, wearer discomfort, and wearer removal. In order for hip protector

implementation policies to become successful in nursing homes, identified barriers will need to be addressed.

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References

1. Weller I, Schatzker J. Hip fractures and Alzheimer's disease in elderly institutionalized Canadians. *Ann Epidemiol.* 2004; 14(5):319–324. [PubMed: 15177270]
2. Chandler JM, Zimmerman SI, Girman CJ, et al. Low bone mineral density and risk of fracture in white female nursing home residents. *J Amer Med Assoc.* 2000; 284(8):972–977.
3. Singh S, Sun H, Anis AH. Cost-effectiveness of hip protectors in the prevention of osteoporosis related hip fractures in elderly nursing home residents. *J Rheumatol.* 2004; 31(8):1607–1613. [PubMed: 15290742]
4. Lauritzen JB. Hip fractures. Epidemiology, risk factors, falls, energy absorption, hip protectors, and prevention. *Dan Med Bull.* 1997; 44(2):155–168. [PubMed: 9151010]
5. Cumming RG. Nursing home residence and risk of hip fracture. *Am J Epidemiol.* 1996; 143(12):1191–1194. [PubMed: 8651217]
6. Brennan nee Saunders J, Johansen A, Butler J, et al. Place of residence and risk of fracture in older people: a population-based study of over 65-year-olds in Cardiff. *Osteoporos Int.* 2003; 14(6):515–519. [PubMed: 12730755]
7. Ooms ME, Vlasman P, Lips P, et al. The incidence of hip fractures in independent and institutionalized elderly people. *Osteoporos Int.* 1994; 4(1):6–10. [PubMed: 8148574]
8. Norton R, Campbell AJ, Reid IR, et al. Residential status and risk of hip fracture. *Age Ageing.* 1999; 28(2):135–139. [PubMed: 10350409]
9. Butler M, Norton R, Lee-Joe T, et al. The risks of hip fracture in older people from private homes and institutions. *Age Ageing.* 1996; 25(5):381–385. [PubMed: 8921144]
10. Vu MQ, Weintraub N, Rubenstein LZ. Falls in the nursing home: Are they preventable? *J Am Med Dir Assoc.* 2004; 5(6):401–406. [PubMed: 15530179]
11. Zimmerman SI, Girman CJ, Buie VC, et al. The prevalence of osteoporosis in nursing home residents. *Osteoporos Int.* 1999; 9(2):151–157. [PubMed: 10367043]
12. Komar L, Nieves J, Cosman F, et al. Calcium homeostasis of an elderly population upon admission to a nursing home. *J Am Geriatr Soc.* 1993; 41(10):1057–1064. [PubMed: 8409150]
13. Morris JC, Rubin EH, Morris EJ, et al. Senile dementia of the Alzheimer's type: An important risk factor for serious falls. *J Gerontol.* 1987; 42(4):412–417. [PubMed: 3598089]
14. Buchner DM, Larson EB. Falls and fractures in patients with Alzheimer-type dementia. *J Amer Med Assoc.* 1987; 257(11):1492–1495.
15. Johansson C, Skoog I. A population-based study on the association between dementia and hip fractures in 85-year olds. *Aging (Milano).* 1996; 8(3):189–196. [PubMed: 8862194]
16. Melton LJ III, Beard CM, Kokmen E, et al. Fracture risk in patients with Alzheimer's disease. *J Am Geriatr Soc.* 1994; 42(6):614–619. [PubMed: 8201146]
17. Wiktorowicz ME, Goeree R, Papaioannou A, et al. Economic implications of hip fracture: Health service use, institutional care and cost in Canada. *Osteoporos Int.* 2001; 12(4):271–278. [PubMed: 11420776]

18. Parkkari J, Kannus P, Poutala J, et al. Force attenuation properties of various trochanteric padding materials under typical falling conditions of the elderly. *J Bone Miner Res.* 1994; 9(9):1391–1396. [PubMed: 7817822]
19. Kannus P, Parkkari J, Poutala J. Comparison of force attenuation properties of four different hip protectors under simulated falling conditions in the elderly: An in vitro biomechanical study. *Bone.* 1999; 25(2):229–235. [PubMed: 10456390]
20. Robinovitch SN, Hayes WC, McMahon TA. Energy-shunting hip padding system attenuates femoral impact force in a simulated fall. *J Bio-mech Eng.* 1995; 117(4):409–413.
21. Sawka AM, Boulos P, Beattie K, et al. Do hip protectors decrease the risk of hip fracture in institutional and community-dwelling elderly? A systematic review and meta-analysis of randomized controlled trials. *Osteoporos Int.* 2005; 16:1461–1474. [PubMed: 15990949]
22. Parker MJ, Gillespie WJ, Gillespie LD. Effectiveness of hip protectors for preventing hip fractures in elderly people: Systematic review. *BMJ.* 2006; 332:571–574. [PubMed: 16513687]
23. Parker MJ, Gillespie WJ, Gillespie LD. Effectiveness of hip protectors for preventing hip fractures in elderly people: Systematic review. *BMJ.* 2006; 332:571–574. [PubMed: 16513687]
24. Villar M, Hill P, Inskip H, et al. Will elderly rest home residents wear hip protectors? *Age Ageing.* 1998; 27:195–198. [PubMed: 16296679]
25. van Schoor NM, Deville WL, Bouter LM, et al. Acceptance and compliance with external hip protectors: A systematic review of the literature. *Osteoporos Int.* 2002; 13:917–924. [PubMed: 12459933]
26. Warnke A, Meyer G, Bender R, et al. Predictors of adherence to the use of hip protectors in nursing home residents. *J Am Geriatr Soc.* 2004; 52:340–345. [PubMed: 14962146]
27. Maki-Joela P, Valvanne J, Jantti P, et al. Experiences with external hip protectors in homes for the aged: A report from Finland. *J Am Med Dir Assoc.* 2002; 3:29–31. [PubMed: 12807564]
28. Forsen L, Sandvig S, Schuller A, et al. Compliance with hip protectors in nursing homes in Norway. *Inj Prev.* 2004; 10:344–349. [PubMed: 15583255]
29. Thomas DR. Wearing the hip protector. *J Am Med Dir Assoc.* 2003; 4:281–282. [PubMed: 12959648]
30. Burl J, Centola J, Bonner A, Burque C. Hip protector compliance: A 13-month study on factors and cost in a long-term care facility. *J Am Med Dir Assoc.* 2003; 4:245–250. [PubMed: 12959651]
31. Maki-Jokela P, Valvanne J, Jantti P, Heikinheimo R. Experiences with external hip protectors in homes for the aged: A report from Finland. *J Am Med Dir Assoc.* 2002; 3:29–31. [PubMed: 12807564]
32. Harada A, Matsui Y, Mizuno M, et al. Japanese orthopedists' interests in prevention of fractures in the elderly from falls. *Osteoporos Int.* 2004; 15:560–566. [PubMed: 15067499]
33. Rubenstein L. Hip protectors: Another useful report from Finland. *J Am Med Dir Assoc.* 2002; 3:32–33. [PubMed: 14708513]

Table 1

Percentage of Staff in Each Institution Agreeing With Statements of Which Long-Term Care Facility Residents Should Wear Hip Protectors

Sub-group*	Percentage of Participants Responding "yes" (no.)				
	Institution 1	Institution 2	Institution 3	Institution 4	Institution 5
A – All	9.5 (4/42)	9.5 (2/21)	0.0 (0/33)	6.8 (3/44)	5.0 (1/20)
B – Prior fracture	78.6 (33/42)	90.5 (19/21)	51.5 (17/33)	65.9 (29/44)	95.0 (19/20)
C – Dementia	11.9 (5/42)	42.9 (9/21)	9.1 (3/33)	25.0 (11/44)	30.0 (6/20)
D – Frequent falls	85.7 (36/42)	90.5 (19/21)	66.7 (22/33)	72.7 (32/44)	100.0 (20/20)
E – Unsteady gait	69.0 (29/42)	81.0 (17/21)	54.5 (18/33)	70.5 (31/44)	90.0 (18/20)
F – Arthritis hip	26.2 (11/42)	23.8 (5/21)	9.1 (3/33)	4.5 (2/44)	10.0 (2/20)
G – Bed rest	21.4 (9/42)	4.8 (1/21)	6.1 (2/33)	13.6 (6/44)	10.0 (2/20)
H – Incontinent	9.5 (4/42)	0.0 (0/21)	3.0 (1/33)	0.0 (0/44)	5.0 (1/20)
I – Independent transfer	21.4 (9/42)	28.6 (6/21)	15.2 (5/33)	34.1 (15/44)	45.0 (9/20)
J – Osteoporosis	57.1 (24/42)	85.7 (18/21)	33.3 (11/33)	47.7 (21/44)	80.0 (16/20)

*. Participants were asked which of the following long-term care residents should wear hip protectors (select all that were applicable), including (A) everyone in long-term care homes, (B) people who have a history of previous fracture, (C) people with Alzheimer's dementia, (D) people who fall frequently, (E) people who are unsteady on their feet, (F) only people who have arthritis of the hip, (G) people who are restricted to bed rest, (H) people who are incontinent, (I) people who transfer from bed to chair independently, or (J) people with osteoporosis.