Factors associated with the initial acceptance of hip protectors amongst older people in residential care

SIR—Hip fractures in older people are a major public health problem. Hip protectors have been advocated as a means of preventing hip fractures in this group [1]. The impact of hip fracture and methods of prevention can be found in Appendix 1 of the supplementary data on the journal website (http://www.ageing.oxfordjournals.org/).

Many older people refuse hip protectors when initially offered [2–6]. Across a range of studies, initial acceptance of hip protectors ranged from 37 to 72% with a median of 68% [7]. Increasing acceptance rates is an important goal, therefore.

The National Patient Safety Agency (NPSA) is interested in the use of hip protectors as a way of preventing fractures amongst older people. ‘Slips, trips and falls’ accounted for 53% of incidents reported to the NPSA during January–June 2003. Two per cent of all incidents resulted in serious harm (NPSA, unpublished report).

The NPSA commissioned this work to answer the following questions for older people living in residential care homes:

(i) What factors influence the acceptance of hip protectors?
(ii) Do those factors account for the variations in acceptance between care homes?

There are published studies relating to residents of nursing homes and amongst community-dwelling older people that consider a limited range of predictive factors for initial acceptance [3, 5, 6]. There has been no previous published work, however, relating to residential care homes that sought answers these questions.

Method

This investigation used data from The East Kent Hip Protector Study, a prospective study with 6 months follow-up amongst people aged 65 and over living in residential care homes with 20 or more beds. The methods used in this study were presented elsewhere [4]. A synopsis is presented in Appendix 2 in the supplementary data on the journal website (http://www.ageing.oxfordjournals.org/). Research ethical approval was obtained prior to the start of this work.

The mean age of the study subjects was 86; they were predominantly female (80%), and many had difficulty with ambulation (e.g. 55% used a walking aid).

Assessment

Every resident was offered a single assessment (developed for this work), on entry to the study by a project nurse, to identify modifiable risk factors for falling. It included questions on the demographic characteristics of the residents, long-term medical problems (i.e. arthritis, stroke, diabetes and Parkinson’s disease), dizziness, ability to transfer, assistance with walking and with stairs, use of walking aids, use of a wheelchair, vision problems, continence problems, and falls and fracture history. Furthermore, the resident was invited to complete a fall of falling questionnaire based on that developed by Tinetti and colleagues [8].

Lying and standing blood pressures were measured. Postural hypotension was defined as a reduction of either systolic or diastolic blood pressure (DBP) of at least 20 mmHg within 2 minutes of standing following 10 minutes lying. A person was classified as hypertensive if they had a DBP of 95 mmHg or greater lying or standing. These were consistent with definitions used in East Kent at the time.

Definition of initial acceptance

Consistent with the definition proposed by van Schoor in 2002 [7], initial acceptance rate was defined as the percentage of persons who agree to wear the hip protector. In this study, 25 residents agreed to wear hip protectors but subsequently never wore them. These were included in the numerator of the acceptance rate.

Statistical analysis

The data were pre-processed before analysis: a third category was created for dichotomous variables to model the effect of missing values.

The individual factors listed above were investigated for bivariate associations with initial acceptance. The following care home-related factors were also investigated: number of beds in the home, number of residents at baseline, history of fractured neck of femur over the previous 4 years and during the last year, average number of admissions to hospital, and Primary Care Group (PCG) area.

All of the individual-level variables were investigated for independent association using a mixed-model logistic regression analysis. All variables were entered into the analysis and backward elimination used to remove the least significant term at each iteration until all terms left in the model were significant at the 20% level. The care home-related variables were then entered into the model, and the process repeated. The results for all terms remaining in the model were reported. Only those terms that had a P-value of 0.05 or less are described as statistically significant.

Results

A total of 299 residents were offered hip protectors, and in 51% they were initially accepted. The resident refused them in 30% of cases, it was a staff decision to refuse them in 10%, hip size was too large to fit the hip protectors in 2%,
and information on reason for refusal was missing for 7%. The specific reasons for patient and staff refusal were not collected.

The bivariate associations between each of the resident factors and the initial acceptance of hip protectors are shown in Table 1.

The results of the mixed effects logistic regression analysis are shown in Table 2. Increased initial acceptance of hip protectors was associated with dizziness, and reduced activities due to fear of falling. Decreased initial acceptance of hip protectors was associated with increasing age and hypertension. Male gender and difficulty seeing distant objects were associated with reduced acceptance, although neither was statistically significant at the 5% level.

Increased initial acceptance was associated, but not significantly, with the following characteristics of the care home in which they lived: lower number of recorded fractured femurs, increased rate of previous admissions to hospital and a smaller number of residents in the home. The addition of a term in the model to represent PCG gave a significant improvement in fit (chi-squared=12.19, df=4 and P=0.02).

The variance between homes in initial acceptance rates increased when homes were standardised according to individual-level characteristics. The further inclusion of care home-related factors and PCG resulted in a model that explained only 22% of the variance between homes.

**Discussion**

This study has added to our knowledge of what factors are independently associated with the initial acceptance of hip protectors. It was also found that these factors explain only a minority of the variation between residential care homes in initial acceptance. Consequently, we must look for other explanations. These include individual- and staff-level factors (e.g. knowledge and attitude towards hip protectors) or characteristics of the home not measured in this study. Work to investigate the effect of these factors on initial acceptance seems justified. Some authors have speculated that the following are important factors: older people's inherent conservatism, the perception that they are not at risk of hip fracture, or that hip protectors do not work, as well as perceived discomfort, proper fitting, appearance, extra effort to wear hip protectors, laundering and cost [9–11]. Incontinence has been reported as a staff barrier to acceptance of hip protectors [9, 10].

The associations found in our study are discussed in relation to others’ work and this is presented in Appendix 3 in the supplementary data on the journal website (http://www.ageing.oxfordjournals.org/). Some (e.g. gender) of these associations are consistent with the work of others [3, 5, 12]. However, in contrast to others’ work, we found no independent associations with mobility problems or a history of falls or fracture [11, 12].

### Table 1. Associations between each of the individual-level factors and initial acceptance of hip protectors

<table>
<thead>
<tr>
<th>Variable</th>
<th>N</th>
<th>Present % HP use (n/N)</th>
<th>Absent % HP use (n/N)</th>
<th>Chi-squared</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female gender</td>
<td>298</td>
<td>54 (128/238)</td>
<td>40 (24/60)</td>
<td>3.64</td>
<td>0.06</td>
</tr>
<tr>
<td>Arthritis—lower limb</td>
<td>281</td>
<td>70 (65/93)</td>
<td>50 (94/188)</td>
<td>10.02</td>
<td>0.0002</td>
</tr>
<tr>
<td>Arthritis—other</td>
<td>281</td>
<td>59 (54/92)</td>
<td>51 (96/189)</td>
<td>1.55</td>
<td>0.21</td>
</tr>
<tr>
<td>Parkinson’s</td>
<td>281</td>
<td>50 (9/18)</td>
<td>54 (141/263)</td>
<td>0.09</td>
<td>0.77</td>
</tr>
<tr>
<td>Stroke</td>
<td>281</td>
<td>58 (23/40)</td>
<td>53 (127/241)</td>
<td>0.32</td>
<td>0.57</td>
</tr>
<tr>
<td>Diabetes</td>
<td>281</td>
<td>72 (18/25)</td>
<td>52 (132/256)</td>
<td>3.82</td>
<td>0.05</td>
</tr>
<tr>
<td>Postural hypotension</td>
<td>206</td>
<td>53 (18/34)</td>
<td>58 (100/172)</td>
<td>0.31</td>
<td>0.58</td>
</tr>
<tr>
<td>Hypertension</td>
<td>206</td>
<td>40 (8/20)</td>
<td>59 (10/186)</td>
<td>2.70</td>
<td>0.10</td>
</tr>
<tr>
<td>Dizziness on first rising</td>
<td>277</td>
<td>65 (22/34)</td>
<td>52 (127/243)</td>
<td>1.86</td>
<td>0.17</td>
</tr>
<tr>
<td>Dizziness standing quickly</td>
<td>277</td>
<td>54 (26/48)</td>
<td>54 (123/229)</td>
<td>0.00</td>
<td>0.95</td>
</tr>
<tr>
<td>Dizziness any other time</td>
<td>277</td>
<td>71 (30/42)</td>
<td>51 (119/235)</td>
<td>6.20</td>
<td>0.01</td>
</tr>
<tr>
<td>Supervision when transferring</td>
<td>241</td>
<td>65 (42/65)</td>
<td>55 (96/176)</td>
<td>1.97</td>
<td>0.16</td>
</tr>
<tr>
<td>Unsteady walking/gait/balance</td>
<td>238</td>
<td>58 (52/90)</td>
<td>58 (86/148)</td>
<td>0.00</td>
<td>0.96</td>
</tr>
<tr>
<td>Assistance needed with stairs and steps</td>
<td>238</td>
<td>64 (65/102)</td>
<td>53 (72/136)</td>
<td>2.78</td>
<td>0.10</td>
</tr>
<tr>
<td>Uses walking aid?</td>
<td>277</td>
<td>57 (87/152)</td>
<td>50 (62/125)</td>
<td>1.61</td>
<td>0.20</td>
</tr>
<tr>
<td>Wheelchair user?</td>
<td>277</td>
<td>64 (69/107)</td>
<td>47 (80/170)</td>
<td>8.02</td>
<td>0.005</td>
</tr>
<tr>
<td>Difficulty with vision—print</td>
<td>208</td>
<td>36 (10/28)</td>
<td>60 (108/180)</td>
<td>5.82</td>
<td>0.02</td>
</tr>
<tr>
<td>Difficulty with vision—television</td>
<td>213</td>
<td>29 (6/21)</td>
<td>60 (116/192)</td>
<td>7.84</td>
<td>0.005</td>
</tr>
<tr>
<td>Difficulty with vision—immediate surrounds</td>
<td>216</td>
<td>25 (3/13)</td>
<td>61 (123/203)</td>
<td>6.67</td>
<td>0.01</td>
</tr>
<tr>
<td>Rise to toilet at night &gt;1 times</td>
<td>281</td>
<td>57 (70/123)</td>
<td>51 (80/158)</td>
<td>1.10</td>
<td>0.30</td>
</tr>
<tr>
<td>Worry will not make it to the toilet</td>
<td>281</td>
<td>57 (17/30)</td>
<td>53 (133/251)</td>
<td>0.15</td>
<td>0.70</td>
</tr>
<tr>
<td>Wetting/dribbling</td>
<td>281</td>
<td>60 (41/68)</td>
<td>51 (109/213)</td>
<td>1.72</td>
<td>0.19</td>
</tr>
<tr>
<td>Wears incontinence pads</td>
<td>281</td>
<td>60 (61/101)</td>
<td>49 (89/180)</td>
<td>3.12</td>
<td>0.08</td>
</tr>
<tr>
<td>Fallen in the last 3 months</td>
<td>281</td>
<td>61 (46/76)</td>
<td>51 (104/205)</td>
<td>2.14</td>
<td>0.14</td>
</tr>
<tr>
<td>Three or more falls in the last 3 months</td>
<td>279</td>
<td>74 (14/19)</td>
<td>52 (135/260)</td>
<td>3.37</td>
<td>0.07</td>
</tr>
<tr>
<td>Fractures in the last 3 months?</td>
<td>281</td>
<td>60 (3/5)</td>
<td>53 (147/276)</td>
<td>Fisher’s exact 1.00</td>
<td></td>
</tr>
<tr>
<td>Fear of falling?</td>
<td>213</td>
<td>74 (39/53)</td>
<td>53 (84/160)</td>
<td>7.25</td>
<td>0.007</td>
</tr>
<tr>
<td>Effect of fear of falling on several activities?</td>
<td>195</td>
<td>85 (23/27)</td>
<td>54 (90/168)</td>
<td>9.54</td>
<td>0.002</td>
</tr>
</tbody>
</table>
There is no obvious reason for the association between hypertension and a reduced likelihood of accepting hip protectors. In fact it appears counter intuitive since severe hypertension is associated with risk factors for falls including dizziness and impaired vision. Possible explanations are that it is a statistical artefact (i.e. a type I error), or it is confounded with some unmeasured factor that has a more plausible explanation (e.g. negative attitude).

**Conclusion**

We found a number of factors that are associated with initial acceptance of hip protectors. Some, but not all, of these associations are consistent with the limited work that has been published. The finding that variations between homes in initial acceptance rates remain following adjustment for these factors suggests that other factors are also of importance.

Parker and colleagues [1] found: ‘... some evidence that in institutions with high rates of hip fractures, the use of hip protectors may help reduce the risk of hip fracture, but with new evidence the effect has become less certain’. There should be further work aimed at improving initial acceptance, but this should take place in parallel with continued work to investigate efficacy of hip protectors in institutional settings; particularly, in those groups at very high risk of hip fracture. The effect on initial acceptance of individual-level, care home- and staff-related factors not included in this current work should be investigated further. It is recommended that these should include the following factors:

- the perceptions of older people in regard to their hip fracture risks;
- the perceptions of older people of the effectiveness of hip protectors;
- their attitudes to hip protectors;
- the influence of staff knowledge and attitude to hip protectors; and
- other institutional factors that may inhibit or encourage the wearing of hip protectors.

**Key points**

- Initial acceptance and continued adherence to wearing hip protectors have been shown to be a problem in many studies.
- Previous studies give little empirical evidence relating to what factors affect initial acceptance of hip protectors, and whether those factors explain the variability between care homes.
- In this study of older people living in residential care homes, increased initial acceptance of hip protectors was associated with dizziness, and reduced activities due to fear of falling. Decreased initial acceptance of hip protectors was associated with increasing age and hypertension.
- Following adjustment for individual-level and care home-related factors, including primary care group, there was still substantial variation in initial acceptance rates between homes. This could be due to variations between homes in staff or resident knowledge of and attitude towards hip protectors.
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Conflicts of interest

None.

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Non-invasive ventilation for respiratory failure due to acute exacerbations of chronic obstructive pulmonary disease in older patients

SIR—Chronic obstructive pulmonary disease (COPD) is an increasing cause of global morbidity and mortality [1]. It is a chronic progressive disease whose course is frequently punctuated with acute exacerbations, usually due to the presence of infection. Inpatient hospitalisation for acute exacerbations accounts for more than half of the average cost of treating COPD and in addition is associated with a high mortality [2, 3]. In severe disease, patients often have limited respiratory reserve and the resultant tachypnoea, increased work of breathing, and subsequent exhaustion may lead to hypercapnia, hypoxia and respiratory acidosis. The prevalence of COPD increases with increasing age [4], and in addition elderly patients are at increased risk of developing respiratory failure, for example as a result of limited reserve, loss of muscle mass, nutritional deficiencies and associated co-morbidities.

Conventional treatment for respiratory failure resulting from acute exacerbations of COPD (AECOPD) includes bronchodilators, corticosteroids, antibiotics and controlled oxygen [5]. Patients with hypercapnic respiratory failure who fail to respond to such measures may be considered for non-invasive ventilation (NIV) or for endotracheal intubation and mechanical ventilation. NIV employs a nasal or full-face mask to administer ventilatory support from a flow generator, thus unloading fatigued ventilatory muscles, decreasing the work of breathing and enhancing ventilation. Studies have shown NIV decreases the need for endotracheal intubation, decreases mortality and results in shorter duration of hospital stay, and is therefore the treatment of choice in appropriate patients [6]. Despite the extensive evidence for the use of NIV for AECOPD its use specifically in an elderly population with COPD has not been studied, and it is not known whether elderly patients gain similar benefits from NIV as do younger patients with COPD. We therefore investigated the tolerance to and outcome of NIV in a cohort of elderly patients admitted to our unit with acute hypercapnic respiratory failure due to COPD.

Methods

A prospective study of patients aged 65 years or above admitted between September 2002 and August 2003 with an AECOPD to a district general hospital in Reading, UK, was undertaken. These patients were all managed in high-