Appendix 1: Background

Hip fractures in older people are a major public health problem. [1-7] Between 12% and 25% of people die within 1 year of their hip fracture and fewer than half of surviving patients recover their pre-fracture levels of physical functioning. [8-11] Primary prevention of hip fractures is, therefore, extremely desirable.

Falling, the impact energy of the fall, the absorption capacity of the soft tissues around the greater trochanter, and bone strength are important determinants of hip fractures. [12-18] Consequently, methods of preventing hip fractures include: reducing the risk of falling; maintaining the strength of bones through osteoporosis treatment and prevention; and the use of hip protectors. [19] The focus of this paper is the latter.

Hip protectors shunt the energy of a fall away from the greater trochanter to soft tissue around the hip, and/or absorb part of the energy. The evidence for the protective effect of hip protectors is mixed. It is very weak from randomised controlled trials with individual randomisation, many carried out in community dwelling older people. Findings from cluster-randomised trials, however, suggest that for those living in institutional care with a high background incidence of hip fracture, the use of hip protectors appears to reduce the incidence of hip fractures. [20] Most of these cluster-randomised trials do have methodological flaws, however.

Many older people refuse hip protectors when initially offered. [21-25] Across a range of studies, initial acceptance of hip protectors ranged from 37% to 72% with a median of 68%. [26] Increasing acceptance rates is an important goal, therefore.

Appendix 2: Methods

The target population for this work was people aged 65 years and over living in residential care homes with 20 or more beds in the then East Kent Health Authority area. Homes were selected from a list, supplied by the Social Services inspectorate, of every residential care home in East Kent. Homes that were dual registered for residential and nursing home clients, or were offering specific care for learning disability or mental health difficulties, were excluded. Three homes within each of the
five Primary Care Groups\(^1\) (PCG) were selected sequentially from the list ordered by frequency of fractured neck of femur over the previous 4 years. A further two homes (with the next highest frequencies of fractured neck of femur) were selected within one PCG that had additional staff available to support the project.

Within the East Kent Hip Protector Study, every resident within the 17 homes was offered a full interview to elicit falls-risk factors, with referral as necessary, re-assessment, medication review, and three pairs of SAFEHIP\(^\circ\) hip protectors. The protector is made of an outer shell of polypropylene with an inner soft, plastozote lining and is sewn into special underwear so that the protector fits over the greater trochanter.

The methods involved:

- contact with all staff involved
- consent from GPs and home owners/managers for the study procedures
- consent from the residents who took part
- meetings with all primary care and residential care staff in the study areas
- teaching of care staff in homes about falls risk and assessment, hip protectors and the research process
- visit to homes to talk to residents about the project
- offers of hip protectors to residents who consented to take part, and provision to those who initially accepted the hip protectors
- an assessment to identify modifiable risk factors for falls with referral to other services as appropriate
- medication review and modification by pharmacists in conjunction with the GP.

A full description of the methods have been published elsewhere. [23]

**Appendix 3: Results of the study discussed in relation to other published studies.**

In this study, increased initial acceptance of hip protectors was associated with dizziness, and reduced activities due to fear of falling. Decreased initial acceptance

\(^1\) Primary care in England was organised, during the study period, around Primary Care Groups (PCGs) of general practitioners. East Kent included around 600,000 residents and was served by 5 PCGs, ranging from 100,000 to 160,000 patients.
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.

**Person-level factors**

Only two published studies that we identified employed the quantitative approach to investigating the factors associated with initial acceptance in a large number of older people. [22,25] Other work has used focus groups of:

- older women who were hospitalised after fractures, joint replacement or falls, [27]
- carers of older persons with dementia living in the community, [27]
- principal nurse/managers, caregivers and resident older persons in private hospital or rest homes, [28]

or have used surveys. [29,30] In these surveys, respondents answered hypothetical questions about hip protectors – they were not offered the hip protectors.

The associations we found between person level factors and initial acceptance were consistent with others’ work for gender. [22,24,30] In contrast to others’ work, we found no independent associations between initial acceptance and mobility problems, [30] or history of falls, fractures or admission caused by hip fracture. [29,30] In a small study, Patel and colleagues found decreased initial acceptance with increasing age, which is consistent with our work. [24] In contrast, Forsen and colleagues found an increase in hip protector acceptance with increasing age. [25] The likelihood of acceptance has been found to increase with the number of falls risk factors intrinsic to the older person. [22]

In a qualitative study employing focus groups, amongst those who reported that they were prepared to wear hip protectors, fear of falling and recognition of their protective benefits were given as reasons. [27]
Care home-related factors

We found no literature that empirically investigated the association between institutional factors and initial acceptance of hip protectors with which we could compare our results. In studies employing focus groups, carers and principal nurse/manager groups identified incontinence as a potential barrier to acceptance of hip protectors. [27,28] No other studies, nor other factors, were found in the literature that identified the reason for staff refusal.

Variation between homes

Our work found that following adjustment for individual-level and care home-related factors, including PCG, there was still substantial variation between homes in initial acceptance rates. We did not measure staff or resident knowledge of, attitude towards, and perceptions of hip protectors and so these factors could have contributed to this variation. Work to investigate the effect of these factors on initial acceptance seems justified.

Some authors have speculated that these are important factors. Attitudes identified include: older people’s inherent conservatism, as well as perceived discomfort, proper fitting, appearance, extra effort to wear hip protectors, laundering, and cost. [27-29]

Further, the perceptions of the person that they are not at risk of falls or hip fracture, [21,27] the belief that many hip fractures occur before a fall, that falls occur to older people who are active and occur predominantly outside of the home, [27] or the belief that hip protectors are not effective in preventing a further hip fracture, [29] are barriers to acceptance of hip protectors. If these perceptions are independently associated with initial acceptance, changing these perceptions could result in improved rates of wearing of hip protectors.