SHORT REPORTS

Cost–utility analysis of a shock-absorbing floor intervention to prevent injuries from falls in hospital wards for older people

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Abstract

Background: hospital falls place a substantial burden on healthcare systems. There has been limited research into the use of hospital flooring as an intervention against fall-related injuries.

Objective: to assess the cost-effectiveness of shock-absorbing flooring compared with standard hospital flooring in hospital wards for older people.

Design: a cost–utility analysis was undertaken drawing upon data collected in a pilot cluster randomised controlled trial and the wider literature.

Setting: the trial included eight hospital sites across England. Four sites installed shock-absorbing flooring in one bay, and four maintained their standard flooring.

Measurements: falls and resulting injuries and treatment were reported by hospital staff. Data on destination of discharge were collected. Patients were followed up at 3 months and further resource use data were collected. Health-related quality of life was assessed, allowing quality-adjusted life years (QALY’s) to be estimated. The incremental cost-effectiveness ratio of the shock-absorbing flooring was assessed compared with the standard hospital flooring.

Results: in the base case, the shock-absorbing flooring was cost saving, but generated QALY losses due to an increase in the faller rate reported in the intervention arm. Scenario analysis showed that if the shock-absorbing flooring does not increase the faller rate it is likely to represent a dominant economic strategy—generating cost savings and QALY gains.

Conclusion: the shock-absorbing flooring intervention has the potential to be cost-effective but further research is required on whether the intervention flooring results in a higher faller rate than standard flooring.

Keywords: cost-effectiveness, flooring-intervention, falls, older people

Background

Falls in hospital is a significant problem of international concern [1–9]. Research has been undertaken on the effectiveness of fall and injury prevention strategies [10, 11]; however, the effectiveness of interventions can be limited due to poor compliance [12]. In this economic evaluation, we focus on an alternative injury prevention strategy—a shock-absorbing flooring in elderly care wards.

Methods

We conducted an economic evaluation as part of the Helping Injury Prevention in Hospitalised Older People (HIP-HOP) Flooring Study [13]. We took a modelling approach so that costs and outcomes could be extrapolated beyond the end of the trial and to combine multiple data sources.

The trial was a prospective pilot cluster randomised controlled trial that included eight hospitals across England.
N. Latimer et al.

Four sites installed shock-absorbing flooring (Tarkett Omnisports EXCEL [14]) in one ward bay, and four maintained their standard flooring. The wards were predominantly for older people. The trial recruited 226 participants to each arm during the intervention period, with the intervention group showing a non-significant increase in the incidence of falls (adjusted incidence rate ratio = 1.07, 95% confidence interval = 0.64–1.81), but a non-significant reduction in injuries (adjusted incidence rate ratio = 0.58, 95% confidence interval = 0.18–1.91).

Economic analysis

We undertook a cost–utility analysis. This approach takes into account the differential health impact of different types of falls through the measurement of quality-adjusted life years (QALYs) and allows the results to be compared against National Institute for Health and Care Excellence (NICE) funding thresholds. The analysis took the National Health Service and Personal Social Service perspective over a patient’s remaining life, as recommended by NICE [15]. The analysis includes intervention costs, hospital costs, post-discharge health care and social care costs, together with patient mortality and quality of life. Where appropriate, costs and benefits were discounted at 3.5% per annum [15]. Cost-effectiveness is summarised by an incremental cost-effectiveness ratio (ICER).

Model design

A decision tree was developed to estimate the cost-effectiveness of the intervention. This describes patient pathways from admission to hospital until death, taking into account falls, costs and QALYs. A section of the decision tree model is illustrated in Figure 1. For simplicity the full tree is not shown—the complete pathway is only illustrated for ‘Fall’ followed by ‘No injury’. Severity of injury is classified as; ‘Minor’ (complaint of pain, requires ice, dressing, cleaning of wound, elevating limb or medication); ‘Moderate’ (requires suturing, steri-strips, splinting or temporary bed-rest); ‘Major’ (requires surgery, casting, traction, neurological consultation for change in level of consciousness).

Transition probabilities

The proportion of patients falling within an admission and their severity of injury are taken from the trial (Table 1). Probabilities for subsequent events were based on trial data, however, where event numbers were small these were supplemented with literature estimates. The probabilities for pathways subsequent to falls are given in Supplementary data available in Age and Ageing online, Appendix S1.

Costs and outcomes

Quality of life

Participants were followed up 3 months after discharge from the ward, at which point the EQ-5D questionnaire was completed (n = 123). The EQ-5D is a generic instrument that measures health-related quality of life across five domains, producing a single index value for health status (or ‘utility’) [16]. Utilities were calculated for each fall type, although for some types data were very scarce and assumptions had to be made based upon the literature [17]. The utility scores for the different fall types are presented in Table 1.

Mortality

An estimated survival time was applied to the final node of each decision tree pathway. Survival times for patients who were alive at discharge were estimated based upon proportions that remained alive at 3-month follow-up using exponential parametric survival models. Models were fitted for fallers (n = 32) and non-fallers (n = 238) with complete data at follow-up—separate models could not be reliably fitted for different types of fall due to the limited event numbers (n = 16, 4 and 2 for minor, moderate and major falls, respectively). Based upon the trial data, patients who experienced no fall had an expected survival of 1.24 years, and fallers had an estimated mean survival of 0.81 years. By combining estimated lifetimes with utility scores we calculated the number of QALYs associated with each pathway in the decision tree.

Costs

Installation costs for the shock-absorbing flooring were £164/m² (2009/10 price levels). The cost of flooring per patient (£13.43) was based upon this cost, the area covered by all the intervention bays (209 m²), the total number of beds of the bays (20), average length of stay in these beds (21.46 days), bed occupancy (50%) and the expected lifetime of the floor (15 years).

The cost of the initial hospitalisation was based upon the length of stay data from the HIP-HOP trial combined with relative risks to reflect the increase in cost associated with moderate and severe falls (Table 1). Post-discharge resource use data were collected using patient questionnaires administered 3 months after discharge. Patients (or carers, or GP practices) were asked about hospital admissions, outpatient appointments and other healthcare visits in the 3 months since discharge, together with their current place of residence. Post-discharge resource use was estimated separately for fall type and for place of residence. Owing to missing and scarce data, assumptions had to be made based upon the literature [17] for more serious falls.

Resource use data were combined with unit costs from standard sources for use in the economic analysis [15, 18, 19]. The post-discharge resource use and cost data are
Cost–utility analysis of a shock-absorbing floor intervention

Sensitivity analysis

Scenario sensitivity analyses were run to demonstrate which parameters are particularly influential for the cost-effectiveness results. These examined the impact of changes to risk of falling, utility scores, cost differences by fall type and occupancy rate.

Results

The model estimates costs and QALYs to be £39,100 and 0.425 per patient in the control group and £38,257 and 0.419 in the intervention group. The flooring is, therefore, associated with a cost reduction of £843 per patient, a QALY loss of 0.006 and ICER of £134,903. Strictly speaking, the flooring intervention is considered cost-effective as the costs saved per QALY lost are greater than £20,000 (or alternatively, the additional costs per QALY gained for conventional flooring are greater than £20,000 which is the more typical expression of the decision rule).

Our scenario analyses revealed that the results were extremely sensitive to the overall risk of falling, but were not sensitive to utility scores, cost differences between fall types or occupancy rates (Supplementary data are available in Age and Ageing online, Appendix S5). If an equal risk of falling is assumed for the two groups, but with the lower proportion of severe falls observed in the trial maintained, the flooring intervention becomes a dominant treatment strategy—it is cost saving and provides QALY gains.

Discussion

Our base case analysis suggests that the intervention flooring is likely to be cost-effective, but this is due to the intervention producing fewer QALYs at lower cost than standard flooring.
The shock-absorbing flooring intervention has the potential to be cost-effective compared with standard flooring, but conclusions on the actual cost-effectiveness cannot be confidently made without further research directed towards determining whether the intervention flooring causes an increase in the faller rate.

Conclusions

The shock-absorbing flooring intervention has the potential to be cost-effective compared with standard flooring, but conclusions on the actual cost-effectiveness cannot be confidently made without further research directed towards determining whether the intervention flooring causes an increase in the faller rate.

Conflicts of interest

None declared.

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Supplementary data

Supplementary data mentioned in the text are available to subscribers in Age and Ageing online.

References


PHQ-9 for depression in PD

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Validation and internal consistency of Patient Health Questionnaire-9 for major depression in Parkinson’s disease

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Abstract

Background: depression is common in Parkinson’s disease (PD), although frequently under-recognised. Among the scales used to investigate depressive features in PD, the Patient Health Questionnaire-9 (PHQ-9) has been largely used, but no specific cut-off scores for depression have been established thus far, which hinders the use of the PHQ-9 in clinical and research settings.

Objective: we assessed the discriminant validity of the PHQ-9 in order to establish the best cut-off score for the diagnosis of major depression in PD patients.

Method: one hundred and ten patients with a diagnosis of PD without dementia were evaluated with the Structured Clinical Interview for DSM-IV (SCID), considered as the gold standard for the diagnosis of major depression. Eighty-four PD patients completed the PHQ-9, the 15-item Geriatric Depression Scale (GDS-15) and the Zung Self-rating Depression Scale (SDS).

Results: the prevalence of current depression in the sample of PD patients was 25.5%. Maximal discrimination between depressed and non-depressed patients was reached with a cut-off score of 9 in the PHQ-9 (sensitivity of 100% and specificity of 83.1%). The internal consistency of the scale was 0.83 and, when used as a diagnostic instrument, the PHQ-9 had a sensitivity of 52.6% and specificity of 95.4%. The correlation coefficient between the PHQ-9 and the other two scales was 0.63.

Conclusions: the PHQ-9 is an adequate instrument for the screening—but not diagnosis—of depression in PD patients, with optimal sensitivity and specificity attained with a cut-off score of 9.

Keywords: Parkinson’s disease, psychiatric status rating scale, major depression, PHQ-9, older people