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RESEARCH REPORT

Incidence and costs of unintentional falls in older people in the United Kingdom

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Study objective: To estimate the number of accident and emergency (A&E) attendances, admissions to hospital, and the associated costs as a result of unintentional falls in older people.
Design: Analysis of national databases for cost of illness.
Setting: United Kingdom, 1999, cost to the National Health Service (NHS) and Personal Social Services (PSS).
Participants: Four age groups of people 60 years and over (60–64, 65–69, 70–74, and ⩾75) attending an A&E department or admitted to hospital after an unintentional fall. Databases analysed were the Home Accident Surveillance System (HASS) and Leisure Accident Surveillance System (LASS), and Hospital Episode Statistics (HES).
Main results: There were 647 721 A&E attendances and 204 424 admissions to hospital for fall related injuries in people aged 60 years and over. For the four age groups A&E attendance rates per 10 000 population were 273.5, 287.3, 367.9, and 945.3, and hospital admission rates per 10 000 population were 34.5, 52.0, 91.9, and 368.6. The cost per 10 000 population was £300 000 in the 60–64 age group, increasing to £1 500 000 in the ⩾75 age group. These falls cost the UK government £981 million, of which the NHS incurred 59.2%. Most of the costs (66%) were attributable to falls in those aged ⩾75 years. The major cost driver was inpatient admissions, accounting for 49.4% of total cost of falls. Long term care costs were the second highest, accounting for 41%, primarily in those aged ⩾75 years.
Conclusions: Unintentional falls impose a substantial burden on health and social services.

The economic impact of falls in older persons is a matter of increasing concern to public health practitioners and planners as the population aged over 60 in the UK increases. It has been recognised that the risk of falls increases with age, falls are a good independent predictor of admission to long term care, and falls are an expensive cause of hospital admissions,[1–3] however, the cost of falls in older people in the UK has not been widely studied or quantified.

This study serves two purposes: firstly, it provides a background of the epidemiology, resource use, and cost implications of falls in the older UK population. Secondly, it provides estimates of the costs of different fall types and by age group. By calculating these costs, we offer an alternative perspective on the importance of falls compared with other epidemiological indicators.

METHOD

This cost of illness study uses the standard economic framework to estimate the costs imposed on the NHS and the Personal Social Services (PSS) from unintentional falls.[4] In this study we focus specifically on serious falls. Serious falls are defined here as unintentional falls that result in injury requiring treatment by accident and emergency (A&E) or hospital inpatient treatment. The national databases for A&E attendances and hospital inpatient treatment were analysed. Incidence data for 1999 were used throughout, and costs are expressed in UK pounds for the year 2000.

The Department of Trade and Industry (DTI) collects data from 18 geographically distributed sentinel A&E departments in the UK. The Home Accident Surveillance System (HASS) and Leisure Accident Surveillance System (LASS) databases are used to record mode of arrival at A&E, circumstances of the accident (cause), injury sustained, and deployment (for example, referred to general practitioner (GP)/family physician for follow up).

A detailed dataset of 10 000 falls cases, selected using a random case number generator, from the HASS/LASS 1999 database was made available by the DTI. This information permitted estimation of the proportions of patients who incurred additional resources (for example, the numbers of patients transferred to long stay nursing home care, follow up GP attendances, and follow up in hospital outpatients).

The Hospital Episode Statistics (HES) data were used to identify the numbers of admissions to hospital for fall related injuries in England and Wales. These data contain several features including ICD-10 codes, health related grouping codes (for cost information) as well as demographic and admission/discharge information on patients (see: www.doh.gov.uk/hes). These data were grouped into unintentional fall categories using the ICD-10 diagnosis codes. The HASS/LASS data also records information on patients admitted to hospital after an unintentional home or leisure injury, and contains outcome categories in more detail than the HES data. The HASS/LASS data were used for estimating outcomes of patients admitted to hospital, whereas the HES data were used to estimate the numbers admitted to hospital.

The numbers of cases for each injury and outcome category attending A&E were scaled up from the 10 000 HASS/LASS records to reflect the UK population. Firstly, the data were scaled up to match the total HASS/LASS data collected from the 18 sentinel A&E departments and then were multiplied by 18.29 to reflect the UK population (this is the scale factor used by the DTI). Similarly, the HES data for England and Wales were scaled up to the UK population by a factor of 1.2.

Total numbers of falls resulting in A&E attendance and/or hospital inpatient treatment were grouped into four categories of falls (table 1) following Dowsell and colleagues[5] for four age groups: 60–64 years, 65–69 years, 70–74 years, and ⩾75 years. Age group specific rates of falls per 10 000 population were also calculated based on the UK population.[6]

Table 1 Categories of accidental falls

Fall categories	HASS/LASS categories	ICD-10 codes
Fall on or from stairs or steps	Fall on or from stairs or steps	W10
Fall from one level to another	Other fall from one level to another	W05, W06, W07, W08, W09
Fall on same level from slip/trip/stumble	Fall on same level (slipping, tripping, stumbling)	W01
Unspecified fall	Unspecified fall, slip, trip or no fall involved	W18, W19

Table 2 Mean health related grouping (HRG) costs for fall related injury cases admitted to hospital[7]*

Age group	Fall on same level from slip/trip/stumble (£)	Fall on or from stairs or steps (£)	Fall from one level to another (£)	Unspecified fall (£)
60–64	1621	1520	1707	1453
65–69	1742	1571	1792	1521
70–74	2406	2166	2133	1932
⩾75	2490	2189	2236	1876

*Values expressed as UK pounds in year 2000. As at 1 July 2000, UK£1.00=US$1.52 and €1.59.

Costs

For inpatient costs, records from the HES data were split by age and type of falls using the ICD 10 diagnosis (table 1). For each record, an inpatient cost was estimated by multiplying the health related grouping (HRG) in the HES data by the mean reference cost.[7] Mean inpatient costs were then estimated using the inpatient costs for the records in each category (table 2). These HRG costs include the costs for surgical procedures and hospital stay.

All other unit costs used were derived from national sources (table 3). To calculate the additional costs after discharge from hospital or treatment in A&E, a number of assumptions were made based on the HASS/LASS data outcomes. Those referred to a GP or an outpatient clinic were assumed to incur the cost of one attendance. In addition, because a fall may be a catalyst for older people to move into long term nursing home care, we assumed (in the absence of reliable data) a conservative estimate of six months of long term care costs could be attributed to inpatients transferred to long term care. The key factor is the time difference of moving into long term nursing home care after a fall compared with when people move into long term care in the absence of a fall. All costs are expressed in year 2000 UK pounds (NB: as at 1 July 2000, £1.00=US$1.52 and €1.59).

Table 3 Unit costs*

Resource	Unit cost
Ambulance journey	£179†[8]
Travel by other means	No cost assigned
GP consultation	£18[8]
Attendance at A&E	£65[8]
Return to usual residence, no more treatment	No cost assigned
Return to usual residence, attend outpatient clinic	£68‡[8]
Return to usual residence, attend GP	£18§[8]
Admit to long term care/refer to other long term hospital	£9594¶[8]

*Values expressed as UK pounds in year 2000. As at 1 July 2000, UK£1.00=US$1.52 and €1.59. †Based on average journey time of 38.6 minutes. ‡Hospital outpatient costs are the average of costs from a wide variety of specialties. §Cost per 9.36 minute consultation. ¶Assumed six months extra care (£369 per week for 26 weeks) in an independent (private or voluntary) nursing home for older people.

Sensitivity analysis

A one way sensitivity analysis was conducted around parameters with the greatest uncertainty. These parameters were the duration of long term institutional care attributable to a fall, the number of follow up GP, and outpatient consultations.

RESULTS

Incidence of unintentional falls

In 1999, there were over 647 721 fall related A&E attendances in the UK for persons aged ⩾60 years (population =12.1 million); of these 66% occurred in those aged ⩾75 years (population =4.3 million). These falls resulted in 204 424 admissions to hospital, 78% of which were in those aged ⩾75 years.

The rate of A&E attendances per 10 000 population for unintentional falls for those aged ⩾75 years was almost three times that of the other age groups (table 4). Most of the falls across all age groups was "fall on the same level (slip/trip/stumble)". However, the second most common fall category in the younger age groups ("falls on or from stairs or steps") drifts to "unspecified falls" as age increases.

Hospitalisation rates were greatest for the ⩾75 years age group. Persons in this age group were four times more likely to be hospitalised after an unintentional fall than persons in the 70–74 year age group, and 11 times more likely than persons in the 60–64 year age group. Compared with other types of

Key points

- In 1999, there were 647 721 A&E attendances and 204 424 admissions to hospital for fall related injuries in people aged 60 years and over.
- A&E attendance rates per 10 000 population and the percentage admitted to hospital in 1999 were: 273.5 (12.6%) 60–64 years, 287.3 (18.1%) 65–69 years, 367.9 (25.0%) 70–74 years, and 945.3 (39.0%) ⩾75 years.
- The cost per 10 000 population was £300 000 in the 60–64 age group, increasing to £1 500 000 in the ⩾75 year age group, at year 2000 prices.
- The total cost to the UK government from unintentional falls was almost £1 billion; 59% of this cost was incurred by the National Health Service and the remainder by the Personal Social Services for long term care.

Table 4 A&E attendance and hospital admission rates in 1999*

Fall category	Fall on same level (slip/trip/stumble)	Fall on or from stairs or steps	Fall from one level to another	Unspecified fall	Total
A&E attendance rate per 10000 population					
60–64	113.4	76.7	36.7	46.7	273.5
65–69	141.4	77.5	18.9	49.5	287.3
70–74	159.6	65.7	37.9	104.7	367.9
⩾75	397.0	110.8	117.1	320.4	945.3
Mean	229.7	86.9	61.8	156.4	534.9
Hospital admission rate per 10000 population					
60–64	11.7	5.0	2.1	15.8	34.5
65–69	17.6	6.2	3.4	24.9	52.0
70–74	27.3	8.8	6.3	49.5	91.9
⩾75	89.8	18.5	29.8	230.5	368.6
Mean	43.9	10.8	13.1	101.0	168.8
Percentage of A&E accidental fall attendees admitted to hospital†					
60–64	10.3	6.5	5.7	33.8	12.6
65–69	12.4	8.0	17.8	50.2	18.1
70–74	17.1	13.4	16.7	47.3	25.0
⩾75	22.6	16.7	25.4	71.9	39.0
Mean	19.1	12.4	21.1	64.6	31.6

*Fatality rates per 10000 population were 0.62, 1.22, 2.39, and 8.61 for the four age groups. †10.3% of A&E attendees admitted to hospital means 89.7% in this age and injury were not admitted. to hospital

Table 5 Percentage of outcomes for fall related injuries in 1999

Age group	60–64	65–69	70–74	⩾75
A&E attendance outcomes				
Examined/treated, no more treatment required*	63.8	50.6	37.2	37.3
Referred to outpatient clinic	16.9	27.1	32.2	26.4
Referred to GP	17.3	17.7	16.1	13.3
Admitted to hospital	2.0	4.7	14.5	23.0
Hospital inpatient outcomes				
Discharged; no more treatment required	23.8	13.2	23.9	18.5
Discharged; referred to GP	19.0	13.2	17.4	8.9
Discharged; referred outpatient clinic	57.1	73.6	50.0	45.2
Transferred to longstay care	0.0	0.0	8.6	27.4

*Includes 0.23%, 0.43%, 0.65%, and 0.91% deaths for the four age groups.

falls, "unspecified falls" were the leading cause of hospitalisation in the ⩾75 years age group.

Persons who presented at A&E after an unspecified fall were most likely to be admitted to hospital. One in three persons in the youngest age group were admitted compared with one in 1.4 in the ⩾75 age group. "Falls from one level to another" and "fall on same level" were the next highest fall categories leading to admission to hospital for those aged ⩾75 years (table 4).

Outcomes from unintentional falls

For those in the 60–64 year age group, 63.8% of A&E attendees were examined and no further treatment was required (table 5); this percentage decreased as the patient's age increased. For patients aged ⩾70 years, only 37% required no further treatment.

For hospital inpatients, the most common outcome for all the age groups was "discharged; referred to an outpatient clinic". Only those patients aged 70 years and over were likely to be "admitted or transferred to long stay care"; 8.6% of patients aged 70–74 years had this outcome increasing to 27% for the ⩾75 year age group.

Costs of unintentional falls

The cost of unintentional falls per 10 000 population is given in table 6. The total cost of falls in the UK population aged 60 years and over was £981 million; 53% of this was attributable to unspecified falls. Falls on the same level as a result of a slip or trip contributed to just over 30% of this cost.

The cost of falls for those aged ⩾75 years was £647 million. This was 66% of the cost of all unintentional falls in those aged 60 years and over. The lowest cost was for those aged 60–64 who contributed to 8% of the total cost (£78 million).

The highest overall cost component was inpatient admissions, followed by the cost for long term care (table 7). In the ⩾75 year age group, long term care was the main cost driver (48.5% of total age group costs). The lowest cost component was the cost of GP visits (0.2%). The costs for A&E attendances were comparatively small.

Sensitivity analysis

The results were sensitive to the duration of long term care attributed to an unintentional fall. Increasing long term care from 6 months to 24 months doubled the total costs. The number of follow up GP or outpatient consultations made relatively little difference to the results (see table 8).

Policy implications

- More understanding of the confounding factors affecting the incidence and severity of falls is needed to better inform prevention strategies.
- Effective interventions to prevent unintentional falls could "save" the NHS and PSS substantial sums over future years.
- Careful economic modelling of the costs of intervention programmes and the benefits is required to assess the value of fall prevention programmes.

DISCUSSION

In 1999, there were over 640 000 fall related A&E attendances in the UK for persons aged ⩾60; of these 63% occurred in

Table 6 Costs of accidental falls per 10000 population*

	Fall on same level from slip/trip/stumble	Fall on or from stairs or steps	Fall from one level to another	Unspecified fall	Total
	(£,000)	(£,000)	(£,000)	(£,000)	(£,000)
60-64	65.4	30.9	80.9	101.9	279.2
65-69	173.1	74.5	20.8	319.0	587.4
70-74	163.8	63.3	23.5	180.9	431.5
⩾75	458.5	60.5	138.1	838.9	1,496.1
Mean	248.2	57.2	77.2	427.4	810.0

*Incidence data were from 1999,and values are expressed as UK pounds in year 2000. As at 1 July 2000, UK£1.00=US$1.52 and €1.59.

Table 7 Breakdown of costs by resource use (% of total costs for each age group)*

	60–64	65–69	70–74	⩾75	Total
	(%)	(%)	(%)	(%)	(%)
Ambulance journey	5.2	2.6	4.5	3.4	3.5
A&E attendance	6.4	3.2	5.6	4.1	4.3
Hospital inpatient	71.8	58.6	61.2	42.6	49.4
Outpatient attendance	4.4	2.2	3.0	1.2	1.8
GP consultations	0.3	0.2	0.2	0.2	0.2
Long term care	12.0	33.2	25.5	48.5	40.8
Total	100.0	100.0	100.0	100.0	100.0

*Incidence data were from 1999 and costs were expressed in year 2000 UK pounds.

those aged ⩾75 years. These falls resulted in more than 200 000 admissions to hospital and 4800 fatalities, and cost the NHS £581 million and the PSS £400 million, (total £981 million); 53% of this was attributable to unspecified falls. Falls in those aged ⩾75 years accounted for 78% of unintentional falls in older people and 66% of the cost (647 million).

The costs of these falls are a substantial burden to the NHS and the PSS. The total cost is equivalent to almost 20% of the total NHS expenditure on pharmaceuticals, the total budget for one of the 38 new strategic health authorities (or three health authorities operating under previous boundaries), or 3.3 times the total NHS funding earmarked for mental health, coronary heart disease, cancer, and primary care in England. However, the NHS does not incur the full cost because 40.8% of these costs are borne by the PSS.

This study has some limitations. While data from the acute care sector were comparatively abundant (that is, A&E and hospital episode statistics), there was very little information available about costs incurred by community services. Furthermore, we have not included costs of GP consultations for less serious falls such as falls where the faller is treated by the GP at home. And nor have we included costs for fallers who are admitted directly to a nursing home rather than going through A&E or hospital. These costs may be substantial. The duration of time in long term nursing home care that can be attributed to a fall was assumed to be six months for the base-case analysis. This is comparatively conservative compared with other studies that have attributed 12 months of care to the fall.[9] In addition, it is possible there is under-reporting or over-reporting in hospital admission data through miscoding of diagnoses.[10–13] Similarly, the A&E data capture only cases where the injury occurred in the home or during leisure. It is possible that falls on the road/street might be recorded as pedestrian injury rather than home or leisure injury.

Out of pocket costs to individuals and/or their families, and monetary values of the consequent reduced quality of life after a fall have not been included in this analysis; therefore, the total burden of injury is understated. The reduction in quality of life is likely to be substantial—for example, in a time trade off study, on a scale of 0 (death) to 1 (full health), a "bad" hip fracture which results in admission to a nursing home was valued at 0.05; a "good" hip fracture (maintaining independent living in the community) 0.31, and fear of falling 0.67.[14]

Fall prevention programmes might reduce this burden. Evaluating the efficacy of fall prevention programmes has been the subject of many recent studies, including at least five meta-analyses[15–19] and one Cochrane review.[20] Although there is now clear evidence on the effectiveness of interventions to prevent falls, less is known about the effectiveness of interventions to prevent fall related injuries.

Guidelines for the prevention of falls in the UK were recently published in the *BMJ*[21] as well as joint UK and USA guidelines.[22] These guidelines have not considered the costs or cost effectiveness of interventions. However, complementary guidelines are now being developed by NICE and it is expected that the costs and cost effectiveness of interventions will be a significant part of these guidelines (see http://www.nice.org.uk). There have been several comprehensive

Table 8 Sensitivity analysis: costs per 10000 population*

	60–64	65–69	70–74	⩾75	Mean per 10000 pop
	(£,000)	(£,000)	(£,000)	(£,000)	(£,000)
Base case†	279.2	587.4	431.5	1496.1	810.0
Long term care					
1 month	250.9	422.2	338.4	883.3	530.8
12 months	306.9	749.4	522.8	2097.7	1083.9
24 months	367.9	1106.2	724.0	3421.5	1687.3
GP consultations					
2 Follow up consultations	280.1	588.7	432.6	1499.2	811.8
4 Follow up consultations	281.8	591.5	434.9	1505.3	815.5
Outpatient consultations					
2 Follow up consultations	291.4	601.0	444.4	1518.5	826.3
4 Follow up consultations	315.8	628.3	470.4	1563.2	858.9

*Incidence data were from 1999 and costs were expressed in year 2000 UK pounds. UK£1.00=US$1.52 and €1.59 as at 1 July 2000. †Assumed six months long term care, one GP follow up consultation, and one outpatient consultation where appropriate.

economic evaluations of falls prevention programmes within randomised controlled trials.[23–28] These studies, together with this study, are a first step towards incorporating information about the cost effectiveness of interventions into guidelines.

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