Injury in Western Australia

The Health System Costs of Falls
in Older Adults
in Western Australia
Injury in Western Australia:

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in Older Adults in Western Australia

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Title

Injury in Western Australia: The Health System Costs of Falls in Older Adults in Western Australia

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Abstract

The objective of this study was to determine the health system costs of falls in the population aged 65 years and above in Western Australia for 2001/02. A population-based study was undertaken to calculate the health system cost associated with older adults who presented to an Emergency Department (ED) in Western Australia. The data relating to the number of ED presentations and hospital admissions was obtained from hospital records. The use, and corresponding costs, of other health services such as outpatient services, medical services, community care, residential care and ancillary services had to be estimated from alternative sources. There were 18,706 ED attendances and 5,923 admissions to hospital for falls-related injuries in people aged 65 years and above. The rates of ED attendance and hospital admission were higher for females than males, and increased more than tenfold in the 85 years and above age group compared with the 65-69 year age group. These falls cost the health system $83 million, with more than half of this attributable to hospital inpatient treatment. Assuming no changes in the current rate of falls by age group, the projected health system costs of falls in older adults will increase to $174 million in 2021. Falls in older adults impose a substantial burden on health services, and a long-term strategic approach to falls prevention needs to be adopted. Policy in this area should be targeted at both reducing the current rate of falls through preventing injury in people from high risk groups and reducing the future rate of falls through generating a low risk population.

Keywords

Falls, falls injuries, older adults, health system costs, community care costs
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EXECUTIVE SUMMARY

Objective
The objective of this study was to determine the health system costs of falls in the population aged 65 years and above in Western Australia for 2001/02.

Methods
A population-based study was undertaken to calculate the health system costs of falls in older adults who presented to any Emergency Department (ED) in Western Australia. The Emergency Department Incident System (EDIS) was used to ascertain the number of people 65 years and above who presented to an ED with a fall. The Injury Cost Database and the Western Australian Linked Data Project were used to identify cases who were admitted to hospital with falls-related injuries. The individual follow-up of subjects after discharge from the ED or hospital was beyond the scope of the study, thus the use of health services other than ED and hospital inpatient care had to be estimated from alternative sources. These health services included hospital care, medical services, community care, residential care and ancillary services. A cost per unit was attached to each of the resources used by health services to treat falls injuries and the volume of resources used to treat older adults who had fallen was calculated. For each of the health services, the total amount spent on falls injuries was estimated by multiplying the volume of resources used by older fallers by the cost per unit of each resource. Age and gender specific rates of ED presentations and hospital admissions were calculated based on the Western Australian population of 65 years and above. Projections of future health service utilisation and corresponding costs for 2021 were made based on population projections for Western Australia.

Results

Emergency Department presentations
- In 2001/02 the number of falls-related attendances at EDs in Western Australia by people aged 65 years and above was 18,706.
The rate of ED presentations for falls in older adults was 892 per 10 000 population. The rate increased more than ten fold from 286 per 10 000 population in the 65 to 69 year age group to 3287 per 10 000 population in the 85 years and above age group.

The rate for females was more than twice the rate for males at 1130 and 590 per 10 000 population respectively.

**Hospital admissions**

- In 2001/02 the number of hospital admissions of people aged 65 years and above for falls-related injuries was 5923. Some people had more than one admission during 2001/02, with 4162 people accounting for the 5923 admissions.
- The rate of hospital admission for falls in people aged 65 years and above was 283 per 10 000 population. The rate for females was more than double the rate for males at 377 per 10 000 population and 165 per 10 000 population respectively.
- Increasing age was associated with increased likelihood of hospital admission with the rate rising from 71 per 10 000 population in the 65 to 69 year age group to 1056 per 10 000 population in the 85 years and above age group.

**Other resource utilisation**

- In addition to ED presentations and hospital admissions, the use of health system resources by people aged 65 years and above for falls injuries was estimated as:
  - 9 300 ambulance trips, 106 500 allied health consultations; 85 100 personal care assistant visits; 71 600 GP consultations; 59 000 hospital outpatient services; 31 300 nurse visits; 28 700 specialist consultations; 70 300 other domiciliary services; 200 high level residential care beds; and 50 000 prescriptions.

**Health system costs**

- The health system costs of falls injuries for people aged 65 years and above were $83 million in 2001/02. This accounted for approximately 1.5% of health expenditure in Western Australia.
The average health system cost per ED presentation was $4450, increasing from $3060 in the 65 to 69 year age group to $5030 in the 80 to 84 year age group and then dropping to $4680 in the 85 year and above age group. However, some patients have more than one presentation for the same fall. Based on an estimate of the actual number of fallers, the average health system costs per falls injury episode was $6500.

The main components of the cost of falls to the health system were hospital inpatient treatment (52%), high-level residential care (9%), hospital outpatient services (8%), ED presentations (6%); and allied health consultations (5%).

**Projections of resource utilisation and health system costs**

- Assuming no changes in the current rate of falls by age group and gender:
  - The number of people aged 65 years and above presenting at an ED in Western Australia in 2021 with a falls injury will double to 39,000.
  - The number of hospital admissions and hospital bed days will also double to 12,300 and 157,300 respectively, assuming no change to hospital admissions policy and lengths of stay. The additional bed days translate to an additional 220 bed acute care facility that will be required to accommodate the demographic changes in the population.

- Furthermore, assuming no changes in treatment patterns and costs:
  - The projected health system costs of falls in older adults in Western Australia will be $174 million in 2021. The corresponding costs in 2001/02 were $83 million.

**Alternative definitions of a falls-related injury**

- The definition of a falls-related hospital admission adopted in this study was that the admission must have an external cause of ‘accidental fall’ and a principle diagnosis of an injury or care involving use of rehabilitation procedures.

- Alternative definitions of what comprises a falls-related injury lead to different estimates of the number of acute admissions for falls, which affects the resource utilisation and health system costs attributable to falls in older adults.
Discussion

In calculating the costs of falls-related injuries in people aged 65 years and above, the study included only health system costs. Other costs such as the economic impact of falls to other sectors and the health-related loss of quality of life that can result from a falls injury were not considered. This implies that the estimated cost of falls injuries of $83 million is an underestimate of the true burden to the community of falls in older people.

The cost of falls in older adults is a matter of increasing concern to public health practitioners and planners, and these costs will escalate over the next 20 years unless effective prevention programs are implemented. A need exists for a long-term strategic approach to be adopted in relation to falls prevention, which is coherent and well coordinated.

Policy relating to falls prevention should be targeted at both reducing the current rate of falls through preventing injury in people from high risk groups and reducing the future rate of falls through generating a low risk population. The former requires the implementation of effective falls prevention programs, while the latter can be achieved by targeting some of the underlying risk factors of people who fall.

This study provides useful information on the potential cost savings that can be obtained if falls prevention programs are successfully implemented. Alternatively, it highlights the cost outlays needed if successful falls prevention programs are not implemented. This data can be used to assist in the process of planning, prioritising and resource allocation in injury prevention programs.

The information presented in this study is also useful for planning purposes, both in the short term to use to identify the volume of services to be provided to treat falls injuries in older adults and the costs of providing these services, and in the longer term to use in preparing projections of future resource utilisation and budgetary costs. In addition to policymakers in falls prevention, stakeholders who represent the interests of older people may find the incidence and cost data
useful to understand how a proposed policy will impact on its target population and the problem more generally.

In order to obtain a better understanding of the falls problem and its resource implications, the data presented in the Injury Cost Database needs to be analysed in more depth. The geographical distribution of falls incidence and its cost and the breakdown of falls and falls costs by type have not been examined in this study, nor has the incidence of falls been compared with other Australian states and territories to determine the relative magnitude of the falls problem across jurisdictions. Also, the projections of resource implications and health system costs of falls injuries in older adults were made using fairly simplistic assumptions such as the age-specific rate of falls by gender remain constant over time to 2021. More sophisticated projections of the incidence and cost of falls are needed to take account of the likelihood of a healthier older population.
1. **INTRODUCTION**

Only a few studies have examined the costs of falls in older adults in Australia. These studies have varied in their scope and the types of costs included, thus provide quite different estimates of the costs of falls injuries in people aged 65 years and older.

Fildes et al. (1994) calculated the cost of falls in Australia for 1990. Using 1988 Australian data on the number of falls and 1991 Australian costs derived from U.S. injury costs (Rice et al., 1989 cited in Fildes et al.), Fildes et al. estimated a cost of falls of $1 954 million, (1990) assuming that Australian and US relative figures are the same, i.e. the per head of population falling, sustaining an injury of a particular type and severity, and the percentage resulting in death. This figure was not separated into age groups so included younger fallers as well. The costs were calculated using an incidence-based approach, which assesses the lifetime cost of injuries sustained in a given year.

Mathers and Penn (1999) calculated the health system costs of falls injuries in Australia in 1993/94 as part of a study estimating the direct costs of health services attributable to a comprehensive range of diseases and injury types. In contrast to Fildes et al. (1994), this study used a prevalence-based approach to costing, which calculates the total cost of injury in a given year, regardless of onset or when the injuries were sustained. Mathers and Penn adopted a ‘top-down’ approach to costing that took known aggregate expenditures on health care and apportioned these to disease and injury categories using various sources of morbidity data. The direct health system cost of falls was estimated as $471.3 million, of which $406.4 million was associated with falls in the elderly.

Watson and Ozanne-Smith (1997) calculated the lifetime costs of injury in Victoria for 1993/94 using a ‘bottom-up’ approach in which they collected data on the number and type of injuries in Victoria and then estimated the aggregate direct and indirect costs attributable to these injuries using an incidence-based approach. Direct costs consisted of the cost of treating injury, which included the cost of hospital treatment, medical consultations, pharmaceuticals, rehabilitation, attendant care and nursing home care.
Indirect costs included the value of lost output due to reduced productivity caused by injury and any resultant disability and losses due to premature death.

The lifetime costs of falls in Victoria in 1993/94 were estimated as $557.3 million, of which 49% was direct costs. For the 65 years and above age category, the lifetime costs of falls injuries were estimated as $199.3 million.

Moller (1999) used the cost estimates produced by Watson and Ozanne-Smith together with Australian figures on the incidence of injury to estimate the total lifetime costs of injury by cause in Australia for 1995/96. The lifetime costs of falls was estimated as $3,017 million, and the lifetime costs of falls in persons 65 years and older as $1,083 million. Subsequent work on the projected health system costs related to falls suggested a cost in 2001 of $498 million for Australia and $42 million for Western Australia (Moller 2003). These cost projections were prevalence-based, and derived from the population estimates produced by the Australian Bureau of Statistics and the age specific health system costs for falls injuries calculated by Mathers and Penn (1999).

Hall and Hendrie (2003) also produced prevalence-based costs of falls injuries for Western Australia. Their study adopted a ‘bottom-up’ approach in which hospital and three-month post-hospital community and personal costs associated with falls sustained by older adults living in the community were calculated. Seventy-nine patients participated in the study, which was conducted in 1999. The mean cost per patient was between $4,291 and $4,642 (depending on assumptions used), which was extrapolated to the Western Australian and Australian populations to provide a state and national figure of $21 million and $287 million respectively for the cost of hospital and three-month post-hospital community and personal care if those in residential care before the fall were excluded and $48 million in Western Australia if they were included.

The objective of this study was to determine the health system costs of falls in the population aged 65 years and above in Western Australia for 2001/02. Health system costs included hospital treatment, ambulance transport, medical and allied health
consultations, community nursing, domiciliary services, equipment and home modifications, pharmaceuticals, diagnostic tests and residential care. A prevalence-based approach was adopted so costs reflect the burden to the health system of falls in a given year.

Section 2 of this report describes the methods used in producing the data on the incidence and costs of falls, Section 3 presents the results of the study, and Section 4 presents a discussion of the results and related issues.
2. METHODS

This section describes the methods used for this study under four main headings: study design and data sources for obtaining cases, case selection, valuing and measuring the use of health system resources and data analysis issues.

2.1 Study Design and Data Sources for Obtaining Cases

This was a population-based study to estimate the health system costs resulting from falls in older adults who presented to any Emergency Department (ED) in Western Australia.

Two distinct groups of cases were included in the study:

(1) Cases that presented to ED with an injury resulting from a fall and had one or more hospital admission(s) associated with their fall, including transfers to other health care providers or re-admissions. This group includes those admitted to the General Holding Ward at ED.

(2) Cases that presented to ED and had no hospital admission associated with the fall at that presentation.

Data for cases in the first group was available on an individual basis. The Injury Cost Database and the Western Australian Linked Data Project were used to retrieve de-identified data of falls injuries for the financial year 2001/2002. The linked data included a string of all hospital morbidity records for the subject in order for hospital transfers and re-admissions to be tracked, and the admission(s) related to the fall(s) to be identified. The data included demographic variables (age, gender, postcode), hospital-related variables (date of admission and discharge, length of stay, where admitted from and discharged to, hospital location) and injury-related variables (diagnoses codes, external causes of injury, diagnostic related group (DRG) category).
Individual records for cases in the second group, who only had an ED presentation, were not accessed in this study.
For this group the Emergency Department Incident System (EDIS) was used to ascertain the number of people who (i) presented to ED with a fall and met the inclusion criteria for the study and (ii) were transferred, discharged home or to residential care, or died within the ED.

The cases in this group did not generate a hospital morbidity record from the West Australian Linked Data Project. EDIS contains data for the teaching hospitals and three metropolitan non-teaching hospitals (Swan, Rockingham/Kwinana and Armadale/Kelmscott). The number and characteristics of ED presentations for these hospitals were extrapolated to all hospitals in Western Australia on the basis of the proportion of ED attendances in Western Australia presenting at EDIS hospitals.

2.2 Case Selection

Cases for this study had to meet the following inclusion criteria:

- Be 65 years of age or above.
- Present to any ED in Western Australia after a fall.
- Present between 1 July 2001 and 30 June 2002 inclusive.

Cases, who had a hospital admission, also had to have:

- An external cause of ‘accidental fall’ (external cause code between W00.0 and W19.9).
- A principle diagnosis of an injury (diagnosis code between S00.0 and T98.3) or care involving use of rehabilitation procedures (Z50).

The impact on the number of cases and associated resource use and costs of adopting alternative definitions of a fall was examined by changing the last inclusion criterion for the case selection to (i) exclude cases who had a principle diagnosis of care involving use of rehabilitation procedures (ii) include cases with at least one injury code in any of the
diagnosis fields and (iii) include all cases regardless of diagnosis codes (i.e. all cases with
an external cause of injury code indicating a falls-related admission).

2.3 Valuing and Measuring the Use of Health System Resources

2.3.1 Assigning Costs to Health System Resources

A cost was attached to each item identified as a health system resource.

*Inpatient hospital episodes*

For the group of cases admitted to hospital, the inpatient hospital cost for the
admission (including the ED component) was based on the Australian Related-
Diagnostic Related Group (AR-DRG) code recorded in their hospital morbidity record
for the fall-related admission and for any fall-related subsequent admissions within
2001/02. AR-DRG costs for AR-DRG Version 4.1 were available for teaching, other
public sector and private sector hospitals for 2000/01 (Commonwealth Department of
Health & Aged Care 2000). These were adjusted to 2001/02 prices using the hospital
price index produced by the Australian Institute of Health and Welfare (AIHW) (AIHW
2002). AR-DRG costs were assigned to each hospital admission on the basis of the
DRG code and type of hospital.

*Emergency Department presentations*

Cases that only attended the ED were assigned the average cost of an ED attendance for
Royal Perth Hospital (RPH) and Sir Charles Gairdner Hospital (SCGH) if they
attended an ED at a teaching hospital and 80% of this amount if they attended any other
ED. The average cost of an ED attendance for RPH and SCGH was $341 in 2002/03,
and this was adjusted to 2001/02 dollars ($328) using the AIHW’s total health price
index (personal communication1; AIHW 2002). Cases that were admitted to the General
Holding Ward of the ED or to the hospital have the cost of their ED attendance included
in the cost of their hospital admission.

*Non-inpatient occasions of service*

1 Personal communication with Finance Department, Royal Perth Hospital
Non-inpatient occasions of service included outpatient and plaster clinic visits. The most recent published cost for these items was $109 for 1998/99, which was adjusted to 2001/02 prices using AIHW’s total health price index (Metropolitan Health Service Board 1999; AIHW 2002).

**Ambulance transport**

The cost of ambulance transport to an ED was based on current costs adjusted to 2001/02 dollars using the AIHW’s total health price index (personal communication\(^2\); AIHW 2002). The adjusted cost for 2001/02 of an emergency ambulance trip to hospital was $437 per trip and a non-emergency trip from hospital to home or residential care was $248 per trip.

**General practitioner consultations**

The schedule fee of a Level ‘B’ surgery consultation in the Commonwealth Medicare Benefits Schedule was used as the cost of a general practitioner visit. A level ‘B’ consultation is a visit of less than 20 minutes, and the fee was $29.45 (Department of Health and Ageing 2002). Any gap payable by the patient was not included.

**Specialist consultations**

The schedule fees for a consultant physician referred consultation in the Commonwealth Medicare Benefits Schedule were used to cost specialist visits (Department of Health and Ageing 2002). Using these fees a cost of $113.20 per visit was calculated based on the weighted average of the schedule fees for an initial attendance at the surgery ($122.35), an initial attendance at home ($148.50) and a subsequent attendance at the surgery ($61.25). The weights used to calculate this average were obtained from Hall and Hendrie (2003). Again, any gap payable by the patient was not included.

**Allied health consultations**

The weighted average of the cost of all allied health services was calculated from Hall and Hendrie (2003) as $38.00 per consultation for 1998/99, which was adjusted to

\(^2\) Personal communication with Finance Department, St John's Ambulance Service, WA
2001/02 prices ($40.60) using the AIHW total health price index (AIHW 2002). The most commonly used allied health services after a fall were physiotherapy and then occupational therapy.
Community nursing and domiciliary services

Community nursing is supplied by registered nurses. Domiciliary services included personal care provided by personal care assistants and domestic services comprising meals, home help and gardening. The cost of community nursing and domiciliary services was calculated from Hall and Hendrie (2003) for 1989/99 and adjusted to 2001/02 prices using the AIHW total health price index (AIHW 2002). The 2001/02 costs were as follows: registered nurse, $60.40; personal care assistant, $27.80; a meal, $5.30; a home help visit, $14.90; a gardening service visit; $14.90.

Equipment and home modifications

The costs of equipment and home modifications were based on Hall and Hendrie (2003). Total expenditure on equipment and home modification was divided by the number of participants in the study to obtain an average cost for these components of $65.00 per faller expressed in 2001/02 prices (price adjustment using total health price index, AIHW (2002)). Equipment included shower chairs, over-the-toilet seats, commodes and walking aids. Home modifications included the installation of handrails or flexible shower hoses.

Pharmaceuticals

The average cost of a prescription was obtained from Hall and Hendrie (2003), based on the mix of pharmaceuticals used by participants in their study and the prices in the Pharmaceutical Benefits Schedule. The average cost was $7.70 per prescription expressed in 2001/02 prices (price adjustment using total health price index, AIHW (2002)). The most commonly used pharmaceuticals were paracetamol, Panadeine and anti-inflammatories.

Diagnostic tests

The cost of diagnostic tests was derived from Hall and Hendrie (2003). Total expenditure on diagnostic tests was divided by the number of participants in the study to obtain an average cost of $1.34 per faller expressed in 2001/02 prices (price
adjustment using total health price index, AIHW (2002)). Diagnostic tests included blood tests and home visits for phlebotomy.

**Residential care**

The annual cost of a high-level residential care bed was $38 685 in 2001/02 (Productivity Commission 2003).

Table 2.1 summarises the data used to value the costs of health system resources.

**Table 2.1 Costing of Health System Resources**

<table>
<thead>
<tr>
<th>Item</th>
<th>Unit costs 2001/02</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hospital inpatient episodes</td>
<td>Variable depending on DRG code and hospital type</td>
<td>Department of Health and Ageing AN-DRG cost weights (2000)</td>
</tr>
<tr>
<td>Emergency department presentations</td>
<td>$328 for a teaching hospital; otherwise $262</td>
<td>Personal communication</td>
</tr>
<tr>
<td>Hospital outpatient services</td>
<td>$109 per occasion of service</td>
<td>Metropolitan Health Service Board (1999)</td>
</tr>
<tr>
<td>Ambulance transport</td>
<td>$437 per trip for emergency transport and $248 per trip for non-emergency transport</td>
<td>Personal communication</td>
</tr>
<tr>
<td>General practitioner consultations</td>
<td>$29.45 per visit</td>
<td>Medicare Benefit Fee Schedule (2002)</td>
</tr>
<tr>
<td>Specialist consultations</td>
<td>$113.20 per visit</td>
<td>Medicare Benefit Fee Schedule (2002)</td>
</tr>
<tr>
<td>Allied health consultations</td>
<td>$38.00 per visit</td>
<td>Hall and Hendrie (2003)</td>
</tr>
<tr>
<td>Community nursing and domiciliary services</td>
<td>$60.40 per visit for a registered nurse; $27.80 per visit for a personal care assistant; $5.30 per meal; $14.90 per home help and garden service visit</td>
<td>Hall and Hendrie (2003)</td>
</tr>
<tr>
<td>Equipment and home modifications</td>
<td>Average cost of $65.00 per faller</td>
<td>Hall and Hendrie (2003)</td>
</tr>
<tr>
<td>Pharmaceuticals</td>
<td>Average cost of $7.70 per prescription</td>
<td>Hall and Hendrie (2003)</td>
</tr>
<tr>
<td>Diagnostic tests</td>
<td>Average cost of $1.34 per faller</td>
<td>Hall and Hendrie (2003)</td>
</tr>
<tr>
<td>High-level residential care beds</td>
<td>$38 685 per bed per annum</td>
<td>Productivity Commission (2003)</td>
</tr>
</tbody>
</table>

**2.3.2 Measuring the Volume of Resource Use**

In order to calculate the total cost for each health service, the volume of resource use had to be calculated.
**Inpatient hospital episodes**

Individual records of each hospital admission that satisfied the inclusion criteria for this study were available from the Injury Cost Database and the West Australian Linked Data Project. This provided the number of falls-related hospital admissions.

**Emergency Department presentations**

The number of ED presentations was obtained from EDIS. As discussed in Section 2.1, the number and characteristics of ED presentations for those hospitals included in EDIS were extrapolated to all hospitals in Western Australia based on the proportion of ED attendances in Western Australia presenting at EDIS hospitals.

**Ambulance transport**

The number of ambulance trips was calculated separately for cases living in the community and those living in residential care facilities. Forty eight per cent of cases who presented at an ED were assumed to require ambulance transport to the ED and none were assumed to require ambulance transport from the hospital (Hall and Hendrie 2003). All cases living in residential care facilities were assumed to require ambulance transport to and from hospital.

**Hospital outpatient services, general practitioner and specialist consultations, allied health consultations and pharmaceuticals**

The individual follow-up of subjects after discharge from the ED or hospital was beyond the scope of this study, therefore the use of health services other than ED and hospital inpatient care had to be estimated from alternative sources. Mathers and Penn (1999) provided Australian figures of health service utilisation relating to accidental falls by age group for the following items: hospital admissions, non-inpatient occasions of service, GP services, specialist services, prescriptions and allied health consultations. This study assumed that the relationship between the number of each of the health services utilised by fallers of 65 years and older and the number of falls-related hospital admissions for this group had remained constant between 1993/94 and 2001/02 and was
the same for Western Australia as Australia. The Mathers and Penn ratio of the number of each health service utilised to the number of falls-related hospital admissions was calculated for each health service for the 65 years and older group by gender. These ratios were then multiplied by the number of falls-related hospital admissions by gender in 2001/02 to obtain an estimate of the volume of each of the health services used by fallers of 65 years and above.

Community nursing and domiciliary services

Hall and Hendrie (2003) provide the only published figures for the utilisation of community nursing and domiciliary services for fallers aged 65 years and over. The average number of community services provided and domiciliary services used was calculated for their study population of 79 fallers. Each case who presented at the ED, excluding those in residential care, was assumed to utilise this average number of community nursing and domiciliary services.

Equipment and home modifications and diagnostic tests

Again Hall and Hendrie (2003) provide the only published figures of the amount of equipment and home modifications required by older fallers and the number of diagnostic tests needed. No actual utilisation of these items was calculated for this study. Rather the average cost of equipment and home modifications and diagnostic tests was assigned to each case who presented at the ED.

Residential care

The Mathers and Penn (1999) study was also used as the basis for calculating the number of high-level residential care beds attributable to falls. The assumption was made that Mathers and Penn’s ratio of (i) the number of beds in high-level residential care facilities attributable to falls to (ii) the Australian population of 65 years and above had remained constant between 1993/94 and 2001/02 and that this ratio was the same for Western Australia as for Australia. The Mathers and Penn ratio of the number of beds in high level residential care facilities attributable to falls in older adults in
Australian in 1993/94 was applied to the Western Australian population of 65 years and above in June 2002 to obtain an estimate of the number of high-level residential beds attributable to falls in Western Australia in 2001/02 (ABS 2002). This calculation was made separately for males and females.

### 2.4 Data Analysis Issues

The hospital morbidity records for the cases were identified and analysed using SAS Version 8.2 (SAS Institute Inc. 2003). The data relating to ED presentations was obtained from EDIS in tabular form. The volume of all items of health services included as a health system cost was entered into an Excel spreadsheet for analysis. Total costs for each health service were estimated by multiplying the volume of health services used by the cost per unit of each service (Table 2.1).

Age and gender specific rates of ED presentations and hospital admissions were calculated based on the Western Australian population of 65 years and above in June 2002 (ABS 2002). Projections of future health service utilisation and corresponding costs for 2021 were made based on the ABS population projections. (ABS 2003) Series B of the population projections was used; this series provides a mid-point estimate of likely population changes. The assumptions used in making these projections was that the current rate of falls by age group and gender remained constant between 2001/02 and 2021, no changes occurred in the treatment patterns of fallers and treatment costs remained the same.
3. RESULTS

This section presents the number of cases included in the study, the use of health system resources and the corresponding costs for falls-related injury in adults aged 65 years and over. The following data are presented –

(i) Number of cases and the use of health system resources.

(ii) Health system costs of falls injuries in older adults.

(iii) Projections of resource utilisation and health system costs of falls injuries in older adults in 2021.

(iv) The effects on resource utilisation and costs of using alternative definitions of a falls-related injury.

3.1 Number of Cases and the Use of Health System Resources

Emergency Department presentations

The number of falls-related attendances at an Emergency Department anywhere in Western Australia in 2001/02 was estimated as 18,706 (Table 3.1). Females accounted for 70% of fallers presenting at ED and the rate of falls presentations per 10,000 population increased with rising age.

As shown in Table 3.1, the rate of ED presentations for falls in people aged 65 years and above was 892 per 10,000 population. The rate increased more than ten fold from 286 per 10,000 population in the 65 to 69 year age group to 3,287 per 10,000 population in the 85 years and above age group. The rate for females was more than twice the rate for males at 1,130 and 598 per 10,000 population respectively. In each age category, women were considerably more likely than men to fall and present at the ED.

The cumulative incidence is a measure of the proportion of new events or cases of a disease or injury during a specified period of time. In 2001/02, the cumulative incidence
of falls requiring ED attendance in the population aged 65 years and above was 8.9% in 2001/02. This calculation is based on the number of ED presentations.

Each ED presentation does not represent a different person; the same person may present twice at ED as a result of the same fall or may present twice at ED for separate falls.

### Table 3.1 Number and Rate per 10 000 Population of ED Presentations by Older Adults, 2001/02

<table>
<thead>
<tr>
<th>Age groups (years)</th>
<th>65-69</th>
<th>70-74</th>
<th>75-79</th>
<th>80-84</th>
<th>85+</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Males</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number</td>
<td>820</td>
<td>918</td>
<td>1 082</td>
<td>1 073</td>
<td>1 719</td>
<td>5 612</td>
</tr>
<tr>
<td>Rate per 10000 popn</td>
<td>270</td>
<td>345</td>
<td>559</td>
<td>1 034</td>
<td>2 427</td>
<td>598</td>
</tr>
<tr>
<td><strong>Females</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number</td>
<td>940</td>
<td>1 379</td>
<td>2 148</td>
<td>2 741</td>
<td>5 886</td>
<td>13 094</td>
</tr>
<tr>
<td>Rate per 10000 popn</td>
<td>300</td>
<td>486</td>
<td>902</td>
<td>1 678</td>
<td>3 667</td>
<td>1 130</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number</td>
<td>1 760</td>
<td>2 297</td>
<td>3 230</td>
<td>3 814</td>
<td>7 606</td>
<td>18 706</td>
</tr>
<tr>
<td>Rate per 10000 popn</td>
<td>286</td>
<td>417</td>
<td>749</td>
<td>1 428</td>
<td>3 287</td>
<td>892</td>
</tr>
</tbody>
</table>

The three possible places of discharge from the ED are to return home (either their own, family/friends, or residential care), be admitted to hospital or death. This study found that approximately 70% of the fallers presenting at an ED were discharged home and the remainder were admitted to hospital. Seven deaths of fallers were recorded in the EDIS data as having occurred in an ED, which when extrapolated to all hospitals in Western Australia suggested around 22 deaths in an ED at a state level.

Patients who remain in the General Holding ward of the ED generate a hospital morbidity record and thus are counted as having a hospital admission and will have a DRG based hospital cost the same as any other hospital admission. The discharge destination of these patients is the same as for the ED only patients.

**Inpatient hospital episodes**
The number of hospital admissions of people aged 65 years and above for falls-related injuries was 5923 in 2001/02 (Table 3.2). Some people had more than one admission during 2001/02, with 4162 people accounting for the 5923 admissions.

Of the admissions, 79% had a primary diagnosis of an injury and the remaining cases had a primary diagnosis of rehabilitation.

The majority of the hospital admissions were female (n=4 373, 74%). Tables 3.1 and 3.2 suggest that 33% of females presenting at an ED were admitted to hospital compared with 28% of males. However, these percentages will overestimate the admission rate as some rehabilitation cases will not have presented at an ED before being admitted. The number of people admitted to hospital increased as age increased.

The rate of hospital admission for falls injuries in people aged 65 years and above was 283 per 10 000 population. The rate for females was more than double the rate for males at 377 per 10 000 population and 165 per 10 000 population respectively. Increasing age was associated with increased likelihood of hospital admission with the rate rising from 71 per 10 000 population in the 65 to 69 year age group to 1056 per 10 000 population in the 85 years and above age group. The rate for females was almost double the male rate in every age category except the youngest 65-69 year category.

### Table 3.2  Number and Rate per 10 000 Population of Falls-Related Hospital Admissions of Older Adults, 2001/02

<table>
<thead>
<tr>
<th>Age group (years)</th>
<th>65-69</th>
<th>70-74</th>
<th>75-79</th>
<th>80-84</th>
<th>85+</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Males</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number</td>
<td>180</td>
<td>235</td>
<td>322</td>
<td>316</td>
<td>497</td>
<td>1 550</td>
</tr>
<tr>
<td>Rate per 10000 popn</td>
<td>59</td>
<td>88</td>
<td>167</td>
<td>305</td>
<td>702</td>
<td>165</td>
</tr>
<tr>
<td><strong>Females</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number</td>
<td>256</td>
<td>435</td>
<td>743</td>
<td>993</td>
<td>1 946</td>
<td>4 373</td>
</tr>
<tr>
<td>Rate per 10000 popn</td>
<td>82</td>
<td>153</td>
<td>312</td>
<td>608</td>
<td>1212</td>
<td>377</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>436</td>
<td>670</td>
<td>1 065</td>
<td>1 309</td>
<td>2 443</td>
<td>5 923</td>
</tr>
<tr>
<td>Rate per 10000 popn</td>
<td>71</td>
<td>122</td>
<td>247</td>
<td>490</td>
<td>1 056</td>
<td>283</td>
</tr>
</tbody>
</table>
The cumulative incidence of falls requiring hospital admission in the population 65 years and above was 2.8% in 2001/02.

While the hospital admissions data obtained from the Western Australian Linked Data Project was linked to death records, a cause of death had not yet been attributed to all deaths of cases.

Of the 4162 people who were hospitalised in 2001/02 with a falls injury, 909 had a link to a death record but only 184 had a cause of death code.

Using the age-specific rates of death from accidental falls in people aged 65 years and above produced by Cripps and Carman (2001), an estimated 99 people in Western Australia would have died as a result of a fall in 2001/02.

**Other resource utilisation**

In addition to the emergency department and hospital inpatient resources utilised by people aged 65 years and over after presentation at ED with a fall, a range of other health system resources at outpatient departments or in the community are used in providing treatment and long term care to this group. The estimated number of units of these resources is shown in Table 3.3.

<table>
<thead>
<tr>
<th>Item</th>
<th>Number</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ambulance trips</td>
<td></td>
<td>2 800</td>
<td>6 500</td>
<td>9 300</td>
</tr>
<tr>
<td>Allied health consultations</td>
<td></td>
<td>42 600</td>
<td>63 900</td>
<td>106 500</td>
</tr>
<tr>
<td>Personal care assistant visits</td>
<td></td>
<td>25 500</td>
<td>59 600</td>
<td>85 100</td>
</tr>
<tr>
<td>GP consultations</td>
<td></td>
<td>19 100</td>
<td>52 500</td>
<td>71 600</td>
</tr>
<tr>
<td>Hospital outpatient services</td>
<td></td>
<td>11 600</td>
<td>47 300</td>
<td>59 000</td>
</tr>
<tr>
<td>Nurse visits</td>
<td></td>
<td>9 400</td>
<td>21 900</td>
<td>31 300</td>
</tr>
<tr>
<td>Specialist consultations</td>
<td></td>
<td>6 600</td>
<td>22 100</td>
<td>28 700</td>
</tr>
</tbody>
</table>
Almost half of the patients who attended the ED arrived by ambulance. Typically, family and friends would have taken the other half to ED; a few may have driven themselves or gone by taxi depending on their injuries and resources.

The two most commonly used professional services were those provided by allied health professionals and by GPs. There were also a significant number of visits to hospital outpatient services; these patients would have seen a variety of health care providers in a variety of settings such as a plaster clinic after a fracture or for rehabilitation.

Care provided by personal care assistants, mostly through community nursing care agencies, was the second most commonly used service. Registered nurses would have attended patients in need of higher-level services such as those requiring wound care or assistance with medications.

Males were more likely to visit an allied health professional post-fall than females who fell, whereas females were more likely to visit a specialist consultant or have a non-inpatient service provided. This may be due to underlying patterns of injury, such as the rate of fractures or to demographic characteristics such as age.

### 3.2 Health System Costs of Falls in Older Adults

The health system costs of accidental falls for people aged 65 years and above was $83 million in 2001/02 (Table 3.4). This accounted for approximately 1.5% of all health expenditure in Western Australia. The costs attributable to females was considerably greater than to males, reflecting the female to male ratios in the number of fallers presenting at ED and the associated higher number of hospital admissions. Similarly, the
costs rose as age increased, with the 85 years and above age group accounting for 43% of health system expenditure on falls-related injuries.

The average health system cost per ED presentation was $4450, increasing from $3060 in the 65 to 69 year age group to $5030 in the 80 to 84 year age group and then dropping to $4680 in the 85 year and above age group. However, some patients have more than one ED presentation for the same fall. Based on an estimate of the actual number of fallers, the average health system cost per falls injury episode was $6500. This amount increased from $4560 in the 65 to 69 year age group to $7370 in the 80 to 84 year age group, then dropped to $6700 in the 85 year and above age group.

Table 3.4  Total Health System Costs of Falls Injuries of Older Adults, 2001/02

<table>
<thead>
<tr>
<th>Age group (years)</th>
<th>65-69</th>
<th>70-74</th>
<th>75-79</th>
<th>80-84</th>
<th>85+</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Males Cost ($000)</td>
<td>2 299</td>
<td>3 078</td>
<td>4 549</td>
<td>4 889</td>
<td>7 883</td>
<td>22 698</td>
</tr>
<tr>
<td>% of total cost</td>
<td>2.8</td>
<td>3.7</td>
<td>5.5</td>
<td>5.9</td>
<td>9.5</td>
<td>27.3</td>
</tr>
<tr>
<td>Females Cost ($000)</td>
<td>3 093</td>
<td>5 229</td>
<td>10 216</td>
<td>14 290</td>
<td>27 712</td>
<td>60 541</td>
</tr>
<tr>
<td>% of total cost</td>
<td>3.7</td>
<td>6.3</td>
<td>12.3</td>
<td>17.2</td>
<td>33.3</td>
<td>72.7</td>
</tr>
<tr>
<td>Total Cost ($000)</td>
<td>5 393</td>
<td>8 307</td>
<td>14 765</td>
<td>19 179</td>
<td>35 595</td>
<td>83 238</td>
</tr>
<tr>
<td>% of total cost</td>
<td>6.5</td>
<td>10.0</td>
<td>17.7</td>
<td>23.0</td>
<td>42.8</td>
<td>100.0</td>
</tr>
</tbody>
</table>

The cost of hospital inpatient services was by far the greatest cost, accounting for 52% of overall health system costs (Table 3.5). The next two largest cost items were high-level residential care and hospital outpatient services. The share of residential care was high despite the relatively few beds attributable to falls injuries because of the high annual cost of a residential care bed.

Table 3.5  Composition of Health System Costs by Type of Cost, 2001/02

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$000</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Inpatient hospital treatment 43 400 52.1
High-level residential care 7 900 9.4
Hospital outpatient services 7 000 8.4
Emergency department presentations 5 000 6.0
Allied health consultations 4 300 5.2
Ambulance transport 4 000 4.8
Specialist consultations 3 200 3.9
Domiciliary care services 2 800 3.4
GP consultations 2 100 2.5
Community nursing 1 900 2.3
Other 1 200 1.5
Pharmaceuticals 400 0.5
Total 83 200 100.0

3.3 Projections of Resource Utilisation and Health System Costs of Falls Injuries in Older Adults in 2021.

The population of Western Australia is aging and thus the number of falls in people aged 65 years and over is expected to increase, unless there is an improvement in the availability and effectiveness of prevention strategies and their uptake in the community. This section provides estimates of the changes in the level of resources that will be needed to respond to falls-related injuries and the associated costs. The projections are for 2021 based on the assumption that the age-specific rate of falls by gender remains constant over time to 2021. Further assumptions were that injury patterns stays the same as at present, thus the proportions presenting at ED and admitted to hospital stay constant, treatment policy relating to falls injuries does not change, and the costs of treating falls remains the same.

Projected resource utilisation in 2021

The increased demand for health services to treat falls-related injuries is shown in Table 3.6. The number of people aged 65 years and above presenting at an ED with a falls injury will double to 39 000. This will have a flow on effect with a doubling of the number of falls related admissions and number of hospital bed days required to treat falls patients. Assuming no changes to hospital admissions policy and length of stays, 431 beds will be occupied all year round by patients 65 years and above with a falls injury. The additional bed days for treating falls injuries in 2021 (n=81 900) translate to an additional 220 bed acute care facility that will be required to accommodate the demographic changes in the population.
In addition, the increase in the number of hospital outpatient services will require additional infrastructure and staff to support the extra 121 000 patient visits. There are also resource implications for community care, residential care and ancillary care with similar proportional increases in their service provisions.
Table 3.6  Projections of Hospital Care for Older Fallers, 2021

<table>
<thead>
<tr>
<th>Item</th>
<th>Projected number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hospital inpatient treatment</td>
<td>12 300</td>
</tr>
<tr>
<td>- Bed days</td>
<td>157 300</td>
</tr>
<tr>
<td>Allied health consultations</td>
<td>228 500</td>
</tr>
<tr>
<td>Personal care assistants</td>
<td>179 100</td>
</tr>
<tr>
<td>GP consultations</td>
<td>149 200</td>
</tr>
<tr>
<td>Domiciliary services</td>
<td>148 000</td>
</tr>
<tr>
<td>Hospital outpatient services</td>
<td>121 000</td>
</tr>
<tr>
<td>Prescriptions</td>
<td>104 900</td>
</tr>
<tr>
<td>Community nurse visits</td>
<td>65 800</td>
</tr>
<tr>
<td>Specialist consultations</td>
<td>59 300</td>
</tr>
<tr>
<td>Emergency department</td>
<td>39 400</td>
</tr>
<tr>
<td>Ambulance trips</td>
<td>19 600</td>
</tr>
<tr>
<td>High-level residential care beds</td>
<td>400</td>
</tr>
</tbody>
</table>

Projections of the health system costs of falls in 2021

The substantial increases in the number of resources used in the hospital, community and residential care sectors have major repercussions for the cost of falls in people aged 65 years and over in Western Australia in 2021. The projected health system costs of falls in Western Australia in 2021 will be $174 million. The corresponding costs in 2001/02 were $83 million.

Table 3.7  Health System Cost of Falls of Older Adults, 2021

<table>
<thead>
<tr>
<th>Age group (years)</th>
<th>65-69</th>
<th>70-74</th>
<th>75-79</th>
<th>80-84</th>
<th>85+</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Males</td>
<td>Cost ($000)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>% of total cost</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>65-69</td>
<td>5 025</td>
<td>6 815</td>
<td>9 244</td>
<td>11 687</td>
<td>22 923</td>
<td>55 694</td>
</tr>
<tr>
<td>70-74</td>
<td>2.9</td>
<td>3.9</td>
<td>5.3</td>
<td>6.7</td>
<td>13.2</td>
<td>32.0</td>
</tr>
<tr>
<td>75-79</td>
<td>11 687</td>
<td>22 923</td>
<td>55 694</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>80-84</td>
<td>6.7</td>
<td>13.2</td>
<td>32.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>85+</td>
<td>13.2</td>
<td>32.0</td>
<td>68.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>55 694</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Females</td>
<td>Cost ($000)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>% of total cost</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>65-69</td>
<td>6 802</td>
<td>11 126</td>
<td>17 676</td>
<td>25 712</td>
<td>57 147</td>
<td>118 463</td>
</tr>
<tr>
<td>70-74</td>
<td>3.9</td>
<td>6.4</td>
<td>10.1</td>
<td>14.8</td>
<td>32.8</td>
<td>68.0</td>
</tr>
<tr>
<td>75-79</td>
<td>17 676</td>
<td>25 712</td>
<td>57 147</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>80-84</td>
<td>14.8</td>
<td>32.8</td>
<td>68.0</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>85+</td>
<td>32.8</td>
<td>68.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>118 463</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>Cost ($000)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>% of total cost</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>65-69</td>
<td>11 827</td>
<td>17 941</td>
<td>26 919</td>
<td>37 399</td>
<td>80 070</td>
<td>174 157</td>
</tr>
<tr>
<td>70-74</td>
<td>6.8</td>
<td>10.3</td>
<td>15.5</td>
<td>21.5</td>
<td>46.0</td>
<td>100.0</td>
</tr>
<tr>
<td>75-79</td>
<td>26 919</td>
<td>37 399</td>
<td>80 070</td>
<td></td>
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</tr>
<tr>
<td>80-84</td>
<td>21.5</td>
<td>46.0</td>
<td>100.0</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>85+</td>
<td>46.0</td>
<td>100.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>174 157</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
3.4 Effects on Resource Utilisation and Costs of Using Alternative Definitions of a Falls-related Injury

The definition of a falls-related hospital admission adopted in this study was the admission must have an external cause of ‘accidental fall’ and a principle diagnosis of an injury or care involving use of rehabilitation procedures.

Using this definition the number of falls-related admissions was 5923. Excluding the cases admitted for care involving use of rehabilitation procedures, the number of acute admissions for falls would be 4693. Alternatively, widening the definition to include all falls-related admissions with an injury diagnosis in any of the diagnosis fields would result in 7303 admissions being falls-related, or 7320 if all admissions with an external cause of ‘accidental fall’ were counted. Table 3.8 shows the effect on resource use and health system costs of using alternative definitions of a fall. Health system costs range from $70.3 million if only acute admissions are included to $100.4 million if all ‘accidental falls’ are counted. Similarly the projected health system costs for 2021 range from $147.2 million to $210.8 million.

The purpose of this study was to determine the health system costs of falls in the adult population aged 65 years and above, thus all acute and rehabilitation admissions were included as falls-related. Clearly, widening the definition to include all admissions with an injury diagnosis in any field would overestimate the number of falls-related hospital episodes. The primary diagnoses of patients with an injury diagnosis in fields other than the primary field include diseases of the circulatory, nervous and respiratory systems, neoplasms, mental and behavioural disorders and diseases of the musculoskeletal system and connective tissue. However, some resources used by this group would have been as a result of their fall thus the estimates of the costs to the health system of falls in older adults produced in this study are conservative.
Table 3.8 Effects on Resource Utilisation and Health System Costs of Alternative Definitions of a Falls-related Injury

<table>
<thead>
<tr>
<th>Alternative definitions</th>
<th>Number of hospital admissions</th>
<th>Health system costs 2001/02 ($000)</th>
<th>Projected health system costs 2021 ($000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Falls-related admission and injury as primary diagnosis</td>
<td>4 693</td>
<td>70 333</td>
<td>147 197</td>
</tr>
<tr>
<td>Falls-related admission and injury or rehabilitation as primary diagnosis (base case)</td>
<td>5 923</td>
<td>83 238</td>
<td>174 157</td>
</tr>
<tr>
<td>Falls-related admission and any diagnosis of an injury</td>
<td>7 303</td>
<td>100 129</td>
<td>210 133</td>
</tr>
<tr>
<td>Falls related admission</td>
<td>7 320</td>
<td>100 389</td>
<td>210 759</td>
</tr>
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</table>
4. DISCUSSION

The purpose of this study was to determine the health system costs of falls in older adults aged 65 years and above. These costs include hospital treatment, medical services, community care, residential care and ancillary services. The population for which costs were calculated was older adults who presented to any Emergency Department in Western Australia.

The number of falls-related presentations at an ED anywhere in Western Australia in 2001/02 was 18,706 or 892 per 10,000 population. The number of hospital admissions was 5,923. Depending on the type and severity of their injuries, these fallers had contact with a range of different health services on discharge from ED or hospital. The overall health system costs of accidental falls in older people across all these services were estimated to be $83 million. With the future ageing of the population, the demand for health services as a result of the increase in the number of falls injuries, in the absence of effective prevention and lower treatment costs, was projected to be $174 million in 2021.

A strength of this study was it was population-based, with cases identified from ED and hospital morbidity records. However, the individual follow-up of subjects after discharge from the ED or hospital was beyond the scope of this study so the use of health services other than ED and hospital inpatient care had to be estimated from alternative sources. While this introduces some uncertainty into the results of the study, the best possible known sources were used as the basis for determining utilisation of health system resources by older fallers. In order to calculate the costs associated with the utilisation of health system resources, a cost per unit had to be assigned to each item of expenditure. Some items such as hospital inpatient care were easy to allocate a cost as DRG cost weights provide a readily available source of the cost of hospital admissions. However, a number of other items were more difficult to cost and, as was the case with resource use, estimates of the cost per unit of these items were made based on the best possible known sources.
Because of the perspective of the study, only costs to the health system were covered. The economic impact of falls in older people to other sectors was not considered. In addition, a fall can be a very significant event for an older person, resulting in a loss of mobility and independence. Measured on an interval scale from between 0 (death) and 1 (full health), a ‘bad’ hip fracture (which results in admission to a nursing home) has been valued at 0.05; a ‘good’ hip fracture (maintaining independent living in the community) at 0.31, and the fear of falling at 0.67. Eighty percent of the women who provided these valuations would rather be dead (utility=0) than experience the loss of independence and quality of life that results from a bad hip fracture and subsequent admission to a nursing home (Salkeld et al. 2000). This study has not included the non-monetary cost of loss of quality of life associated with falls injuries in older adults.

Of the studies that have examined the costs of falls in older adults in Australia, the most relevant ones with which to compare the results of this study are Moller (2003) and Hall and Hendrie (2003) since both provided prevalence-based figures of health system costs. Mathers and Penn (1998) also provided prevalence-based figures of health system costs; however, Moller has used Mathers and Penn’s estimates for 1993/94 as the basis for his projections of health system costs in 2001 so the latter are more useful for comparison purposes for this study. Other studies of the costs of falls injuries in older adults in Australia have calculated incidence-based or lifetime costs, which cannot be compared in order of magnitude to estimates derived using a prevalence based approach (Fildes 1994; Watson and Ozanne-Smith 1997).

Moller’s estimate (2003) of the cost of falls in 2001 was $42 million, which is considerably below the $83 million presented in this study. One reason for the difference in costs between the two studies is that Moller did not take into account any increase in health care costs since 1993/94. Adjusting for the increase in health system costs raises the Moller estimate to $49 million. A second reason for the cost difference is that Moller based his calculations on 3300 falls-related hospital admissions in
Western Australia in 2001 whereas the number using the definition adopted in this study was 5923.

If Moller’s estimates are adjusted upwards proportionately based on the increased number of hospital admissions (i.e. multiplying his estimate of $49 million by 5923 divided by 3300) then the Moller estimate of the cost of falls injuries in older adults becomes $89 million, which is a similar order of magnitude to the findings of this study.

The extrapolation by Hall and Hendrie (2003) of the hospital and three-month post-hospital community and personal costs associated with falls in older adults in Western Australia was $48 million in 1999. Again, this is well below the $83 million estimated in this study. The main reasons for this difference in costs is that their extrapolation was based on 11 071 patients presenting at an ED in Western Australia. This number of ED presentations was based on the total number of hospital admissions for falls in older adults in Western Australia together with the finding for their study population that 53% of ED presentations were admitted to hospital. This admission rate is too high at a state wide level. It was based on a teaching hospital, which would be likely to have a higher admission rate than the average across all hospitals, and was derived from a relatively small sample of patients. Using population-based data this study suggests an admission rate of around 30%. Reworking Hall and Hendrie’s estimate based on this lower admission rate provides a total cost of hospital and three-month post-hospital community and personal costs of $85 million. Again this is very similar to the estimate of $83 million found in this study. While the Hall and Hendrie estimate represents costs to three months only, their study shows the use of health services reducing in successive months after hospital discharge. In addition, Hall and Hendrie did not restrict their costing to health system costs so their estimate includes a few costs to sectors other than the health system.

The costs of falls in older people are a substantial burden on the health system and will escalate over the next 20 years unless effective prevention programs are implemented. While some falls prevention programs are currently in place, a need exists for a long-
term strategic approach to be adopted that is evidence based and coherent. Policy relating to falls prevention programs should be targeted at both reducing the current rate of falls through preventing injury in people from high risk groups and reducing the future rate of falls through generating a low risk population. The former requires the implementation of effective falls prevention programs, while the latter can be achieved by targeting some of the underlying risk factors of people who fall.

Many recent studies have evaluated the efficacy of falls prevention programs, and several economic evaluations of falls prevention programs have been conducted. This study provides useful information on the potential cost savings that can be obtained if falls prevention programs are successfully implemented. Alternatively, it highlights the cost outlays needed if successful falls prevention programs are not implemented. Given evidence on the effectiveness of falls prevention programs, the cost of falls data from this study can be used to calculate the break-even point of a falls prevention program, which is the point at which program costs exactly equal the cost savings generated from a reduction in the number of falls. Alternatively, the cost of falls data can be used to calculate the cost-effectiveness of falls prevention programs measured in terms of the cost per injury fall prevented. These types of analyses can assist in the process of planning, prioritising and resource allocation in injury prevention programs.

The information presented in this study is also useful for planning purposes, both in the short term to use to identify the volume of services to be provided to treat falls injuries in older adults and the costs of providing these services, and in the longer term to use in preparing projections of future resource utilisation and budgetary costs.

In addition, policymakers in falls prevention and stakeholders who represent the interests of older people require information to understand how a proposed policy will impact on its target population and the problem more generally. Incidence and cost data plays a useful role in advising the variety of groups in the policy making process.
In order to obtain a better understanding of the falls problem and its resource implications, the data presented in the Injury Cost Database needs to be analysed in more depth. For example, this study has not addresses the geographical distribution of falls incidence and its cost nor has it examined the breakdown of falls and falls costs by type.

Furthermore, while the cost of falls in this study has been compared with that found in other studies, no comparative analysis of the incidence of falls in other Australian states and territories was made to determine the relative magnitude of the falls problem across jurisdictions.

Finally, the projections of resource implications and health system costs of falls injuries in older adults were made using fairly simplistic assumptions such as the age-specific rate of falls by gender remain constant over time to 2021. More sophisticated projections of the incidence and cost of falls are needed to take account of the likelihood of a healthier older population.
REFERENCES


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