The Risks of Hip Fracture in Older People from Private Homes and Institutions

MEG BUTLER, ROBYN NORTON, TREVOR LEE-JOE, ADA CHENG, A. JOHN CAMPBELL

Summary
This study aimed to determine whether the incidence of hip fracture is greater among those living in institutions compared with those living in private homes. Over two and a half years of surveillance, 1832 hip fractures were identified, of which 58% were sustained by those living in private homes and 42% by those living in institutions. The risks of hip fracture, unadjusted for age and sex, were 10.5 times greater for those living in institutions compared with those living in private homes. After adjusting for age and sex, these greatly increased risks were maintained, although for both men and women the risks decreased with age, such that at ages over 90 years the risks were not significantly different. Given these findings, hip fracture prevention strategies that focus particularly on individuals within institutions are highly commended.

Keywords: Hip fracture, Old age, Institutional care.

Introduction
In New Zealand, as in other industrialized countries, fractures of the femoral neck are an important cause of mortality, morbidity and disability among older people [1-5]. In addition, as has been shown in other countries, hip fracture incidence is higher among women than men and incidence rates increase with increasing age [6-8].

A recent report has suggested that the incidence of hip fracture may differ by residential status and in particular that the risks of hip fracture are greater for older people living in institutions compared with those living in private homes [9]. While the current emphasis of many falls prevention programmes among older people is on individuals living in private homes [10], there is good evidence to show that physical activity programmes in institutions can also improve function [11]. If the incidence of fractures is indeed substantially higher among those living in institutions compared with those living in private homes, then it may be more cost effective to direct intervention programmes to these individuals.

The purpose of this study was to identify the incidence of hip fractures by sex and residential status among older people in the Auckland region, the largest urban area in New Zealand. Specifically, this study aimed to determine whether the incidence of hip fracture was greater among those living in institutions compared with those living in private homes.

Methods
The Auckland Hip Fracture Study is a large case-control study aimed at identifying potentially modifiable risk factors for fractures of the femoral neck among older people. In order to select 'cases' randomly to participate in the case-control study, a surveillance system was established between 8 July 1991 and 7 February 1994 to identify all individuals in the Auckland region, aged 60 years or older, who sustained a fracture of the femoral neck. All such individuals are admitted directly or transferred to either Auckland or Middlemore Hospitals. Management of hip fracture within private hospitals is extremely rare, as is conservative management without hospitalization [6]. Individuals who normally resided outside the Auckland region, whose fracture was the result of some major trauma, such as a road traffic crash, or whose fracture was the result of a pre-existing pathological condition, such as a primary or metastatic bone cancer, were excluded from the surveillance system.

Individuals were identified through the ward registers in each hospital. Demographic information, including age, sex and residence was obtained on each identified individual from the register. Residence was defined as being either a private home or an institution. An institution was defined as a supervised residential home or complex, specifically for the accommodation and care of older people, but did not include sheltered housing. Traditionally in New Zealand, rest homes have provided minimal (Category 1) and moderate (Category 2) levels of care, while private hospitals have provided moderate to total care (Category 3) [12]. However, as a consequence of the health reforms, all public long-term-care beds were closed in the Auckland region between 1989 and 1990, with patients being transferred to the private sector. Rest Homes were encouraged by way of government subsidies to expand their Category 2 capacities and in some cases to provide Category 3 facilities. Consequently the levels of care provided by both rest homes and private hospitals have become similar; thus more detailed examination of
Table I. Number of hip fractures, estimated population at risk, and annual hip fracture incidence rates by age group, residence and sex, July 1991–February 1994, Auckland Region

<table>
<thead>
<tr>
<th>Age group</th>
<th>Private homes</th>
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<th>Institutions</th>
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<tbody>
<tr>
<td></td>
<td>No. of fractures</td>
<td>Population at risk</td>
<td>Annual rates per 100 000</td>
<td>No. of fractures</td>
<td>Population at risk</td>
<td>Annual rates per 100 000</td>
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<td>Women</td>
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<td>20</td>
<td>17 060</td>
<td>47</td>
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<td>85</td>
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<tr>
<td></td>
<td>65–69</td>
<td>50</td>
<td>16 151</td>
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<td>163</td>
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<tr>
<td></td>
<td>70–74</td>
<td>95</td>
<td>13 627</td>
<td>279</td>
<td>29</td>
<td>287</td>
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<tr>
<td></td>
<td>75–79</td>
<td>159</td>
<td>11 003</td>
<td>578</td>
<td>70</td>
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<tr>
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<td>80–84</td>
<td>207</td>
<td>6664</td>
<td>1242</td>
<td>161</td>
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<td>85–89</td>
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<td>2740</td>
<td>2511</td>
<td>191</td>
<td>1403</td>
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<tr>
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<td>90–94</td>
<td>74</td>
<td>731</td>
<td>3995</td>
<td>105</td>
<td>795</td>
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<tr>
<td></td>
<td>95+</td>
<td>14</td>
<td>81</td>
<td>6914</td>
<td>53</td>
<td>349</td>
</tr>
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</table>

| Men       | 60–64          | 14              | 16 939          | 33              | 2              | 92              | 870              |
|           | 65–69          | 23              | 14 210          | 65              | 9              | 167             | 1781             |
|           | 70–74          | 31              | 10 330          | 120             | 11             | 247             | 1781             |
|           | 75–79          | 60              | 7266            | 330             | 25             | 322             | 3106             |
|           | 80–84          | 61              | 3836            | 636             | 36             | 414             | 3478             |
|           | 85–89          | 42              |                |                 | 40             |                |                  |
|           | 90–94          | 31              | 321             | 3863            | 30             | 185             | 6486             |
|           | 95+            | 4               | 38              | 4211            | 5              | 46              | 4348             |
| Total     | 1057           |                |                 | 775             |                |                  |
| Women     | 790            |                |                 | 617             |                |                  |
| Men       | 267            |                |                 | 158             |                |                  |

institutionalized individuals by type of institutional care was not undertaken.

Crude incidence rates for femoral neck fractures for those in private homes and for those living in institutions were calculated using two population databases. The number of people aged 60 years or older living in the study area at the time of the study was obtained from the 1991 census data [13]. As the census data do not identify the residential status of individuals, data from a survey of all institutions for older people in the Auckland region, undertaken in 1993, were used to determine the number of individuals residing in them [12]. The total population figure, less those residing in institutions, was used to estimate the number of individuals residing in private homes.

Compared with those living in private homes, individuals living in institutions are older and a higher proportion are women. Thus, to examine the relationships between residence, age, sex and hip fracture, grouped data were analysed by logistic regression using the method of maximum likelihood [14].

Results

Over the two and a half years of surveillance 1832 hip fractures were identified (Table I). Individuals living in private homes sustained 1057 (57.7%) of these hip fractures, while those living in institutions sustained 775 (42.3%). Women sustained 1407 (76.8%) of these hip fractures, men 425 (23.2%). Among women, those living in private homes sustained 790 (56.1%) of the fractures, while those in institutions sustained 617 (43.9%). Among men, those in private homes sustained 267 (62.8%) of the hip fractures, while those in institutions sustained 158 (37.2%). For both men and women, the numbers of hip fractures in each age group increased with age, up until the age of 85 years. Among subjects aged 60–84 years, those living in private homes sustained 720 (67.2%) of the hip fractures, while those living in institutions sustained 351 (32.8%). However, after the age of 85 years, those living in institutions sustained 424 (55.7%) of the hip fractures, while those in private homes sustained 337 (44.3%). These patterns were evident for both men and women [Figures 1(a) and (b)].

At the time of the 1991 Census there were 129 225 individuals aged 60 years or older living in the Auckland region. The 1993 survey of institutions identified 7798 individuals aged 60 years or older living in institutions. The average annual incidence of hip fracture was 348 hip fractures per 100 000 population for those living in private homes and 3975 hip fractures per 100 000 population among institutionalized older people. Hip fracture incidence rates were higher for women compared with men, for both those living in private homes and those living in institutions [Figures 2(a) and (b); Table I]. For both men and women, hip fracture incidence rates increased with age, with higher rates sustained among institutionalized individuals compared with those living in private homes, at all
The risks of hip fracture, unadjusted for sex or age, were 10.5 times higher (95% CI: 9.7-11.3) for those living in institutions compared with those living in private homes. The risks were 8.6 times higher (95% CI: 7.9-9.4) for women living in institutions compared with women living in private homes, while men living in institutions were 13.3 times more likely (95% CI: 11.3-15.5) to sustain a hip fracture compared with men living in private homes. Women aged 60-64 years living in institutions, were 17.0 times more likely (95% CI: 5.9-49.2) to sustain a fracture than women of the same age living in private homes (Table II). The risks of hip fracture among women living in institutions compared with those living in private homes decreased with increasing age and beyond 90 years were no longer statistically significant. Men aged 60-64 years living in institutions were 23.7 times more likely (95% CI: 8.7-64.8) to sustain a hip fracture than men of a comparable age living in private homes (Table II). The risks also decreased with increasing age and beyond 90 years were no longer statistically significant.

The risks of hip fracture were significantly greater for

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**Figure 1.** Hip fracture incidence among (a) women and (b) men by residential status in the Auckland region from July 1991 to February 1994. • Private; □ institution.

**Figure 2.** Average annual hip fracture rates among (a) women and (b) men by residential status in the Auckland region from July 1991 to February 1994. • Private; □ institution.
women compared with men (OR = 2.6; 95% CI: 2.3–2.9). Among those living in institutions, the risks of hip fracture were 1.5 times greater (95% CI: 1.3–1.8) for women compared with men, whereas among those living in private homes, the risks were 2.4 times greater (95% CI: 2.1–2.7) for women compared with men.

Discussion

This study has shown that in Auckland, New Zealand, men and women aged 60 years or older who live in institutions comprise almost half those who sustain hip fractures. The incidence rate of hip fracture among this population is very high, such that one in every 25 individuals who lives in an institution is likely to sustain a hip fracture annually. Even when the age and sex differences between those living in private homes and institutions are taken into account, the risks of fracture are significantly greater for those living in institutions compared with those living in private homes.

These findings, therefore, confirm earlier reports which suggest that older people living in institutions are at greater risk of hip fracture than independently living older people of the same age [9]. They also support the finding that the differences in risks are greatest for the ‘younger old’, with the differences in risks declining with age. Unlike earlier findings, however, these risks were found to be modified by sex, such that the risks for men living in institutions compared with those living in private homes were somewhat greater than those for women.

The higher incidence of hip fractures among individuals living in institutions compared with those living in private homes, particularly among the younger old, is likely to be related to the fact that those in institutions are, by virtue of the reason for their institutional admission, likely to have many more risk factors for hip fracture, particularly risk factors associated with an increased risk of falling. Recent reports that injury-causing falls are more frequent in older people living in institutions than among home-dwelling older people further supports this contention [15]. There is good evidence to show that fall prevention programmes [16] and in particular physical activity programmes [11] among this population may be cost effective. In addition, recent research has shown a positive effect of hip protectors in reducing the risk of hip fracture, once an individual has fallen [17]. Given these latter findings and the results of the current study, there is a real need to focus prevention strategies on individuals residing in institutions, if efforts aimed at reducing hip fracture incidence are to be successful.

Acknowledgements

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References

11. Fiatarone MA, Marks BC, Ryan MD, Meredith CH, Lipsitz LA, Evans WJ. High intensity training in
 HIP FRACTURE RISK BY RESIDENCE 

nonagenarians: effects on skeletal muscle. JAMA 1990;263:3029–34.


Authors' addresses
M. Butler, R. Norton, T. Lee-Joe
Injury Prevention Research Centre, Department of Community Health, University of Auckland, Private Bag 92019, Auckland, New Zealand.

A. Cheng
Clinical Trials Research Unit, Department of Medicine, University of Auckland

A. J. Campbell
Department of Geriatric Medicine, University of Otago, New Zealand

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