

Mortality, Independence in Living, and Re-fracture, One Year Following Hip Fracture in Canadians*

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Key Words

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Abstract

Purposes:

1. To determine the one year mortality, institutionalization, and re-fracture rates following hip fractures in Canadians.
2. To compare post-fracture outcomes between those who fracture while living in institutions versus living in the community.
3. To compare Canadian data with that of other countries.

Methods: an observational study involved a cohort of 527 men and women aged 50 and older with hip fractures identified by ICD-9 codes. Subjects were contacted 12 months following acute care discharge between April 1, 1995 and March 21, 1996, from four hospitals in Hamilton, Ontario. Data on mortality, place of residence, and re-fractures were obtained by telephone contact and searches of re-hospitalization records.

Results: data were obtained on 504 of the 527 patients. Overall, 25.2% of patients died within one year. Among 399 patients coming from the community, 20.5% died, 5.2% sustained another hip fracture, and 19.0% (24.3% of survivors) were institutionalized. Among the 105 patients from institutions, only one returned to the community, 39.0% died, and 5.7% re-fractured a hip. Of those returning to the community, 62.4% had used home care services for a mean of 154 days (95% CI = 129,179). Osteoporosis was noted in the hospital records for only nine of 141 patients (1.7%). None had bisphosphonates or hormone replacement recorded and only 25 (17.7%) had vitamin D or calcium recorded as discharge medications.

Interpretation: rates of mortality and loss of independence in living were similar to those found in other studies, whereas hip re-fracture rates were higher ($p < 0.5$). The frequency of diagnosis and preventative medications for osteoporosis was low in light of the risk of re-fracture. While outcomes may change with different health care systems, these findings may provide a framework in the Canadian context to direct further research and intervention to optimize patient care.

Résumé

Objectifs :

1. établir le taux de mortalité annuel, la présence dans des institutions et les taux de secondes fractures à la suite d'une première fracture de la hanche, au Canada.
2. comparer les résultats à la suite de fractures selon que les patients vivaient dans une institution ou chez eux.
3. comparer les données canadiennes à celles d'autres pays.

Méthodes : étude par observation d'une cohorte de 527 hommes et femmes de plus de 50 ans, ayant subi une fracture de la hanche, telle que définie par le code de la CIM9. On a pris contact avec les sujets 12 mois après leur autorisation de sortie des soins intensifs des quatre hôpitaux de Hamilton, en Ontario, entre le 1er avril 1995 et le 21 mars 1996. On a recueilli les données sur la mortalité, le lieu de résidence et les deuxièmes fractures, par téléphone et par un examen des dossiers de seconde hospitalisation.

Résultats : on a recueilli les données sur 504 des 527 patients. Globalement, 25,2 pour cent des patients sont décédés moins d'un an après. Sur les 399 patients qui vivaient chez eux avant leur accident, 20,5 pour cent sont décédés, 5,2 pour cent ont subi une seconde fracture, et 19,0 pour cent (24,3 % des survivants) ont été admis dans une institution. Parmi les 105 patients qui étaient dans des institutions, un seul est retourné chez lui, 39,0 pour cent sont décédés et 5,7 pour cent ont subi une seconde fracture. Sur ceux qui sont retournés chez eux, 62,4 pour cent ont reçu des services à domicile pour une moyenne de 154 jours

(IC de 95 % = 129,179). Les dossiers d'hôpital ne mentionnaient la présence d'ostéoporose que pour 9 des 141 patients (1,7 %). Aucun n'avait pris de biphosphonates ou suivi une hormonothérapie, selon ces dossiers, et seulement 25 d'entre eux (17,7 %) avaient pris des vitamines D ou du calcium comme médicaments prescrits au moment du congé.

Interprétation : ces taux de mortalité et de perte d'indépendance étaient semblables à ceux rapportés par d'autres études alors que les taux de seconde fracture étaient plus élevés ($p < 0,5$). La fréquence d'un diagnostic d'ostéoporose et de la prescription de médicaments contre l'ostéoporose était basse compte tenu du risque de seconde fracture. Certes, ces résultats peuvent varier d'un système de santé à l'autre. Cependant, ils fournissent un cadre permettant de mener davantage de recherche et d'intervenir pour optimiser les soins des patients dans le contexte canadien.

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INTRODUCTION

Assessing the burden of illness of hip fracture is of considerable worldwide importance given projected increases in fracture rates and need for associated health resources.¹⁻⁶ Mortality related to hip re-fracture has been studied extensively.^{2,7-20} Morbidity has also been studied in some countries, both in institutionalized patients^{12,16-22} and those receiving assistance in the home.^{23,24}

Mortality rates 12 months following hip fracture are reported to range between 16 percent and 37 percent.^{2,8-10,12-15,17,20} One year mortality was reported to be 22 percent in Quebec,⁷ and 21 percent in Manitoba.²⁰

International reports indicate that between 14 percent¹⁸ and 22 percent^{21,22} of community dwellers become institutionalized by one year following a hip fracture. In a Canadian study, 16.6 percent of community-dwellers with hip fractures were admitted to nursing homes at hospital discharge,²⁵ but the longer term status is not known.

Since it is known that re-fracture increases longer term mortality and morbidity,²⁶ our study addressed one year follow-up of institutionalization and re-fracture rates in Canadians with hip fractures. Hamilton, Ontario was considered an advantageous study site, being a moderately sized city with institution sites close enough to enable follow-up that can be difficult in larger cities.

METHODS

Subjects and Setting: Data was obtained from the four acute care teaching hospitals in the Hamilton-Wentworth Region of Ontario (population 467,799). Patients were included regardless of whether the hip fracture was their first fracture or a subsequent fracture. Exclusion criteria included: age less than 50 years, hospitalization for motor vehicle accidents, malignancy, treatment at a psychiatric facility, and discharge to hospitals outside the Hamilton-Wentworth region. In Ontario, hospital discharge data is 95 percent accurate for demographics, with 99 percent agreement obtained for hip fracture diagnoses.²⁷

Data collection: Hospital discharge data was used to identify all hip fracture patients admitted between April 1, 1995 and March 31, 1996, using the 820 codes of the International

Statistical Classification of Diseases 9th edition (ICD-9).²⁸

Outcome was established by telephone 12 months following discharge. The source was either the patient's next of kin (86%) or a health care provider at the institutional setting (14%). Re-fracture data were validated through hospital records to establish whether ipsilateral fractures were true re-fractures, not simply complications. Place of residence was defined as 'community' for those living in their own homes, seniors' buildings or retirement homes; and 'institutional' for those in rehabilitation, chronic care, long-term care or acute care facilities. Chronic and long term care were distinguished using the working definitions of the Ontario Ministry of Health,²⁹ which considers chronic care to involve a higher level of care for multiple health problems, requiring both a health care team and intervention on a regular basis. 'Home care' was defined as services provided to patients living in the community involving one or more of homemaking, nursing, physiotherapy or occupational therapy. Home care data was obtained from charts provided by the Community Care Access Centre, which coordinates all home care in Hamilton-Wentworth.

Data Analysis: The rates of mortality, institutionalization, and re-fracture were summarized for two populations based on initial place of residence (i.e. community, institution). Multivariate logistic regression was performed using the computerized Statistical Package for the Social Sciences (SPSS 9.0) to examine correlations between patient characteristics and rates of mortality, institutionalization, and re-fracture. In the regression analysis, patient characteristics were removed sequentially using backward elimination.

RESULTS

Hip fractures were coded for 541 hospitalized patients at the four sites. Of these patients, 527 met inclusion criteria. Demographic and clinical characteristics are shown in Table I. Twenty-three patients (4.4%) were lost to follow-up, leaving 504 with complete follow-up data. Mean hospital stay for the initial hip fracture was 22 days (95% CI = 19.7, 24.8). The sample included 396 women (75.1%) who fractured their hips at a mean age of 81.5 years (median = 81). Fractures occurred at a mean age

| Clinical Characteristic | Initial Residence | | Total (%) |
|-------------------------------|-------------------|------------------|------------|
| | Community (%) | Institutions (%) | |
| Total | 420 (79.7) | 107 (20.3) | 527 (100) |
| Gender | | | |
| Women | 315 (75.0) | 81 (75.7) | 396 (75.1) |
| Men | 105 (25.0) | 26 (24.3) | 131 (24.9) |
| Age | | | |
| 50-64 | 38 (9.0) | 4 (3.7) | 42 (8.0) |
| 65-74 | 95 (22.6) | 13 (12.1) | 108 (20.5) |
| 75-84 | 168 (40.0) | 34 (11.8) | 202 (38.3) |
| 85+ | 119 (28.3) | 56 (52.3) | 175 (33.2) |
| Fracture Type | | | |
| Intercapsular | 195 (46.4) | 51 (47.7) | 232 (44.0) |
| Trochanteric | 181 (43.1) | 51 (47.7) | 246 (46.7) |
| Unspecified Femur | 44 (10.5) | 5 (4.6) | 49 (9.3) |
| Procedures | | | |
| Internal Fixed Closed | 210 (50.0) | 65 (60.7) | 275 (52.2) |
| Internal Fixed Open | 48 (11.4) | 10 (9.3) | 58 (11.0) |
| Partial Hip Replacement | 97 (23.1) | 17 (15.9) | 114 (21.6) |
| Total Hip Replacement | 8 (1.9) | 4 (3.7) | 12 (2.3) |
| Other | 35 (8.3) | 7 (6.5) | 42 (8.0) |
| None | 22 (5.2) | 4 (3.7) | 26 (4.9) |
| Post Op. Complications | | | |
| Pressure Sores | 15 (3.6) | 2 (1.9) | 17 (3.2) |
| Pulmonary Infection | 24 (5.7) | 4 (3.7) | 28 (5.3) |
| Urinary Tract Infect. | 32 (7.6) | 6 (5.6) | 38 (7.2) |
| Surgical Orthopaedic | 18 (4.3) | 3 (2.8) | 12 (2.3) |
| Venous Thrombosis | 2 (0.5) | 1 (0.9) | 3 (0.6) |
| Delirium | 6 (1.4) | 1 (0.9) | 7 (1.3) |
| Any Complication | 83 (19.8) | 15 (14.0) | 98 (18.6) |

Percentages are the proportion within the community, institutionalized, or total groups.

of 75.7 years in the 131 men (24.9%). Falls were reported as the reason for fracture in 488 patients (92.6%).

Mortality, residence and re-fracture rates are shown in Table II. Overall one year mortality was 25.2 percent. The mortality rate for those institutionalized at the time of fracture was close to double the rate for those living in the community at six months (31.4%, 18.0% respectively), and remained higher at 12 months (39.0%, 21.6%). Place of residence remained largely unchanged for survivors who initially resided in institutions, as indicated by the fact that only one patient was living in the

| Residence Following Fractures n (%) | Initial Residence | |
|-------------------------------------|-------------------|----------------------|
| | Community n = 399 | Institutions n = 105 |
| 6 Months Post-discharge | | |
| Community | 251 (62.9) | 1 (1.0) |
| Institutions | 76 (19.0) | 71 (67.6) |
| Long-term Care | 57 (14.3) | 68 (64.8) |
| Rehab. or Chronic Care | 14 (3.5) | 2 (1.8) |
| Acute Care | 5 (1.3) | 1 (1.0) |
| Deceased | 72 (18.0) | 33 (31.4) |
| 12 Months Post-discharge | | |
| Community | 237 (59.4) | 1 (1.0) |
| Institutions | 76 (19.0) | 63 (60.0) |
| Long-term Care | 62 (15.5) | 61 (58.1) |
| Rehab. or Chronic Care | 7 (1.8) | 2 (1.9) |
| Acute Care | 7 (1.8) | 0 |
| Hip re-fracture | | |
| Total | 20 (5.0) | 6 (5.7) |
| Ipsilateral | 7 (1.8) | 1 (1.0) |
| Contralateral | 13 (3.3) | 5 (4.8) |
| Deceased | 86 (21.6) | 41 (39.0) |
| After 1st Fracture | 81 (20.3) | 35 (33.3) |
| After 2nd Fracture | 5 (1.3) | 6 (5.7) |

1st fracture refers to first fracture followed in the study.

community at 12 months. Considerable changes occurred for those initially living in the community. Of the 313 survivors, 24.3 percent were living in institutions at 12 months. Among those who had returned to the community, 62.4 percent had home care for a mean 154 days (95% CI = 129,179), whereas only 4.6 percent had any home care prior to fracture.

Twenty-six of the 504 patients (5.2%) re-fractured a hip in the first year. Eleven of these patients (42.0%) died within 12 months of the previous hip fracture. The re-fracture rate was 9.9 percent when hip, vertebral, wrist, and rib were included.

Osteoporosis was coded in only nine charts (1.7%). At one site, more extensive review of 141 charts reported vitamin D, calcium or both in only 25 patients (17.7%). None had record of preventative bisphosphonates or hormone replacement use.

Multivariate regression revealed that dementia, respiratory disease, and living in an institution at the time of fracture were associated with increased mortality ($p < 0.5$). Increasing age, trochanteric fracture, and post-operative complications predicted increased institutionalization ($p < 0.5$, Table III, see p. 596). Those originally living in an institution were more likely to be deceased at 12 months. Extracapsular fractures were

more frequent among the 175 patients aged 85 and over, consistent with other studies.³⁰ No variable was predictive of recurrent hip fracture as indicated by the absence of any significant bivariate correlations.

Although men were more likely to be deceased at follow-up (consistent with other studies^{7,18,19}), this finding was not significant in the multivariate regression.

DISCUSSION

The rates for mortality, institutionalization, and home care obtained in this study are similar to findings reported for other countries in the last 10 years (Table IV, see p. 596). The findings for re-fracture exceed those of most other studies internationally.

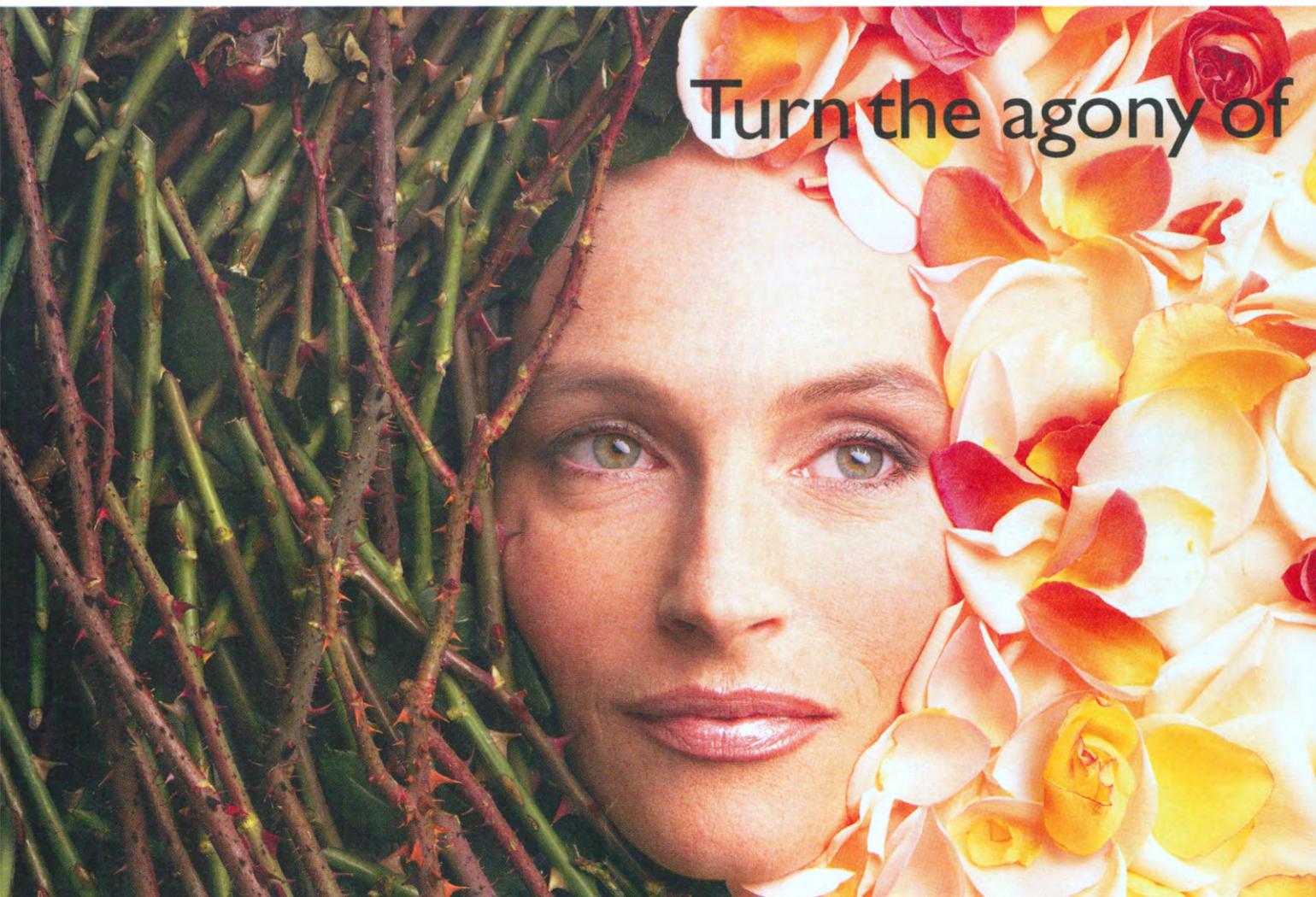
Our mortality rate at one year post hip fracture of 25.2 percent is slightly higher than previous Canadian reports (21%, 22%).^{7,20} It is perhaps more noteworthy that elderly individuals institutionalized at the time of their hip fracture had a 39 percent mortality rate.

The United States Office of Technology Assessment reported that up to half of female hip fracture patients may spend

some time in a nursing home, and 14 percent were still there at one year.¹⁸ This is comparable to our rate for institutionalization of 15.5 percent. Studies in other countries have produced rates between 14 percent³¹ and 34 percent.²¹ Whether this range reflects regional differences in the rate at which long term institutionalization actually takes place is unclear because differences in health care systems may affect the outcome measures. For example, in many acute care facilities in the United States, patients are discharged for rehabilitation to nursing homes or rehabilitation hospitals.²⁵ This pattern contrasts with patterns of care in Canada where rehabilitation is typically considered a component of an acute care or rehabilitation facility, and discharge to a nursing home tends to occur only when the patient is considered unlikely to ever return to the community. In fact, in our study, the numbers in nursing homes at six months remained similar at twelve months.

Among Danes, home care was used by 55 percent within six months of hip fractures.³² Our rate of 62 percent by one year is not suggestive of substantial differences between the two countries.

Comparison of the hip re-fracture rates with prospective studies in other countries is more complex. Our overall



one-year rate (5.2%) is higher than that suggested by a Danish study²⁶ (6.2% of 3,898 hip fracture patients re-fractured within 16 years; 1.7 percent re-fractured within one year); and American reports (7.3% re-fracture in eight years;^{3,32} 8% in five years³⁴). However, these studies did not involve follow-up contact with family members or nursing home staff, relying rather on data from hospital records on re-admissions. In the Danish study, hospital billing records were used and only 8 percent of re-fractures were ipsilateral, suggesting underestimation. In the U.S. studies, no patient contact was made and the rates for the first year were not reported. Studies looking only at contralateral re-fractures are closer to our findings. Our one-year rate of 3.6 percent (18 of 504) is quite similar to one study in Britain³⁵ (3.7% in one year), but higher than a study in New Zealand^{6,35} (2.4% in two years). Our rate is not likely to be related to the numbers coming from institutions, because the re-fracture rates in this group (5.7%) were similar to those coming from the community (5.0%).

Our correlational analysis agreed with other studies reporting that dementia^{37,38} and respiratory illnesses^{39,40-44} were predictive of mortality. Post-operative complications were also

found to be associated with institutionalization, a result not previously reported. Variables predicting mortality were not associated with hip re-fracture in our cohort, a finding which may be related to the limited identification of comorbid conditions in our study. Previous research has found various conditions to be predictive of re-fracture, including osteoporosis,⁴⁵ stroke,⁴⁶ and Parkinson's disease.⁴⁶ The incidence with which some conditions were recorded in hospital records was quite low. For example, the reported rates for osteoporosis (1.7%), dementia (11.6%) and delirium (7.1%) in the hospital records were low compared to prevalence reported in the literature, which may reflect under-recognition in hospital care as well as coding issues.^{31,47,48}

The low rates at which osteoporosis was diagnosed and preventative medications were prescribed in our study, combined with the high incidence of hip re-fracture within one year (5.2%), are noteworthy. Only 1.7 percent of patients had osteoporosis noted in their charts, and we could not establish from their hospital records whether preventative hormone therapy or bisphosphonates were prescribed for any of the sub-sample of patients (n = 141) that we reviewed. Since osteoporosis might not be the

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TABLE III

PATIENT CHARACTERISTICS PREDICTIVE OF MORTALITY AND INSTITUTIONALIZATION ONE YEAR FOLLOWING HIP FRACTURES

| Patient Characteristics | Mortality | Institutionalized |
|-----------------------------------|-------------------|---------------------|
| Age 75-84 | n.s. | 8.33 (1.96, 36.34) |
| 85+ | n.s. | 10.46 (2.36, 46.25) |
| Male Gender | n.s. | n.s. |
| Length of Stay | n.s. | n.s. |
| Trochanteric Fracture | n.s. | 1.64 (1.02, 2.66) |
| Surgical Procedures | n.s. | n.s. |
| Post-operative Complications | n.s. | 2.33 (1.31, 4.12) |
| Comorbidity | | |
| Disease Circulatory System | n.s. | n.s. |
| Disease Nervous System | n.s. | n.s. |
| Mental Disorder | n.s. | n.s. |
| Respiratory Disease | 2.21 (1.28, 3.80) | n.s. |
| Dementia | 2.80 (1.69, 4.65) | n.s. |
| Institutionalized Before Fracture | 2.56 (1.39, 4.74) | n.s. |

Data are odds ratios and 95% confidence intervals for characteristics significant at $p < 0.05$ in multivariate analysis. n.s. = non-significant

focus of clinical attention at the time of hospitalization, and given potential limitations created by the reliance on hospital recording in this study, it cannot be concluded that hospital care is misdirected. Rather, these findings serve to heighten awareness of the need for osteoporosis management as one aspect of follow-up.

A limitation of this study, and of this line of research in general, is the absence of methods to establish the degree to which outcomes are caused by fractures, by other patient characteristics, and by their interactions. It should also be noted that our findings do not represent the expected annual averages for subsequent years, since mortality, institutionalization, and re-fracture rates are all highest in the first one to two years following hip fracture, declining substantially thereafter.^{1,7,26}

The following recommendations could be considered in light of the findings, particularly to prevent re-fracture. First, the reason for falls ought to be investigated, followed by preventative interventions. Second, bone densitometry would assist in clarifying future risk and response to preventative care. Third, calcium and vitamin D supplementation should be considered prior to discharge. In follow-up, hormone replacement may be relevant, but challenges of starting hormone therapy in the elderly should be considered. Bisphosphonates may be indicated, and initiated once the patient can participate in the appropriate education and decision making process.

In summary, this is the first study that provides long term follow-up data on rates of institutionalization and re-fracture in Canadians who have fractured a hip. Rates of institutionalization are similar to those found internationally. Re-fracture rates were generally higher than reports from other countries. Health care differences between countries may explain this pattern, but it is also possible that improved follow-up reveals a greater re-fracture rate than previously appreciated.

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TABLE IV

INTERNATIONAL DATA ON ONE YEAR OUTCOMES FOLLOWING HIP FRACTURE

| Outcome (%) | Geographic Region | | | | |
|------------------------------------|-------------------|---|--------------------|-------------|--------------------|
| | Canada | United States | Great Britain | Switzerland | Scandinavia |
| Mortality | 21 <20> 22 <7> | 17 <9> 20 <14> 23 <10> 24 <17> | 33 <15> 37 <13> | 30 <2> | 28 <8> 16 <12> |
| Institutionalization Post-fracture | | 14 <30> | 15 <15> | | 15 <16> 22 <21> |

Studies were not included if reported prior to 10 years ago or if 12 month follow-up data could not be abstracted from the publication. Only studies including patients from the 50 years and older population are shown. Some data points were estimated by visual inspection of published graphs producing only approximations.

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