

Hospitalization Rates of Nursing Home Residents and Community-Dwelling Seniors in British Columbia

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RÉSUMÉ

L'utilisation de l'ensemble des services de soins actifs par les pensionnaires des CHSLD (centres d'hébergement et de soins de longue durée) au Canada n'a pas été bien documentée. Nous visons à déterminer les principales causes de l'hospitalisation des pensionnaires des CHSLD et à en comparer le taux avec celui des personnes âgées résidant dans la communauté. Nous avons analysé une cohorte rétrospective à l'aide de données administratives sur la santé au niveau de la population, y compris toutes les personnes de 65 ans et plus résidant dans un CHSLD en Colombie-Britannique entre avril 1996 et mars 1999. Les taux d'hospitalisation des pensionnaires des CHSLD ont été comparés aux taux estimatifs des personnes âgées résidant dans la communauté, à l'aide de ratios standardisés d'incidence en fonction du sexe (RSI): RSI = 2,81 (95 % CI: 2,71, 2,91) pour les fractures du fémur ; 1,96 (1,88, 2,04) pour la pneumonie ; 0,73 (0,70, 0,76) pour d'autres maladies du coeur; et 1,01 (0,99, 1,02) toutes causes confondues. Les pensionnaires des CHSLD sont plus susceptibles de présenter un écart plus considérable du taux d'hospitalisation pour une fracture du fémur ou une pneumonie, les pensionnaires des CHSLD représentant environ le quart des aînés de la Colombie-Britannique hospitalisés pour une fracture du fémur.

ABSTRACT

The overall use of acute care services by nursing home (NH) residents in Canada has not been well documented. Our objectives were to identify the major causes of hospitalization among NH facility residents and to compare rates to those of community-dwelling seniors. A retrospective cohort was defined using population-level health administrative data, including all individuals aged 65 years and older living in a British Columbia NH facility between April 1996 and March 1999. Hospitalization rates of NH residents were compared to estimated rates for community-dwelling seniors, using age- and sex-adjusted standardized incidence ratios (SIRs): SIR = 2.81 (95%CI: 2.71, 2.91) for femoral fractures, 1.96 (1.88, 2.04) for pneumonia, 0.73 (0.70, 0.76) for other heart disease, and 1.01 (0.99, 1.02) for all causes. NH residents have disproportionately higher rates of hospitalization for femoral fractures and pneumonia, with NH residents accounting for approximately one quarter of all femoral fracture hospitalizations of BC seniors.

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Nursing homes (NH), or long-term care facilities, provide care to our community's frail elders who are no longer able to care for themselves. As demand for care exceeds available spaces, individuals now admitted to NH facilities tend to have more complex health challenges, such as advanced dementia, multiple co-morbidities and limited mobility.¹ In British Columbia (BC), evidence of an increase in death rates among NH residents suggests that long-term facility stays are being reserved for a sicker group of elderly people than in the past.²

The decision to transfer a NH resident to hospital depends on many factors, including the availability of on-site medical assessment and follow-up; the ability to offer diagnostic tests and results in a timely fashion; the number and skill levels of nursing staff; the availability of psychogeriatric evaluation; and the documentation of advanced directives related to the patient's preference for hospitalization.³ Hospitalization of NH residents is also expensive and can be traumatic for the resident and her/his family.^{3,4} Elderly NH residents transferred to hospital may be particularly vulnerable to developing problems unrelated to the cause of hospital admission and susceptible to deterioration in functional status during and after their hospital stay.^{5,6} Recent evidence from the United States also suggests that approximately half (45%) of all acute care hospitalizations of NH residents are potentially avoidable.⁷

Most studies examining the use of acute care services by NH residents have been conducted in the United States, driven in large part by concerns about quality of NH care and escalating costs.⁸ Among NH populations in the United States, pneumonia and other infections are major reasons for hospitalization,^{9,10} and hip fracture hospitalization rates have been shown to be more than four-fold higher than among community-dwelling seniors.¹¹ A study in the United Kingdom found significantly higher rates among residential and NH residents than among seniors in the community for all-cause emergency admissions and for specific diagnoses of respiratory and digestive-system diseases, femur fractures, stroke, and skin diseases.⁸ Among Canadian NH residents, there is some evidence that rates of hospitalization due to falls¹ and pneumonia and influenza¹² are higher than for community-dwelling seniors. The overall use of acute care services by NH residents in Canada, however, has

not been well documented, and it may not be possible to generalize studies from the United States and other countries to the Canadian setting. Better understanding of the use of acute care services in this distinct subpopulation of elderly individuals is important for Canadian health-policy and health-services decision makers.

This study is part of a larger project examining hospitalization and mortality rates associated with facility ownership characteristics among NH residents.¹³ Our objectives were (a) to identify the major causes of hospitalization among British Columbia NH residents and (b) to compare hospitalization rates of NH facility residents to hospitalization rates of BC community-dwelling seniors.

Methods

A retrospective cohort of NH residents was defined using administrative data from the BC Linked Health Database (BCLHD).¹⁴ The cohort included all individuals aged 65 years and older living in a NH facility in BC at a care level of *Intermediate I or higher*, for 1 or more days between April 1, 1996 and March 31, 1999. The NH population excluded individuals who were residing in family care homes or mental health group homes or who were receiving respite care. Personal care homes in BC are facilities that house minimally disabled elders, and residents in these facilities were also excluded from the NH population. Demographic data, dates of NH residence, dates of acute care hospitalizations, and the principal diagnosis (ICD9) most responsible for each hospital admission were extracted from the continuing care, hospital separations, and deaths data files of the BCLHD. Hospitalization rates for NH facility residents were calculated for all medical and surgical causes, excluding day surgeries, for each of 191 ICD9-based Diagnostic Short List codes.¹⁵ The Diagnostic Short List codes, originally created by Statistics Canada, are based primarily on the sub-headings contained within the ICD9 codebook. However, some common diagnostic categories, such as pneumonia and femur fractures, are further assigned unique codes within the Diagnostic Short List. Primary diagnoses for hospitalization, aggregated to the level of Diagnostic Short List codes, were the only outcomes available to us for our community-dwelling population. The denominator for NH rate calculations was defined as the average NH population on July 1 of each study year, stratified by age group and sex.

Table 1: Demographics of the British Columbia NH population, compared to the total British Columbia population aged 65 years and older

	Total BC Population ^a	NH Population ^b	Community Population ^c	Proportion of Total BC Population Resident in a NH Facility (%)
Total Population	498,632	18,467	480,165	3.7
65–69 Years				
Male	73,749	334	73,415	0.5
Female	76,038	308	75,730	0.4
70–74 Years				
Male	59,698	612	59,086	1.0
Female	71,245	788	70,457	1.1
75–79 Years				
Male	43,013	989	42,024	2.3
Female	58,835	1,649	57,186	2.8
80–84 Years				
Male	26,057	1,299	24,758	5.0
Female	40,696	2,964	37,732	7.3
85–89 Years				
Male	11,655	1,251	10,404	10.7
Female	22,221	3,537	18,684	15.9
90+ Years				
Male	4,500	1,011	3,489	22.5
Female	10,924	3,725	7,199	34.1

^a Includes all BC residents aged 65 years and older; reported value is the average BC population on July 1 of the 3 study years (1996–1999), obtained from the BC Ministry of Health, using PEOPLE 26 population estimates ¹⁶

^b Includes all individuals aged 65 years and older resident in a BC NH facility for 1 or more days between April 1, 1996 and March 31, 1999; reported value is the average NH population on July 1 of the 3 study years

^c Community population estimated as the total BC population minus the NH population

Hospitalization rates for the community-dwelling population aged 65 years and older were estimated using aggregated data from a Ministry of Health population health database.¹⁶ First, data were obtained for all BC residents aged 65 years and older, including age group and sex, and numbers of acute care hospitalizations, aggregated to the level of Diagnostic Short List Codes for each of the 3 fiscal years between 1996 and 1999. The population and number of hospitalizations of BC residents aged 65 years and older who were not residing in a NH facility during the study period were estimated as the total BC senior population and number of hospitalizations minus the NH population and number of hospitalizations. When estimating the community-dwelling population size, we did not adjust for seniors living in family care homes, mental health group homes, or personal care homes, or for seniors who were receiving respite care. The denominator for community-dwelling rate calculations was defined as the average community-dwelling population on July 1 of each study year. Standardized incidence ratios (SIRs) were then calculated using indirect standardization, with expected number of hospitalizations in the NH population estimated using the BC community-dwelling rates stratified by 5-year age

group and gender. As one of our primary objectives was to identify the major causes of hospitalization for NH residents, we selected the three most common causes of hospitalization among NH residents for comparative analyses with SIRs.

Results

Overall, 3.7 per cent of the BC population aged 65 years and older resided in a NH facility over the study period (Table 1). For all age groups aged over 70 years, an increasingly greater proportion of females than of males were resident in a NH facility, with 22.5 per cent of males and 34.1 per cent of females aged over 90 years residing in a NH facility (Table 1).

In total, NH facility residents accounted for 5.3 per cent ($N=6,826$) of all hospitalizations among BC seniors (Table 2). The most frequent primary cause of hospitalization among NH facility residents was femur fractures ($N=944$), which accounted for 25.5 per cent of total femur fracture hospitalizations among BC seniors. Pneumonia was the second most frequent cause for hospital admission among NH residents, representing 12.9 per cent ($N=768$) of all hospitalizations of BC seniors. The third most frequent cause for admissions among NH residents was

Table 2: Main causes of acute care hospitalizations for the British Columbia NH population compared to the total British Columbia population aged 65 years and older

Diagnostic Short List Code	Average Annual # of Hospitalizations, April 1996 to March 31, 1999			
	Total BC	NH	Community ^a	Proportion of BC Hospitalizations from NH Facility (%)
Femur fractures (ICD9 820, 821)	3,709	944	2,765	25.5
Pneumonia (ICD9 480–483, 485, 486)	5,941	768	5,173	12.9
Other heart disease (ICD9 420–429)	13,747	650	13,097	4.7
Symptoms, signs, and other ill-defined conditions (ICD9 780–796, 798, 799)	9,251	359	8,892	3.9
Other and late effect cerebrovascular (ICD9 435–438)	3,024	216	2,808	7.1
Other urinary system diseases (ICD9 584–589, 591, 593, 595–599)	2,492	215	2,277	8.6
Medical and surgical complications (ICD9 996–999)	3,636	130	3,506	3.6
Other intestinal or peritoneal disease (ICD9 562, 564–569)	2,384	126	2,258	5.3
Acute myocardial infarct (ICD9 410)	4,105	126	3,979	3.1
Other COPD and allied conditions (ICD9 494–496)	2,379	110	2,269	4.6
Total: All-cause hospitalizations	130,000	6,826	123,174	5.3

^a Annual average number of hospitalizations for the community-dwelling population estimated as the average number of BC hospitalizations minus the average number of NH hospitalizations

Table 3: Main causes of hospitalization and standardized incidence ratios for the British Columbia NH population compared to the British Columbia community-dwelling senior population, stratified by age group and sex

	Femur Fractures (ICD9 820–821)				Pneumonia (ICD9 480–483, 485–486)				Other Heart Disease (ICD9 420–429)				All-Cause Hospitalizations			
	NH # ^a	Rate ^b	Community #	Rate	NH #	Rate	Community #	Rate	NH #	Rate	Community #	Rate	NH #	Rate	Community #	Rate
Males																
65–69 yrs	7	21.0	85	1.2	16	47.9	414	5.6	8	24.0	1,218	16.6	143	428.1	14,387	196.0
70–74	22	35.9	124	2.1	39	63.7	539	9.1	20	32.7	1,548	26.2	285	465.7	15,184	257.0
75–79	35	35.4	144	3.4	64	64.7	642	15.3	32	32.4	1,599	38.0	462	467.1	14,184	337.5
80–84	49	37.7	172	6.9	100	77.0	603	24.4	49	37.7	1,328	53.6	612	471.1	10,217	412.7
85–89	56	44.8	134	12.9	92	73.5	400	38.5	57	45.6	774	74.4	562	449.2	5,232	502.9
90+	47	46.5	74	21.2	67	66.3	180	51.6	37	36.6	286	82.0	392	387.7	1,904	545.7
Females																
65–69 yrs	9	29.2	137	1.8	10	32.5	313	4.1	6	19.5	770	10.2	125	405.8	11,375	150.2
70–74	30	38.1	248	3.5	23	29.2	477	6.8	20	25.4	1,091	15.5	318	403.6	13,855	196.6
75–79	93	56.4	403	7.0	59	35.8	514	9.0	58	35.2	1,552	27.1	604	366.3	14,563	254.7
80–84	176	59.4	524	13.9	84	28.3	524	13.9	113	38.1	1,507	39.9	1080	364.3	12,156	322.2
85–89	212	59.9	439	23.5	117	33.1	365	19.5	141	39.9	993	53.1	1234	348.8	7,061	377.9
90+	208	55.8	281	39.0	97	26.0	202	28.1	109	29.3	431	59.9	1009	270.9	3,056	424.5
Crude Incidence Ratio (IR):	8.88				3.85				1.29				1.44			
Standardized IR (95% CI) ^c :	2.81 (2.71, 2.91)				1.96 (1.88, 2.04)				0.73 (0.70, 0.76)				1.01 (0.99, 1.02)			

^a = average annual number of hospitalizations (April 1, 1996–March 31, 1999)

^b Rate = average annual number of hospitalizations/1000 population

^c Standardized incidence ratios were calculated using indirect standardization, with expected number of hospitalizations in the NH population estimated using the BC community-dwelling rates, stratified by 5-year age group and gender.

other heart disease (N=650). Although third highest in absolute numbers, NH resident admissions for other heart disease as a proportion of all hospitalizations (4.7%) was less than for other and late effect cerebrovascular (7.1%) or for urinary tract (6.6%) disease.

Hospitalization rates for femur fractures and pneumonia were higher for the NH population than for the community-dwelling population for almost all age groups (Table 3). Hospitalization rates for other heart disease were higher for the community-dwelling

population than for the NH facility residents in the older age groups (age 80 and over for females and 75 and over for males). Hospitalization rates were higher for males than for females in all age categories, except in the case of femur fractures, where the opposite was true. Similar patterns of gender differences across age groups were observed in the community-dwelling population.

The standardized incidence ratio (age- and gender-adjusted) for all-cause hospitalization (Table 3) was comparable for the NH versus the community-dwelling population: SIR 1.01 (95%CI: 0.99, 1.02). In contrast, cause-specific incidence ratios were higher among the NH population for femur fractures SIR 2.81 (95%CI: 2.71, 2.91) and pneumonia SIR 1.96 (95%CI: 1.88, 2.04). The SIR for other heart disease in the NH versus community-dwelling population was 0.73 (95%CI: 0.70, 0.76).

Discussion

We found that femur fractures were the most common reason for hospitalization among NH residents, particularly among female residents. The adjusted rate was almost three times higher than that for community-dwelling seniors, which likely represents the impaired mobility and increased frailty of NH residents. Evidence from Canada¹⁷ and several European countries¹⁸ indicates that hip fracture hospitalizations account for a major cost burden on health care systems. As well, hip fracture hospitalizations lead to significant functional decline and loss in quality of life.¹⁹ Our additional finding that femur fracture hospitalizations of NH residents accounted for one in four femur fracture hospitalizations of seniors in BC was striking and indicates the importance of targeting falls and injury prevention interventions towards NH populations. Unfortunately, the current evidence for preventing falls and fractures in elderly people living in NH homes is inconclusive,²⁰ and most research into preventive programs for hip fractures has targeted community-dwelling residents.

Our study found that pneumonia was the second most common cause of NH hospitalization, where the adjusted rate was almost twice that for community-dwelling seniors. It would not be surprising to find a higher incidence of pneumonia among NH residents, as pneumonia is a well-known final pathway for disabled elders at their end of lives.²¹ However, rates of hospitalization of NH residents for pneumonia may be modifiable. Uptake of influenza and pneumonia vaccinations and appropriate antibiotic use,²¹ careful swallowing assessments and good feeding practices,²² early detection, provision of increased support to facilities to manage acuity on site,²³ and pro-active

end-of-life discussions with residents and their families regarding expectations with respect to hospitalization²⁴ may all contribute to a lower rate of hospitalization of NH residents for this common diagnosis.²⁴ There is evidence that hospitalization of NH residents for infection is unlikely to improve outcomes and may even be associated with worsening functional status⁶ and higher mortality^{6,21,25} than is provision of care in-place. Further investigation is needed to identify when hospitalization for pneumonia among NH residents is most appropriate.

We found the adjusted all-cause hospitalization rate to be comparable between NH residents and community-dwelling seniors. Closer inspection of rates across strata indicates that this finding is, however, age-dependent, with the trend reversing itself in older age groups. This undoubtedly reflects a less aggressive treatment approach to the older and likely frailer NH population. Similarly, the higher hospitalization rates among males in the majority of age groups (with the exception of femur fractures), in both NH and community-dwelling seniors, may indicate a practice of treating males more aggressively than females. Higher rates of pneumonia-related hospitalizations have been reported for males in other studies of NH and community-based seniors.^{24,26} Similarly, the lower hospitalization rates seen for other heart disease among NH residents compared to community-dwelling seniors may reflect a less aggressive approach to treating the NH population for this diagnosis.

There are several limitations to this study that are important to address. First, the time period investigated for this study was limited to the fiscal years between 1996 and 1999, based on the availability of data from a previously conducted data linkage for these years.¹⁴ It is possible that the hospitalization rates of NH residents and community-dwelling seniors changed after this study period, which could limit extrapolation of our conclusions to more recent years. Although there is some evidence that hip fracture hospitalization rates have declined among the general population of seniors in BC since 2001, no rates are reported for seniors residing in NHs.²⁷ The *Report on Seniors' Falls in Canada* noted that the numbers of fall-related hospitalizations among seniors from NHs had increased between 1998 and 2001, with a slight decreasing trend in 2002 and 2003. No rates, however, were reported, due to the lack of available data about the population size of seniors residing in NHs.¹ Further population-based studies of NH residents are needed to determine how these rates may have changed over time and to provide stronger surveillance data for monitoring trends in disease incidence and hospitalization rates in this population.

A second limitation is that the BC population data were only available from the BC Ministry of Health in aggregated form, based on the principal diagnosis most responsible for hospitalization. One limitation of using solely the principal diagnoses is that many seniors suffer from multiple co-morbidities, and there is seldom a single cause for hospitalization.²⁸ As well, because there were no data available on the functional status and number of co-morbidities in the community population, we were unable to adjust for this in our analyses. Further, we were limited to using the Diagnostic Short List code groupings available from the Ministry of Health to identify causes of hospitalizations. While these codes for pneumonia and femur fractures are fairly straightforward to interpret, the category for other heart disease (ICD9 420–429), for example, represents a heterogeneous mix of clinical entities, including heart failure (ICD9=428) and arrhythmias (ICD9=427).

Lastly, the hospital discharge summary data obtained from the Ministry of Health database are derived from the same hospital separations data included in the BCLHD; however, there may be some differences between these databases for which we were unable to account. As well, with the exception of femur fractures, which are likely to trigger a hospitalization with every event, we are unable to determine from these data whether differences observed in hospitalization rates for the other diagnoses reflect differences in incidence or differences in the decision to hospitalize for these conditions.

The major strength of this study, despite these limitations, is that we are able to provide comparative population-level hospitalization rates for NH and community-dwelling seniors in a Canadian setting, which has generally been lacking in the literature to date. This has current relevance as decision makers attempt to understand the utilization of acute care services by long-term care residents.

The proportion of seniors aged 65 and older residing in British Columbia NH facilities was relatively low (3.7%) and is similar to previous rates reported for Canada²⁹ and the United States.³⁰ However, this proportion also increased dramatically with age, with one third of BC residents aged 90 years and older living in a NH facility. Seniors constitute the fastest-growing population group in Canada, with an estimated one in five Canadians reaching the age of 65 years within the next two decades.³¹ Further, the fastest growth among seniors is occurring among the oldest Canadians; with an estimated 4 per cent of the Canadian population reaching the age of 85 years by the year 2041, the impact of population

growth in this group will be felt more and more.³¹ Although there are many health care advances that attenuate disability and though today's aging boomers may be a "fitter" cohort, we are likely to see an increase in the number of individuals living in residential NH facilities. Greater efforts at reducing disease incidence and hospitalization rates in this population of seniors, particularly for femoral fractures and pneumonia, are clearly needed.

Conclusion

NH residents have disproportionately higher rates of hospitalization for femoral fractures and pneumonia, with NH residents accounting for approximately one quarter of all femoral fracture hospitalizations of BC seniors. Programs successfully targeted towards reducing incidence and rates of hospitalization for these two health problems are likely to benefit NH residents' quality of life and to reduce this population's use of acute care services.

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