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Short Report

Hospitalisation of older people before and after long term care entry in Auckland, New Zealand

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Abstract

Introduction: Global population projections forecast large growth in demand for long term care (LTC) and acute hospital services for older people. Few studies report changes in hospitalisation rates before and after entry into LTC. This study compares hospitalisation rates one year before and after LTC entry.

Methods: The Older Persons' Ability Level (OPAL) study was a 2008 census-type survey of LTC facilities in Auckland, New Zealand. OPAL resident hospital admissions and deaths were obtained from routinely-collected national databases.

Results: All 2,244 residents (66%=female) who entered LTC within 12 months prior to OPAL were included. There were 3,363 hospitalisations, 2,424 in 12 months before, and 939 in 12 months after entry, and 364 deaths. In the six to twelve months before LTC entry, the hospitalisation rate/100 person-years was 67.3 (95% confidence interval [CI] 62.5-72.1).

Weekly rates then rose steeply to over 450/100 person-years in the six months immediately before LTC entry. In the six months after LTC entry the rate fell to 49.1 (CI 44.9-53.3; RR 0.73 (CI 0.65-0.82, $p < 0.0001$)) and decreased further six to twelve months after entry to 41.1 (CI 37.1-45.1; rate ratio [RR] 0.61 (CI 0.54-0.69, $p < 0.0001$)).

Conclusions: The increased hospitalisations a few months before LTC entry suggest functional and medical instability precipitates LTC entry. New residents utilise hospital beds less frequently than when at home before that unstable period. Further research is needed to determine effective interventions to avoid some hospitalisations and possibly also LTC entry.

Key Words: Long-term care, community, nursing home, hospital admissions, cohort study

Key Points:

1. Few studies describe hospitalisation rates before and after entry into long term care (LTC) facilities.
2. Hospitalisations 12 months before and after entry were analysed for a large cohort of LTC residents.
3. Immediately following long term care (LTC) entry hospitalisation rates dropped significantly below the previous 12 months.
4. Weekly hospitalisation rates rose exponentially during the six months before LTC entry, to over 450/100 person-years.
5. Research is needed about health instability prior to LTC entry compared to those similarly disabled that do not enter LTC.

Background

The oldest old (85+ years) are the fastest growing segment of Western society and as a result, demand on health and social service resources is dramatically increasing worldwide [1-3].

Many countries have adopted policies to promote 'ageing in place' with the intention of delaying or preventing entry into long term care (LTC) facilities [4]. An assumption behind this policy is that community-based care will be more cost effective than institutional care. Consequently, this creates a rare 'win win' policy scenario by providing the care older people want and a way to manage escalating costs [5,6]. However, systematic reviews of clinical outcomes and overall cost savings of substituting community care for LTC have been mixed [7-9].

There are many studies examining the nature, predictability and avoidability of hospitalisations amongst frail older people living in the community and in LTC facilities, however few focus on changes in hospitalisation across the two settings, and study periods are often a year or less [5,10-13]. There are limited studies comparing hospitalisation rates before and after LTC entry [14-16]. This study aims to describe hospitalisation rates in a single cohort of vulnerable older people twelve months before and after LTC facility entry.

Methods

Hospitalisations from the 2008 Older Persons' Ability Level (OPAL) study cohort were analysed [17,18]. OPAL was a census-type survey of LTC facilities and residents in Auckland, New Zealand (NZ) (n=6810, 89% response rate). Facility staff recorded resident information using a 36-item assessment covering demographics, functional and disability levels [17,18]. One specific survey day was designated for all facilities. The study received approval from the NZ Health and Disability Northern X Regional Ethics Committee (NTX/08/49/EXP and NTX/11/EXP/193).

Each OPAL resident's unique National Health Index number (NHI) was matched with routinely-collected national data to report hospital admissions from twelve months before, to 12 months after, LTC entry. The OPAL study database provided demographic, care level and date of LTC entry. NHI information supplied date of death if that occurred within 12 months of the OPAL date, and also missing gender (<1.8%), and age (missing for <0.4% of residents), calculated at LTC entry date. All those who entered LTC within 12 months of OPAL were included (2,244 residents, see supplemental information on-line). Residents were classified as either in low-level 'rest home' care (with 24-hour care assistants but not 24-hour registered nursing care) or as in high-level 'private hospital' care (with 24-hour registered nursing care).

The 24-month period was divided into four 6-month intervals, two prior to entry and two after. Total hospitalisations, weekly hospitalisation rates per 100 person-years of follow up and mean rate for each of the 6-month periods were calculated. Rates calculations during the follow-up period did not include time after death. Using the first 6-month period as baseline, rate ratios were calculated for the second, third and fourth 6-month periods. Subgroup analyses by age, gender, LTC care level, whether the resident entered LTC from home or via the hospital, and mortality at 24 months were also performed. SAS 9.3 and OpenEpi 3.01 were used for statistical analyses.

Results

Of the 2,244 residents, 66% were women and mean age at LTC entry was 82.0 years (men=78.8 years, women= 83.5 years). There were 3,363 hospitalisations over the 24 months, and 364 deaths within 12 months of entry. The hospitalisation rate/100 person-years was 67.3 (95% confidence interval [CI] 62.5-72.1) in the baseline period (1-6 month period) prior to LTC entry (Figure 1 and Table 1). Rates then rose exponentially to over 450/100 person-years just before LTC entry (Figure 1). After LTC entry the 6-month mean rate fell immediately to 49.1 (CI 44.9-53.3; RR 0.73 (CI 0.65-0.82, $p < 0.0001$)) and decreased further in the following 6-month

period to 41.1 (CI 37.1-45.1; RR 0.61 (CI 0.51-0.67, $p<0.0001$)). Compared to the first 6-month period, hospitalisation rates in each 6-month period differed significantly across all sub-groups (Table 1).

Hospitalisations in the six months prior to LTC entry rose further for those admitted to LTC from an acute care hospital (rate ratio=2.68, CI 2.38-3.01) than those admitted to LTC from elsewhere (usually from home) (rate ratio=1.67, CI 1.46-1.90); however, in the last six month period following entry to LTC the rate ratio was similar in both groups (rate ratio=0.60). In the last 6 months, hospitalisations dropped less for the high-level group (private hospital) than the low-level group (rest home) (Table 1).

Discussion

These findings use cohort data to provide a rare insight into hospitalisation rates/100 person-years 12 months before and after LTC entry. Hospitalisation rates rose exponentially during the six month period prior to LTC entry (67.3 to 148.8, R-square is 0.85). It is encouraging that mean rates decreased so dramatically immediately after LTC entry. The reduction may occur as a result of clearer understanding of the resident's chronic conditions and better monitoring of health status. However, after entry to LTC hospitalisation for those living in low-level care dropped less than those in high-level care. This may be related to the higher registered nurse staffing levels in higher level care compared to lower level care. It may also reflect a more palliative management approach for some residents in higher level care [20].

The results are consistent with the few other studies comparing hospitalisation rates before and after LTC entry [19]. A European longitudinal cohort study demonstrated a six-fold higher rate of hospitalisations in the three months prior to LTC entry compared to the three months after entry (6.0 rate per person year at risk before LTC entry and 1.1 after LTC entry) [16]. A 2005 Canadian study compared hospitalisation rates over a two-year period for LTC facility residents,

community care recipients and a healthy older adult sample. Hospitalisations for LTC residents were less than half of those receiving community care. The mean hospitalisation rate over two years for those in LTC was 0.29 per resident, and 1.46 for those receiving home care services in the community [14]. A study of home and community-based waiver programme participants found that hospitalisation for those receiving community care was more than twice the rate of LTC residents after one year [21]. Another recent study found a 58% increased risk of hospitalisation for those who were transitioned back into the community after an extended LTC stay [15].

Internationally there have been many studies across several decades attempting to decrease hospitalisations and delay or prevent LTC entry for high needs older people [22-24]. However, the cost/benefit of these programmes is still not clear [21]. One reason is that people truly at risk of institutionalization are difficult to identify prospectively [8]. Another reason is that interventions that expand community services often result in what is known as the 'woodwork effect' - when a large, previously unrecognised population starts to access newly available services, when in reality they may have been able to live independently in the community without these services [25]. This results in increased community care costs with little LTC avoidance savings. Although 'ageing in place' is the desired goal for those with high levels of disability and frailty, it is difficult to know when risk of harm (as evidenced by increased hospitalisations) outweighs the benefits of 'ageing in place'. Improved methods of identifying those at risk and more intensive intervention in the community are needed to attempt to decrease hospitalisations for those on the verge of requiring 24 hour LTC. In NZ, the interRAI assessment has been implemented in the community and the CHESS subscale may be one way to better target services in the future although this has not yet been fully realised [27].

Study limitations may include difficulty with generalisability due to differences in international social service provision. In NZ, home care provision is based on assessed need and usually is

for no more than approximately three hours per day maximum. Some residents move to LTC directly from acute hospital. To test whether these admissions accounted for the exponential increase, sensitivity analyses were conducted by removing those direct transfers. No substantial changes were apparent in the results. Cohorts assembled from cross-sectional data are prone to length-biased sampling. Here, sub-group analyses by length-of-stay are similar, suggesting little bias in this instance.

Conclusion

A large increase in hospitalisations is apparent a few months before LTC entry, suggesting functional and medical instability as precipitating factors. New LTC residents utilise hospital beds less frequently than when living at home before that unstable period. Preventing hospitalisation prior to LTC entry requires substantial health and social service intervention [26]. Further research is needed about hospitalisation rates for those with similar disability that do not enter LTC and for interventions to improve care following hospitalisation from the community that may delay or avoid entry to LTC.

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MB was primary investigator and obtained funding from the Freemasons' Roskill Foundation for the OPAL survey. MB, MJC, JB and NK were responsible for primary acquisition of the data as co-investigators of the OPAL study which provided the LTC resident database for this paper. JBB and XZ were responsible for the acquisition and analysis of the healthcare utilisation data. MB, JB, XZ, NK, MG and MJC collaborated in this paper's original study concept, and design, drafting of the manuscript and critical revisions. Statistical analysis was conducted by JBB and XZ. All authors had access to the data. Authors have no financial, relationship or affiliation conflict of interests to declare and did not receive additional financial reimbursement to complete this study.

Joanna B Broad and Xian Zhang from the University of Auckland, Freemasons' Department of Geriatric Medicine had full access to all the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis.

Figure 1: Weekly hospitalisation rates (per 100 person-years) of residents 12 months before and 12 months after entry to LTC.

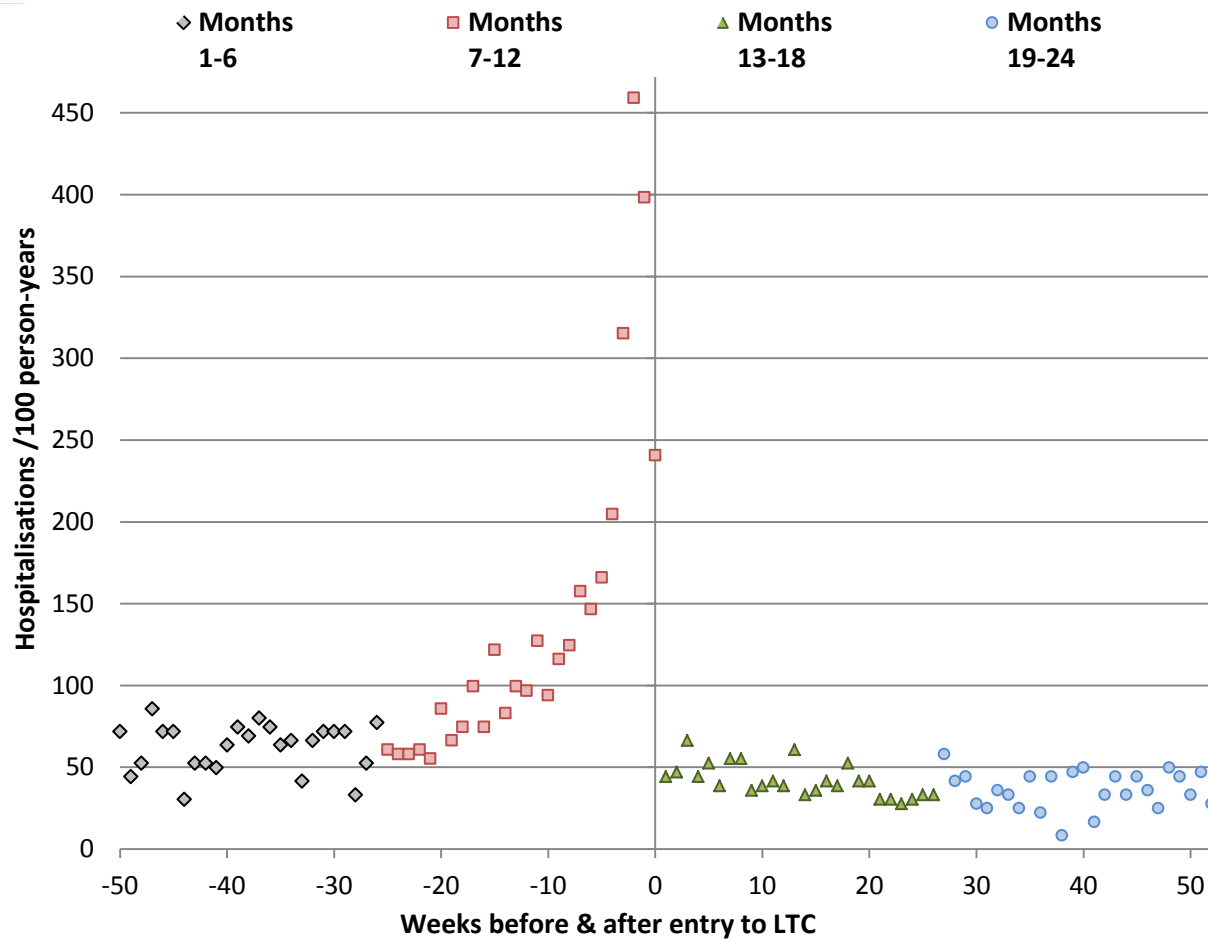


Table 1: Hospitalisation rates before LTC entry, and rate ratios for each 6-month period compared to the baseline period.

	N people	Baseline hospitalisation		Rate ratios for each 6-month period vs. Months 1-6								
		rate [#]	95%CI	Months 7-12			Months 13-18			Months 19-24		
				RR	95%CI	p-value	RR	95%CI	p-value	RR	95%CI	p-value
All residents	2,244	67.3	(62.5, 72.1)	2.21	(2.03, 2.41)	<0.0001	0.73	(0.65, 0.82)	<0.0001	0.61	(0.54, 0.69)	<0.0001
Status at 12 months post LTC entry												
Alive	1,880	62.4	(57.4, 67.5)	2.25	(2.04, 2.47)	<0.0001	0.67	(0.59, 0.76)	<0.0001	0.58	(0.51, 0.67)	<0.0001
Died	364	92.3	(78.3, 106.3)	2.09	(1.74, 2.51)	<0.0001	1.04	(0.83, 1.30)	0.7316	1.38	(1.03, 1.84)	0.03
Entry to LTC*												
from hospital	941	81.2	(73.0, 89.3)	2.68	(2.38, 3.01)	<0.0001	0.76	(0.65, 0.89)	0.0006	0.60	(0.50, 0.71)	<0.0001
from home	1,223	57.6	(51.5, 63.6)	1.67	(1.46, 1.90)	<0.0001	0.68	(0.58, 0.80)	<0.0001	0.60	(0.50, 0.72)	<0.0001
LTC Bed type at survey*												
High level (Hospital)	985	75.1	(67.5, 82.8)	2.11	(1.86, 2.38)	<0.0001	0.62	(0.52, 0.73)	<0.0001	0.47	(0.38, 0.57)	<0.0001
Low level (Rest home)	1,250	61.1	(55.0, 67.2)	2.31	(2.05, 2.61)	<0.0001	0.84	(0.72, 0.97)	0.02	0.75	(0.64, 0.87)	0.0002
Gender*												
Men	759	73.5	(64.9, 82.1)	2.14	(1.86, 2.47)	<0.0001	0.80	(0.67, 0.95)	0.01	0.64	(0.53, 0.78)	<0.0001
Women	1,449	64.0	(58.2, 69.9)	2.25	(2.01, 2.51)	<0.0001	0.69	(0.60, 0.80)	<0.0001	0.61	(0.52, 0.71)	<0.0001
Age group at LTC entry												
18-64	109	100.9	(74.2, 127.6)	1.24	(0.87, 1.76)	0.2429	0.50	(0.32, 0.79)	0.003	0.44	(0.27, 0.71)	0.0006
65-74	254	85.8	(69.7, 101.9)	2.16	(1.72, 2.71)	<0.0001	0.68	(0.50, 0.91)	0.01	0.51	(0.37, 0.71)	<0.0001
75-84	692	64.2	(55.7, 72.6)	2.33	(1.99, 2.73)	<0.0001	0.69	(0.56, 0.85)	0.0005	0.68	(0.55, 0.84)	0.0003
85-94	1,016	62.0	(55.2, 68.9)	2.28	(2.00, 2.60)	<0.0001	0.81	(0.68, 0.95)	0.01	0.63	(0.52, 0.76)	<0.0001
95+ years	173	62.4	(45.8, 79.1)	2.41	(1.75, 3.31)	<0.0001	0.76	(0.50, 1.15)	0.1945	0.60	(0.38, 0.96)	0.03
LTC Length of stay pre-survey												
under 3 months	814	73.0	(64.7, 81.3)	2.16	(1.89, 2.48)	<0.0001	0.90	(0.76, 1.07)	0.2373	0.72	(0.60, 0.87)	0.0007
3 to <6 months	585	67.7	(58.3, 77.1)	1.98	(1.67, 2.35)	<0.0001	0.70	(0.57, 0.88)	0.001	0.48	(0.37, 0.62)	<0.0001
6 to <9 months	432	64.8	(54.1, 75.6)	2.39	(1.96, 2.91)	<0.0001	0.61	(0.47, 0.80)	0.0003	0.62	(0.47, 0.81)	0.0004
9 to <12 months	413	58.1	(47.7, 68.5)	2.49	(2.02, 3.08)	<0.0001	0.53	(0.39, 0.71)	<0.0001	0.60	(0.44, 0.80)	0.0005

Notes: # Hospitalisations per 100 person-years in Months 1-6, P-values were derived from mid-P exact test (2-tail)

*Some residents did not have classifying information so are omitted from these comparisons

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