


Transitions Between Care Settings at the End of Life Among Older Homecare Recipients: A Population-Based Study

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Abstract

Objectives: Objectives were to (a) describe transitions between care settings in older homecare recipients at the end of life, and (b) examine what personal (e.g., age, sex) and health system factors (e.g., hospital bed supply) predict care transitions. **Methods:** The study involved analysis of administrative health care data and was based on a complete cohort of homecare recipients aged 65 years or older who died in Manitoba, Canada between 2003 and 2006 ($N = 7,866$). **Results:** More than half of homecare recipients had at least one care transition in the last 30 days before death and 21% had two or more hospitalizations in the last 90 days. Both personal characteristics and health system factors were related to transitions and hospitalizations. **Discussion:** The findings suggest that homecare recipients are an important population to focus on in terms of reducing potentially burdensome transitions and enhancing the end-of-life experience for them and their family.

Keywords

health care transitions, homecare, end of life, hospitalization, administrative data

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Some transitions in care settings toward the end of their life, such as hospitalizations are sometimes appropriate or essential. For example, certain medical conditions such as heart failure or stroke are only manageable in a hospital and it may be difficult for family to provide care at home (Bond, 2013; Reyniers, Houttekier, Cohen, Pasma, & Deliens, 2014; Stajduhar, 2003; Tosh, 2013). Care transitions can also be stressful for older adults and their families, however (Burge, Lawson, Critchley, & Maxwell, 2005), and are, therefore, sometimes considered indicators of poor quality of care at the end of life (Heyland, Lavery, Tranmer, Shortt, & Taylor, 2000; Wilson et al., 2012). As such, they have received considerable attention in the research literature (e.g., Aaltonen et al., 2014; Gozalo et al., 2011; Teno et al., 2013).

Care transitions have been defined in a number of different ways in research. Some researchers have counted the number of moves between care settings (e.g., home, nursing home, hospital, and palliative care) toward the end of life (Burge et al., 2005; Lawson, Burge, Critchley, & McIntyre, 2006; Van den Block, Deschepper, Bilsen, Van Casteren, & Deliens, 2007; Van den Block et al., 2015; Wang et al., 2016). Other researchers have defined “burdensome” care transitions to more clearly differentiate between necessary and potentially inappropriate transitions at the end of life

(Aaltonen et al., 2014; Aaltonen, Rissanen, Forma, Raitenen, & Jylhä, 2012; Gozalo et al., 2011; Teno et al., 2013). Several types of burdensome care transitions have been identified, including a change in care location in the last 3 days of life or having two or more hospitalizations in the last 90 days of life (Gozalo et al., 2011).

Research shows that care transitions are common at the end of life. However, the prevalence varies considerably depending on the population studied, the time frame during which transitions are examined, and the health system context. For example, in a large database study conducted in the United States involving close to half a million Medicare recipients in nursing homes who had advanced cognitive and functional impairment, 19% experienced at least one burdensome transition in the last 3 months of life (Gozalo et al., 2011). In a similar population-based Finnish study with long-term care residents with dementia, 9% had a burdensome transition in the last 3 months of life, with multiple

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hospitalizations being the most common transition in this population (Aaltonen et al., 2014). In Belgium, the Netherlands, Italy, and Spain, from 55% to 60% of patients registered with general practitioners had one care transition in the last 3 months before death and between 5% and 12% patients had three or more care transitions (Van den Block et al., 2015). In a Canadian study involving palliative care patients, nearly half of palliative care patients had at least one transition (a change in the location or care or a change in care provider), during the last 4 weeks of life (Burge et al., 2005). In contrast, in a study from the United States involving Medicare beneficiaries aged 66 or older who used hospices, only 10% had at least one care transition in the last 6 months of life (Wang et al., 2016).

Research further indicates that transitions between care settings are influenced by a variety of personal factors, such as age, sex (e.g., Aaltonen et al., 2014; Abarshi et al., 2010; Bähler, Signorell, & Reich, 2016; Gozalo et al., 2011; Lawson et al., 2006; Wang et al., 2016) and medical conditions, such as dementia (Aaltonen et al., 2012). Regional variation in care transitions has also been shown (Aaltonen, Forma, Rissanen, Raitinen, & Jylhä, 2013; Gozalo et al., 2011; Wang et al., 2016), suggesting that transitions are influenced by regionally determined health care practices or health care supply.

In the present study, we examined care transitions toward the end of life among older homecare recipients, that is, older adults who received support services in their own homes, such as assistance with everyday activities (e.g., meal preparation or bathing) or nursing care (e.g., wound care). Homecare falls on a continuum of care between living completely independently in the community and nursing home care for individuals who can no longer safely remain in their own homes. We focus here on homecare recipients because these individuals may be at particular risk of care transitions toward the end of life, given that they are experiencing functional decline to such an extent that makes it necessary for them to receive formal support services; however, toward the end of life, home supports may no longer be sufficient, potentially necessitating transitions to other care settings. There is a paucity of research that has examined possible burdensome transitions at the end of life in this population, however.

The study was guided by the Medical Outcomes Study (MOS) conceptual framework (Tarlov et al., 1989), which has previously been used for evaluating the quality of medical care. The framework consists of three components: the structure of care, process of care, and patient outcomes. The *structure* of care includes system characteristics (e.g., organization, physician specialty mix), provider characteristics (e.g., age, specialty training), and patient characteristics (e.g., age, sex, and health habits). The structure of care is expected to determine the *process of care*, such as coordination, hospitalization, and continuity of care, which in turn affects *outcomes*, such as function, general well-being, and

patient satisfaction. In this study, we considered two aspects of the structure of care: personal characteristics of older homecare recipients (e.g., age, income, and cause of death) and health system factors (e.g., physician supply, hospital bed supply). In sum, the present study had two objectives:

1. to describe transitions between care settings in older homecare recipients at the end of life, and
2. to examine what personal (e.g., age, sex) and health system factors (e.g., hospital bed supply) predict care transitions in this population.

Method

Study Setting

The setting of the present study was a Midwestern Canadian province, Manitoba. The province has a population of about 1.2 million, 14% of whom are 65 years or older. The province has a universal health care system, with the provincial health ministry overseeing and funding health care services in the province, although health care is regionally organized and administered. Hospital care and physician care are provided free of charge. Homecare is also free in Manitoba. It is available based on a standardized needs assessment, with factors such as the extent of assistance needed to complete activities of daily living (e.g., getting dressed, taking a bath) being taken into consideration. Once an individual can no longer safely be cared for in the home with homecare, admission to a nursing home will occur. Nursing homes are partially government-funded, subject to a residential fee that is income-based. Admission to nursing homes is also needs-based and occurs on the basis of a standardized assessment. Palliative care for individuals who are diagnosed to have a life expectancy of less than 6 months and who no longer wish to receive aggressive care (e.g., chemotherapy) is offered in Manitoba in hospital settings, at home via palliative homecare, or in nursing homes.

Study Sample

The sample in this study was a complete cohort of individuals 65 years or older who died in Manitoba within the fiscal years 2003/2004-2005/2006, and who received homecare for at least 30 days in the last year of their life. This sample selection criterion ensured a broad inclusion of all homecare recipients in the province. Given the free access to homecare, receiving homecare services exclusively through privately funded agencies would be rare. Individuals who were hospitalized outside the province were excluded from the study. Research indicates that very few Manitoba residents have hospitalizations outside the province (<2%; Martens et al., 2003), so excluding this group would not significantly affect the results. The final sample size for this study

was 7,866 homecare recipients. Ethics approval for the study was obtained from the Health Research Ethics Board (HREB) in the Max Rady College of Medicine at the University of Manitoba.

Data Sources

The study involved secondary data analysis of anonymized administrative health care data (hospital, homecare and nursing home data), vital statistics data, census data, and publicly available annual provincial statistical reports. The hospital, homecare, and nursing home data sets provided complete information on hospitalizations, homecare, and nursing home usage in the province of Manitoba. Health care data have been validated extensively and have been found to be reliable and valid (Roos et al., 1993; Roos & Nicol, 1999). Vital statistics data provided information on demographic factors including age, sex, marital status, and cause of death. Census data were used to determine area-level income. The annual provincial statistical reports were used to provide data on health system use factors, such as per capita physician supply and hospital bed supply.

Measures

Personal characteristics. The personal characteristics examined included age (categorized into three age groups: 65-74, 75-84, and 85+ years), sex (male, female), marital status (categorized into two categories: single/widowed/divorced vs. married), income (expressed in terms of income quintiles), and cause of death. Income quintile was an area-level variable derived from census data, whereby the population of Manitoba was divided into five income groups (from least affluent to most affluent) such that about 20% of the population was in each group. Individuals were then assigned an income quintile based on their area of residence. People who could not be linked to an area of residence (e.g., those assigned a public trustee) were categorized into a “not assignable” category. Cause of death, as derived from vital statistics data was categorized into two categories based on the International Classification of Diseases–10 (ICD-10): individuals who died of neoplasms versus individuals who died of diseases other than neoplasms.

Systems factors. Hospital bed supply, nursing home bed supply, homecare supply, and physician supply were derived from publicly available statistical reports from the provincial ministry of health. These variables were initially described as a rate: number of hospital beds per 1,000 residents in a region, number of nursing home beds per 1,000 residents in a region, number of physicians per 1,000 residents in a region, and average monthly number of persons receiving homecare per 1,000 residents in a region. The variables were later recoded into two

categories based on median cutoffs. As an example, the hospital bed supply was recoded as high hospital bed supply (4+ hospital beds per 1,000 residents) versus low hospital bed supply (<4 hospital beds per 1,000 residents).

As an additional measure, we included homecare days. This variable was obtained from the homecare data file and was defined as the number of homecare days older adults received in the last year of their life. It was treated as a continuous variable in this study.

Outcome variables. Care transitions were derived using the following steps. First, for each day in the last 30 days before death, it was determined which care setting individuals were in, with five settings identified as follows: hospital, nursing home, palliative care (made of palliative care hospital units and beds and palliative homecare), homecare, and other (which included institutions other than hospitals or nursing homes and anybody who did not appear in any of the previous four categories). Second, the number of moves between any of these five care settings was counted. It is important to note that for a transition to take place in this study, homecare recipients did not have to be physically transferred from one setting to another. A transition could also occur when the individual stayed in the same location. For example, a transition can be said to have occurred when a person initially lived at home while receiving homecare and later received palliative homecare at home. Similar definitions of transitions have been used in previous research (Burge et al., 2005; Teno et al., 2013). Finally, the number of moves between care settings in the last 30 days before death was dichotomized to create two outcome variables: (a) 1+ transitions versus 0 transitions, and (b) 2+ transitions versus <2 transitions, to more clearly differentiate between possible burdensome transition patterns versus potentially more appropriate ones (e.g., being admitted to a nursing home and dying there, which would be considered one transition).

Furthermore, a hospitalization measure was derived by counting the number of times homecare recipients were hospitalized in the last 90 days before death. The variable was dichotomized into 2+ hospitalizations in the last 90 days of life versus 0 or 1 hospitalization. This definition was chosen based on previous literature that considered two or more hospitalizations in the last 90 days before death, a burdensome transition (Gozalo et al., 2011).

Data Analysis

Data were analyzed using IBM SPSS statistics (Version 22) in a secure location at the University of Manitoba. Initially, descriptive statistics such as frequencies and percentages were used to describe homecare recipients' characteristics and transition patterns. Multivariate logistic regression analysis was subsequently used to examine the relationship between

Table 1. Descriptive Profile of Older Homecare Recipients (N = 7,866).

Variable	n	%
Sex		
Male	3,609	45.9
Female	4,257	54.1
Age (in years)		
65-74	1,355	17.2
75-84	3,037	38.6
85+	3,474	44.2
Marital status		
Single/widowed/divorced	4,915	62.5
Married	2,951	37.5
Income quintiles		
Q1 (lowest)	1,989	25.3
Q2	1,696	21.6
Q3	1,524	19.4
Q4	1,017	12.9
Q5 (highest)	887	11.3
Not assignable	753	9.6
Cause of death		
Died of neoplasms	2,205	28.0
Died of other diseases	5,661	72.0

personal characteristic and systems factors and the three outcome measures (1+/ ∞ transitions; 2+/ ∞ transitions; 2+/ ∞ hospitalizations).

Results

Overall, in this decedent cohort, there were more women than men (54.1% vs. 45.9%) and the majority of the individuals were in the 85+ age group (44.2%; see Table 1). There was a gradient in terms of income quintiles, in that the highest proportion of individuals was in the lowest, least affluent income quintile (25.3%) and the lowest proportion in the highest, most affluent income quintile (11.3%).

As shown in Table 2 more than half of homecare recipients (56.4%) had one or more transitions between care settings in their last 30 days before death and 12.7% had two or more transitions. Similarly, the majority (73.7%) of homecare recipients had one or more hospitalizations in the last 90 days before death, with 21% having two or more hospitalizations during that time period.

A more detailed examination of transitions showed that there were 131 distinct patterns of transitions between care settings in the last 30 days before death. As can be seen in Table 3, the most common transition in the last month before death was the transition from receiving homecare at home to the hospital (27%) and the second most common transition (5.8%) was from receiving homecare to receiving palliative care (either through palliative homecare or in a palliative care hospital unit or bed).

Table 2. Number of Transitions and Hospitalizations Among Older Homecare Recipients (N = 7,866).

Number of transitions or hospitalizations	Transitions in the last 30 days of life		Hospitalizations in the last 90 days of life	
	n	%	n	%
0	3,434	43.7	2,072	26.3
1	3,437	43.7	4,142	52.7
2	615	7.8	1,276	16.2
3	306	3.9	307	3.9
4-7	74	1.0	69	0.9

Note. Percentages do not add up to 100% because of rounding.

Table 3. The Most Common Transition Patterns in the Last 30 Days of Life Among Older Homecare Recipients.

Number of transitions	Transition pattern	n	%
1	Homecare to hospital	2,126	27
1	Homecare to palliative care	454	5.8
1	Nursing home to hospital	273	3.5
1	"Other" to hospital	168	2.1
1	Hospital to nursing home	133	1.7
2	Hospital to homecare to hospital	132	1.7
3	Homecare to hospital to homecare to hospital	173	2.2

Note. The last care setting in each transition pattern is the place of death; for example, homecare to hospital means that the individual was first receiving homecare and was later transferred to a hospital, and died in the hospital.

We also examined the proportion of individuals in different care settings in the last month before death. In Figure 1, we show the proportion of decedents in different care settings with "Day 1" being the day of death. As can be seen in the figure, the percentage of individuals using homecare decreased in the last 30 days before death, whereas the percentage of individuals in hospital increased substantially. The majority of homecare recipients (55.4%) died in hospital, 16.8% died in palliative care settings, 14.2% died in nursing home settings, 12.2% were receiving homecare in their homes when they died, and 1.4% of the individuals died in an "other" setting.

We next conducted multivariate logistic regression analyses to examine factors related to (a) 1+ transitions in the last 30 days before death, (b) 2+ transitions, and (c) 2+ hospitalizations in the last 90 days before death. Table 4 shows that homecare recipients who were male, in the 75- to 84-year age group, received more homecare days, and lived in regions of high hospital bed supply had significantly higher odds of 1+ transitions in the last 30 days before death, whereas those who were single, in the lower income quintile groups, and who lived in

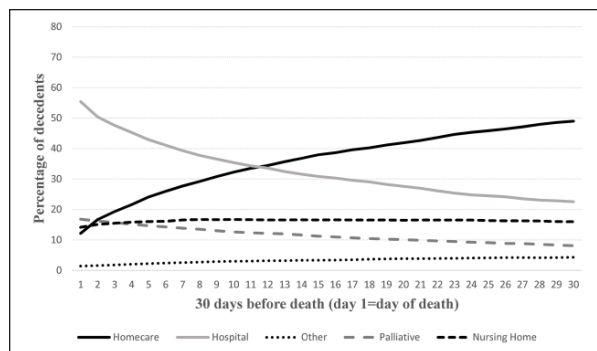


Figure 1. Percentage of older homecare recipients in different care settings in the last 30 days of life ($N = 7,866$).

regions of high physician and nursing home bed supply had significantly lower odds. Findings for 2+ transitions were somewhat similar, with statistically significant relationships emerging for sex, age group, homecare days, and physician supply.

In terms of factors related to hospitalizations, homecare recipients who were 65 to 74 and 75 to 84 years old, and lived in regions of high hospital bed supply, had significantly higher odds of having 2+ hospitalizations in the last 90 day before death. However, individuals who were single, died of neoplasms, received more homecare days, and lived in regions of high physician and nursing home bed supply had lower odds of multiple hospitalizations.

Discussion

Transitions at the end of life have been described as potentially burdensome (Gozalo et al., 2011) and can be distressing to older adults and their families. In the present study, 56% of homecare recipients had at least one transition between care settings in the last 30 days before death and 13% had two or more transitions. Moreover, 21% of older homecare recipients were hospitalized two or more times in the last 90 days before death. In addition, more than half of the individuals in the study died in a hospital, with 16.8% dying in a palliative care setting and 14.2% dying in a nursing home. Similar findings for transitions and hospitalizations toward the end of life have been reported in previous studies (e.g., Gozalo et al., 2011; Kaspers, Pasman, Onwuteaka-Philipsen, & Deeg, 2013). For example, studies in Canada have shown that 50% or more of older adults die in hospitals (Canadian Institute for Health Information, 2007; Fowler & Hammer, 2013; Menec, Lix, Ekuma, & Nowicki, 2007).

The most common pattern of transitions in the last 30 days of life was from receiving homecare at home to dying in hospital (27%). Similar results were found in a study conducted in Amsterdam where between 28% (in 2000) and 32% (in 2010) of older adults were transferred from home to hospitals toward the end of their life

(Kaspers et al., 2013). The second most common transition in the present study was from receiving homecare at home to palliative care (either through palliative homecare or palliative care in hospitals; 5.8%). This is an encouraging finding as it suggests that homecare recipients transitioned to a more appropriate care setting that is designed to maximize the quality of the end of life. However, it is important to note that there were 131 distinct patterns of transitions in the last month before death. This shows that care transitions are quite heterogeneous at the end of life among older homecare recipients.

Both personal characteristics and system factors were associated with transitions between care settings and hospitalizations toward the end of life, consistent with the Medical Outcome Study framework (Tarlov et al., 1989) and previous research in the end-of-life domain (e.g., Aaltonen et al., 2014; Abarshi et al., 2010; Bähler et al., 2016; Gozalo et al., 2011). The findings were quite similar for transitions and hospitalizations, which is not surprising given that many of the transitions involved hospitalizations; in other words, there is overlap between the variables. Consistent findings for personal characteristics were that younger age was associated with higher odds of transitions and hospitalizations, whereas being single was related to lower odds.

Men also had higher odds of having one or more or two or more transitions, albeit not hospitalizations. These findings make sense in the context of considering how people move through the health care system in Manitoba. Older women live longer and are more likely to be single than men in very old age; they are, therefore, also more likely to be admitted to a nursing home. Once in a nursing home, the likelihood of being transferred to a hospital is quite low (Menec, Nowicki, Blandford, & Veselyuk, 2009).

Individuals living in low-income areas had lower odds of having one or more transitions in the last 30 days before death than homecare recipients living in higher income areas. On one hand, this might be construed as a positive sign, as it may mean that individuals on low income do not incur any burdensome transitions. On the other hand, it may also mean that low-income individuals are less likely to be transferred into more appropriate care settings at the end of life, particularly palliative care, than more affluent individuals. Potential inequities in access to appropriate care settings at the end of life should be explored in future research by examining in more detail reasons for care transitions, as well as by looking at people's actual income levels, rather than area-level income.

Several of the systems level variables were also related to transitions and hospitalizations. Specifically, more hospital beds per capita were associated with higher odds of one or more transitions and two or more hospitalizations. The finding corroborates previous research in Manitoba that focused on all older adults, not only homecare recipients (Menec, Nowicki, & St John,

Table 4. Predictors of Transitions and Hospitalizations (Adjusted Odds Ratios; $N = 7,866$).

	1+ transitions in last 30 days (vs. 0)	2+ transitions in last 30 days (vs. <2)	2+ hospitalizations in last 90 days (vs. <2)
Sex			
Male (vs. female)	1.154**	1.177*	1.099
Age group			
65-74 (vs. 85+)	1.108	1.546**	1.394**
75-84 (vs. 85+)	1.133*	1.188*	1.301**
Marital status			
Single/widowed/divorced (vs. married)	0.893*	0.897	0.851*
Income quintiles			
Not assignable (vs. Q5)	0.768*	1.289	0.878
Q1 (lowest vs. Q5)	0.820*	0.911	1.000
Q2 (vs. Q5)	0.774**	1.013	1.000
Q3 (vs. Q5)	0.946	1.037	0.982
Q4 (vs. Q5)	0.798*	0.857	0.841
Cause of death			
Neoplasms (vs. other diseases)	0.988	0.857	0.695**
Homecare days	1.002**	0.999*	0.999**
Hospital beds (per 1,000 population)			
4+ beds (vs. <4)	1.707**	1.300	1.486*
Physicians (per 1,000 population)			
2+ physicians (vs. <2)	0.865*	0.732**	0.581**
Nursing home beds (per 1,000 population)			
8+ beds (vs. <8)	0.631*	0.676	0.616**
Homecare use (per 1,000 population)			
20+ persons (vs. <20)	0.972	0.947	0.999

* $p < .05$. ** $p < .01$.

2011). It is also consistent with Roemer's Law, a widely acknowledged principle in the health care field that posits that hospital beds that are built will also be used. Consequently, the more hospital beds there are in a region, the greater the hospital use is (Delamater, Messina, Grady, WinklerPrins, & Shortridge, 2013).

Conversely, greater physician and nursing home bed supply were related to reduced odds of transitions and hospitalizations toward the end of life. This is consistent with previous research that showed that greater physician supply was associated with reduced hospitalizations in older adults in general near the end of life (Menec, Nowicki, & Kalischuk, 2010). Moreover, research with homecare cancer patients shows that greater continuity of care with a family physician is associated with decreased likelihood of hospital death (Almaawi, Pond, Sussman, Brazil, & Seow, 2014), which highlights the importance of primary care in reducing hospitalizations at the end of life.

The only system variable consistently not related to transitions and hospitalizations was homecare supply, defined here in terms of the number of people per capita who received homecare. It is also noteworthy that the effects for the number of homecare days that people incurred, although statistically significant, were extremely small, so likely of little practical importance. This is reminiscent of research with palliative homecare cancer patients, which shows that hospitalizations at the

end of life were reduced only when personal and home-making support exceeded 7 hr per week but not with fewer hours (Seow, Barbera, Howell, & Dy, 2010). The homecare data used in present study did not allow us to examine the intensity of homecare services. We were, therefore, not able to assess homecare use in such detail.

That homecare supply was not related to our outcome measures may also be due to how the homecare system is structured in Manitoba, with there being an upper limit to the types and volume of services that are provided. If a person's care needs exceed these limits, then a transfer becomes necessary, typically into a nursing home. This begs the question, however, to what extent hospitalizations toward the end of life, or perhaps even nursing home admissions, could be prevented by increasing homecare supports. This is an important area of future research that requires an in-depth examination of reasons for hospital admissions and how people's needs might instead be dealt with in their homes. The cost-effectiveness of enhancing homecare services at the end of life should also be examined. Similarly, the question arises as to whether increasing palliative homecare for individuals very near the end of the lives could reduce the need for hospitalization and enhance the quality of the end-of-life experience for both the older adults and family. In this respect, although a transition from homecare to palliative care was the second most common transition, the frequency was quite low (less

than 6% of homecare recipients), suggesting that investment in this area could be beneficial.

One of the limitations of the study was the variables that can be examined using administrative data are limited. We were, therefore, not able to examine the medical conditions or functional limitations that precipitated a transition. We were also not able to examine what kind of informal caregiver and other support services older adults received at home. As such, we were not able to disentangle which transitions or hospitalizations were appropriate and which ones might be avoidable if appropriate alternative services were in place. Also, the data that were used in this study is from the years 2003 to 2006 and one should be careful when applying these findings to homecare recipients today. However, it is important to note that there have not been any major changes to the health care system per se in Manitoba, although some changes in the supply of health services have been observed. For example, the number of hospital beds per capita decreased from 3.35 per 1,000 residents in 2006 to 3.13 in 2011. This is due to the fact that bed numbers have remained relatively stable, whereas the provincial population has increased (Fransoo et al., 2013). Similarly, the per capita number of nursing home beds has decreased slightly because of demographic changes (Fransoo et al., 2013). Although these changes would be expected to affect health service use to some extent, they likely would not have an impact on the relationships between predictor and outcome variables, thus should not affect the findings substantially.

Even though there were limitations in the current study, there were also strengths. The use of administrative health care data and vital statistics data provided the opportunity to include a complete cohort of deceased homecare recipients, as well as allowing us to examine the care setting of individuals for each day before their death. As such, the study was not subject to recall bias and provides a complete picture of transitions among homecare recipients.

In sum, this study adds to the literature by examining transitions among homecare recipients at the end of life. The large number of transitions and hospitalizations found in this study suggest that homecare recipients are an important population to focus on in terms of reducing potentially burdensome transitions and enhancing the end-of-life experience for them and their family.

Authors' Note

The results and conclusions are those of the authors, and no official endorsement by the Manitoba Centre for Health Policy, Manitoba Health, or other data providers is intended or should be inferred.

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