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Hospitalizations at the End of Life Among Long-Term Care Residents

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Background. Concerns have been raised over transfers into acute care hospitals at the end of life. The objective of this study was to examine (a) the extent of and (b) factors related to hospitalization in the last 180 days before death among long-term care (LTC) residents.

Methods. The study included all LTC residents from 60 facilities in the province of Manitoba, Canada, who died in 2003/04 (N = 2,379), with data derived from administrative health care records. Multilevel regression analyses were conducted to examine the relationship between resident and facility characteristics and the following: location of death (in hospital vs the LTC facility); whether individuals were hospitalized in the last 180 days before death; and number of hospital days in the last 180 days.

Results. Overall, 19.1% of LTC residents died in hospital; however, 40.7% were hospitalized at least once in the last 6 months before death. Several resident characteristics (age, trajectory group, and level of care) were related to the outcome measures. Living in a not-for-profit LTC facility decreased the odds of dying in hospital (adjusted odds ratio [OR] = 0.589; 95% confidence interval [CI] = 0.402–0.863) or being hospitalized (adjusted OR = 0.647; 95% CI = 0.452–0.926).

Conclusions. Hospitalization at the end of life is common among LTC residents, and the likelihood of hospital transfers is increased for residents who are younger, have organ failure, lower care level needs, as well as among those who live in for-profit facilities. Particular emphasis should, therefore, be placed on targeting these groups to determine the appropriateness of hospital admission and possible ways of reducing transfers.

Key Words: End-of-life care—Hospital use—Long-term care—Administrative data—Multilevel models.

IN recent years, the quality of care provided at the end of life has been the focus of considerable research. One area of interest has been transfers into hospital at the end of life, with the proportion of hospital deaths often considered an indicator of a potentially inappropriate care setting at the end of life (1), reflective of the medicalization of dying that is often contrary to people's wishes (2). Numerous studies show that the proportion of hospital deaths ranges from about 35% to 70% when considering all causes of deaths and cancer deaths (3–10). Among older adults aged 65 or older, the proportion is around 50% (11–15), although it is considerably lower among older individuals with dementia, the majority of who die in long-term care (LTC) facilities (12).

There is a paucity of research, however, that has focused on hospital transfers at the end of life among LTC residents. LTC facilities are defined here as institutions for individuals who require nursing care and who can no longer live independently in the community. An examination of LTC residents is important because they represent a large segment of the population. In the United States, 1.6 million individuals live in LTC institutions (16). In the province of Manitoba, Canada, the location of the present study, 24% of individuals aged 85 or older live in LTC facilities (17) and about 30% of deaths among adults aged 65 or older occur in LTC institutions (11). Hospital transfers may have a particularly negative impact when they occur at the end of life. In one study, family members of LTC residents were significantly less satisfied with the end-of-life care when the family member died in hospital versus in the LTC institution (18).

Previous research that has focused on hospital transfers among LTC residents, albeit not at the end of life per se, has shown that hospitalizations are common (19–21) and as many as 40% were deemed inappropriate in one study (22). A variety of factors increase the likelihood of hospitalization among LTC residents, including younger age, presence of certain diseases, such as congestive heart failure (19), and lower care needs (23). Facility and systemwide characteristics are also related to the likelihood of hospital transfers, including Medicaid nursing home reimbursement level, clinical resources available in the facility, and area-level hospital bed supply (20,24,25). The few existing studies that have examined transfers specifically at the end of life suggest that they are also common shortly before death, ranging from 25% to 46% within the last 6–12 months before death (26,27) to 58% in the last month before death (28).

Thus, the aim of the present study was to add to the sparse literature on hospital transfers at the end of life among LTC residents by examining: (a) the extent of hospital transfers and (b) factors related to hospitalizations, focusing on both resident and facility factors. On the resident side, we considered factors found important in the literature, including age and care level. We were also particularly interested in

determining whether hospital transfers at the end of life could be predicted based on individuals' health condition. Specifically, we focused on the notion of functional trajectory groups that have been identified in the literature based on their distinct functional and health care use patterns at the end of life (29–31). Trajectories of dying that have been described include sudden, abrupt deaths (eg, due to accidents); terminal illness, which is typical of cancer, characterized by a distinct terminal phase of rapid functional decline; organ failure (eg, characteristic of chronic obstructive pulmonary disease, congestive heart failure), which is associated with a relatively slow decline and periodic, severe exacerbations of the disease; and frailty, which is characterized by a prolonged, steady functional decline prior to death (29,30).

On the facility side, we examined the location of the LTC facility (rural vs urban) as a way to capture potential geographic inequities, and ownership type (for profit vs not for profit). In terms of the latter issue, a large body of research has demonstrated differences in quality of care between these two types of ownership models, with for-profit LTC facilities performing more poorly than not-for-profit ones on various quality of care indicators, such as hospitalizations for pressure ulcers (32,33). As this research did not focus on the end of life per se, whether a similar pattern emerges shortly before residents' death therefore warrants examination.

Methods

Context of the Present Study

In Manitoba, LTC facilities are included in the universal health care coverage. Admission can occur only on the basis of an assessment that is standardized across the province. Thus, admission is based solely on need, with factors such as the extent of assistance needed to complete activities of daily living (eg, getting dressed, using the bathroom) being taken into consideration. Services provided in LTC facilities include nursing care and the provision of meals and assistance with activities of daily living. Only very rarely do individuals return from LTC facilities back to the community. Thus, once admitted, the LTC facility becomes the final place of residence.

With respect to the end of life, palliative care in Manitoba is the term used for care provided for terminally ill individuals that is focused on improving the quality of their lives at the end of life. Palliative care can be delivered in a range of settings, including LTC facilities and hospitals. LTC residents are, therefore, not routinely transferred into a palliative care setting at the end of life. Palliative care is, like other health care services, provided through the universal insurance plan. At the time the present study was conducted, only a few (very small) hospices existed, that is, free-standing facilities dedicated to providing care for terminally ill individuals. There were two large hospital-based palliative care units, however, and many acute care hospitals have designated "palliative" beds, which are set aside for terminally ill patients who have decided to forego curative treatment. These palliative care units and palliative care beds were excluded from our definition of "hospitalization" in the present study (see details below).

Data Sources

Data sources were administrative data files, including hospital discharge abstract and LTC data. These data sources provide complete information of all hospital and LTC use in the entire province for all individuals admitted to hospital or LTC facilities. The data have been validated extensively and have been found to be reliable and valid (34,35). Vital statistics data provided information of all deaths in the province, including the cause of death, as well as demographic information (age and sex). All data files are completely anonymized.

Sample

The sample was drawn from a complete cohort of individuals of all ages who died in Manitoba in 2003/04, as determined from vital statistics data. We defined LTC residents as individuals who had resided one or more days in an LTC institution in the last 360 days before death. Institutions included all LTC facilities in Manitoba, as well as the two facilities in the province that are specifically designated as chronic care hospitals and are designed for individuals with LTC needs, which cannot be accommodated in an LTC institution.

To ensure sufficient statistical power for multilevel analyses, only facilities with at least 20 deaths in 2003/04 were ultimately included in the present study. As the number of deaths among residents of a facility is strongly correlated with the number of beds ($r = .72$), this means that we tended to exclude small LTC facilities. Moreover, we excluded individuals who died in locations other than a hospital or LTC facility (see details below). Applying these exclusionary criteria left 2,379 individuals living in 60 facilities or 77.8% of the total LTC decedent cohort and 47.6% of all LTC facilities in Manitoba.

Measures

Predictor variables.—Demographic characteristics derived from vital statistics data included age, with individuals being categorized into four groups (≤74, 75–84, 85–94, and ≥95), and sex (see Table 1).

Trajectory groups.—In the absence of more detailed data related to functional status, we used the methodology developed and validated by Fassbender and coworkers (36), which classifies decedents based on International Classification of Disease (ICD-10) diagnostic codes of the primary cause of death derived from vital statistics data. Trajectory groups included (a) terminal illness (eg, cancer, amyotrophic

Table 1. Descriptive Statistics: Predictor Variables

Measures	*N* (%)
Sex	
Men	851 (35.8)
Women	1,528 (64.2)
Age group (y)	
≤74	219 (9.2)
75–84	701 (29.5)
85–94	1,147 (48.2)
95+	312 (13.1)
Trajectory group	
Frailty	986 (41.5)
Organ failure	946 (39.7)
Terminal illness	242 (10.1)
Sudden death/other	205 (8.6)
Level of care	
Levels 1 and 2	632 (26.6)
Level 3	929 (39.1)
Level 4	632 (26.6)
Chronic care	186 (7.8)
LTC location	
Rural	478 (20.1)
Urban	1,901 (79.9)
LTC ownership	
For profit	752 (31.6)
Not for profit	1,627 (68.4)
Total	2,379 (100.0)

Note: LTC = long-term care facility.

lateral sclerosis, end-stage renal disease); (b) organ failure (eg, congestive heart failure, stroke, chronic obstructive pulmonary disease, and chronic ischemic heart disease; (c) frailty (eg, dementia and multiple sclerosis); and (d) sudden deaths (eg, accidents) and other causes of death (eg, mental health conditions).

Level of care.—In Manitoba, LTC residents are assigned a level of care as part of the process of being admitted to an institution. They are based on the individual's level of dependence in the areas of bathing and dressing, assistance with meals (feeding), ambulation/mobility/transfers, elimination, professional intervention (treatment/medication), and behavior management/support supervision. Four levels of care are assigned at admission and recorded in the LTC data file, with Level 1 reflecting "independent" or "minimal dependence" in each of the six areas of care and Level 4 "maximal dependence" in four or more areas of care. As there were few Level 1 and Level 2 residents, these two groups were subsequently combined. A "chronic care" group was created for individuals who were in one of the two chronic care facilities.

Length of stay in the LTC institution was taken into account in the analyses, as determined based on the date of admission to the LTC institution (derived from the LTC data file) and date of death (derived from vital statistics data).

Facility characteristics included location (urban vs rural) and type of ownership (not for profit vs for profit). Of the 60 institutions, 42 were in urban areas and 18 in rural areas, and 43 were not for profit versus 17 for profit.

Outcome variables.—Location of death was determined by linking hospital and LTC data, with individuals being classified as having died in hospital versus in an LTC. Patients in palliative care units and hospitals designated for palliative patients are coded as "palliative" in the data. As we were interested in acute care hospitalizations, we excluded these individuals, as well as those who died in nonacute care institutions (eg, mental health facility). In total, they constituted a very small proportion of LTC residents (<2%).

Hospitalizations were a count of the number of times decedents were admitted to hospital within the last 180 days before death (excluding hospitalizations coded as palliative) as derived from the hospital data. Hospitalizations were subsequently dichotomized (0 vs 1+), because the measure was highly skewed.

Hospital days for all acute care hospitals were derived from the hospital data by summing the days between admission and separation dates during the 180 days before death.

Analyses

Multilevel analysis was used to analyze the data, as LTC residents (Level 1) were nested within LTC institutions (Level 2). Logistic regression was used for binary outcome variables (location of death and hospitalization). The number of hospital days was treated as a continuous measure and was analyzed using a negative binomial distribution, as the variable was skewed and overdispersed. Predictors were entered simultaneously into the regression models and included resident characteristics (sex, age, trajectory groups, levels of care, and length of stay in the facility) and facility characteristics (location and type of ownership). Because of a confound between facility location and ownership, with all for-profit LTC facilities in Manitoba being located in urban areas, we conducted separate analyses for each outcome measure with location versus type of ownership, respectively, in the model, in addition to the resident characteristics.

To facilitate interpretation, results for dichotomous measures are presented as odds ratios (ORs), whereas results for hospital days are presented as relative rates. Following Merlo et al. (37), we present the facility (random) effect as a median odds ratio (MOR), which translates facility variance into an OR scale. If there is no variation across facilities, the MOR will be 1. An MOR > 1 would indicate that there is variation.

Results

Table 2 provides descriptive information of the location of death, hospitalizations, and hospital days in the last 180 days before death. Overall, 80.9% of the LTC residents died in the LTC facility, compared with 19.1% who died in

Table 2. Number (%) of Residents by Location of Death and Hospitalization

	Location of Death		Hospitalizations	
	LTC	Hospital	0	1+
	N (%)	*N* (%)	*N* (%)	*N* (%)
Sex				
Male	666 (78.3)	185 (21.7)	458 (53.8)	393 (46.2)
Female	1,259 (82.4)	269 (17.6)	952 (62.3)	576 (37.7)
Age group (y)				
≤74	155 (70.8)	64 (29.2)	99 (45.2)	120 (54.8)
75–84	533 (76.0)	168 (24.0)	366 (52.2)	335 (47.8)
85–94	956 (83.3)	191 (16.7)	711 (62.0)	436 (38.0)
95+	281 (90.1)	31 (9.9)	234 (75.0)	78 (25.0)
Trajectory group				
Frailty	819 (83.1)	167 (16.9)	623 (63.2)	363 (36.8)
Organ failure	726 (76.7)	220 (23.3)	538 (56.9)	408 (43.1)
Terminal illness	211 (87.2)	31(12.8)	138 (57.0)	104 (43.0)
Sudden death/other	169 (82.4)	36 (17.6)	111 (54.1)	94 (45.9)
Level of care				
Levels 1 or 2	489 (77.4)	143 (22.6)	341 (54.0)	291 (46.0)
Level 3	756 (81.4)	173 (18.6)	524 (56.4)	405 (43.6)
Level 4	556 (88.0)	76 (12.0)	443 (70.1)	189 (29.9)
Chronic care	124 (66.7)	62 (33.3)	102 (54.8)	84 (45.2)
LTC location				
Rural	386 (80.8)	92.0 (19.2)	290 (60.7)	188 (39.3)
Urban	1,539 (81.0)	362 (19.0)	1,120 (58.9)	781 (41.1)
LTC ownership				
For profit	582 (77.4)	170 (22.6)	386 (51.3)	366 (48.7)
Not for profit	1,343 (82.5)	284 (17.5)	1,024 (62.9)	603 (37.1)
Total	1,925 (80.9)	454 (19.1)	1,410 (59.3)	969 (40.7)

Note: LTC = long-term care facility.

hospital. However, the hospitalization rate was substantially higher, with 40.7% of residents being hospitalized at least once in the last 180 days before death. These individuals incurred a total of 1,312 hospitalizations and 13,489 hospital days (see Table 3).

The descriptive statistics in Tables 2 and 3 also show that there was considerable variation across resident and facility characteristics in location of death and hospitalizations. For example, 12% of Level 4 care residents versus 33.3% of chronic care patients died in hospital. Noteworthy is also that whereas only 84 chronic care patients were hospitalized at least once, they incurred 120 hospitalizations and 2,580 hospital days in total, for an average of 21.5 days per hospitalization. Thus, although these individuals constituted only 3.5% of our entire sample, they incurred 19.1% of all hospital days. Table 3 also shows the wide variability in the number of hospital days incurred, with a range from 0 to 142. Note that these are cumulative days within the last 6 months before death. In other words, an individual could have been hospitalized several times within that time period.

Table 4 shows multilevel regression results for location of death and hospitalization. Younger age, organ failure, and lower care levels were associated with increased odds of dying in hospital and hospitalization, whereas being in a not-for-profit facility was related to lower odds. Particularly strong effects emerged for age and levels of care. For example, residents aged less than 75 had more than three times the odds of dying in hospital than those aged 95 or older. Similarly, chronic care patients had more than three times the odds of dying in an acute care setting, relative to Care Level 4 LTC residents. The effect for ownership type was also quite substantial, with not-for-profit LTC facilities having 0.59 the odds of dying in hospital, relative to those in for-profit LTCs, or expressed the opposite way, residents of for-profit LTC facilities had about 70% greater odds of dying in an acute care hospital than those in not-for-profit LTC institutions.

A significant "facility" effect also emerged for both measures. For instance, the percent (unadjusted) of LTC residents who died in a hospital ranged from 0% to 41%; the MOR was 1.69 (see Table 4).

Figure 1 illustrates hospital use in the last 30 days before death in more detail for the six largest LTC facilities. For each day (Day 1 being the day of death), the figure shows the percent of individuals in hospital. For example, on Day 30, the percentage of LTC residents in hospital ranged from 2.1% to 11.5% across the six facilities; the percentage ranged from 11.4% to 40% on the day of death (ie, Day 1). Thus, the variability across LTC facilities increased markedly as individuals approached death.

Table 3. Descriptive Statistics for Hospitalizations and Hospital Days

	Hospitalizations			Hospital Days		
	Total Count	Mean Per Decedent (*SD*)	Range	Total Count	Mean Per Decedent (*SD*)	Range
Sex						
Male	544	0.64 (0.82)	0–4	5,937	6.98 (16.07)	0–142
Female	768	0.50 (0.77)	0–5	7,552	4.94 (13.10)	0–139
Age group (y)						
≤74	176	0.80 (0.97)	0–5	2,230	10.18 (19.40)	0–101
75–84	471	0.67 (0.85)	0–4	5,276	7.53 (17.32)	0–142
85–94	570	0.50 (0.74)	0–4	5,385	4.69 (12.17)	0–127
95+	95	0.30 (0.58)	0–3	598	1.92 (5.77)	0–71
Trajectory group						
Frailty	483	0.49 (0.76)	0–4	4,415	4.48 (11.35)	0–97
Organ failure	568	0.60 (0.83)	0–5	6,536	6.91 (17.50)	0–142
Terminal illness	132	0.55 (0.73)	0–4	1,228	5.07 (11.06)	0–86
Sudden death/other	129	0.63 (0.82)	0–3	1,310	6.39 (13.25)	0–101
Level of care						
Levels 1 or 2	408	0.65 (0.85)	0–4	3,539	5.60 (11.90)	0–101
Level 3	537	0.58 (0.76)	0–4	4,921	5.30 (12.66)	0–142
Level 4	247	0.39 (0.69)	0–4	2,449	3.88 (12.37)	0–127
Chronic care	120	0.65 (0.94)	0–5	2,580	13.87 (27.03)	0–139
LTC location						
Rural	257	0.54 (0.78)	0–4	2,962	6.20 (15.06)	0–141
Urban	1,055	0.55 (0.79)	0–5	10,527	5.54 (14.07)	0–142
LTC ownership						
For profit	518	0.69 (0.86)	0–4	4,693	6.24 (13.82)	0–142
Not for profit	794	0.49 (0.75)	0–5	8,796	5.41 (14.47)	0–141

Note: LTC = long-term care facility; *SD* = standard deviation.

The results for hospital days essentially parallel those for location of death and hospitalizations, with younger LTC residents, those with organ failure, and those with lower care levels incurring more days than the oldest age group, the frail, and Care Level 4. Neither type of ownership nor the location of the facility was significantly related to hospital days, however. As for the other outcome measures, some of these effects were quite large. For example, the relative rate of hospital days was about 4.5 times greater for chronic care patients, as compared with Care Level 4 residents. A significant facility effect also emerged (MOR = 1.60), indicating that there was still unexplained variation across facilities when taking the predictors considered here into account (Table 5).

Discussion

Overall, 19% of LTC residents died in hospital, a proportion that is substantially below that found in the general population (3–6) and among older adults (11–15), although it is similar to that found among individuals with dementia (12), many of whom would be living in LTC facilities (38). The relatively low proportion of hospital deaths in our LTC cohort suggests, therefore, that an effort is made to keep residents in the facility as they die.

However, quite a different picture emerges when examining hospitalizations overall, with 41% of LTC residents being hospitalized at least once in the last 6 months before death, a percentage that is similar to that found in previous research conducted in the United States (27). In combination, this indicates that 22% of LTC residents were hospitalized toward the end of life, although they were subsequently transferred back to the LTC facility and died there. The majority of previous studies have focused on location of death only (eg, 1,3,5). The present findings indicate that by doing so, important information about the extent of transfers at the end of life is missed.

Younger age, organ failure and lower care/chronic care levels were associated with increased odds of dying in hospital and being hospitalized in the last 6 months before death. These findings are similar to those of studies that examined hospital transfers among LTC residents in general without restricting the time frame to the end of life. For instance, residents with congestive heart failure, one of the components of our organ failure trajectory group, had an increased likelihood of hospitalization in one study (19), and so did younger residents (19), and those requiring lower care levels (23), as was the case in the present study.

The findings for chronic care patients warrant highlighting. These individuals had three times higher odds of dying in hospital and four times the rate of hospital days, relative to Care Level 4 LTC residents. However, their

Table 4. Multilevel Regression Results: Location of Death (Hospital vs LTC) and Hospitalization in Last 180 Days Before Death (1+ vs 0)

	Location of Death		Hospitalization	
Predictor	Odds Ratio	95% CL	Odds Ratio	95% CL
Sex				
Men	1.187	0.945–1.492	1.203	0.992–1.457
Women (reference group)	—		—	
Age group (y)				
≤74	3.308*	1.990–5.497	4.083*	2.698–6.178
75–84	2.792*	1.814–4.295	2.863*	2.069–3.962
85–94	1.839*	1.213–2.787	1.839*	1.358–2.491
95+ (reference group)	—		—	
Trajectory group				
Organ failure	1.347*	1.058–1.716	1.267*	1.034–1.552
Terminal illness	0.515*	0.333–0.796	0.932	0.677–1.283
Sudden death/other	0.995	0.646–1.532	1.288	0.907–1.830
Frailty (reference group)	—		—	
Level of care				
Levels 1 or 2	2.579*	1.865–3.566	2.426*	1.871–3.145
Level 3	1.762*	1.300–2.389	1.997*	1.578–2.526
Chronic care	3.127*	1.277–7.658	1.088	0.452–2.618
Level 4 (reference group)	—		—	
Length of stay in last 180 days	0.997*	0.994–0.999	0.988*	0.986–0.991
LTC location				
Urban	0.957	0.622–1.472	1.017	0.688–1.503
Rural (reference group)	—		—	
LTC ownership†				
Not for profit	0.589*	0.402–0.863	0.647*	0.452–0.926
For profit (reference group)	—		—	
LTC institutions				
Estimate (*SE*)	0.302* (0.101)		0.306* (0.900)	
Median odds ratio	1.689		1.695	

Notes: LTC = long-term care facility; CL = confidence level; *SE* = standard error.

*Significant at $p < .05$.

†Estimates are derived from a separate analysis that included sex, age group, trajectory group, level of care, length of stay, and LTC institutions in the model.

odds of hospitalization did not differ. This suggests that these individuals, once admitted to hospital, remained there for extended periods of time and ultimately, tended to die there. Their hospital use was, thus, substantial, constituting 19% of all hospital days incurred by the LTC residents in our study.

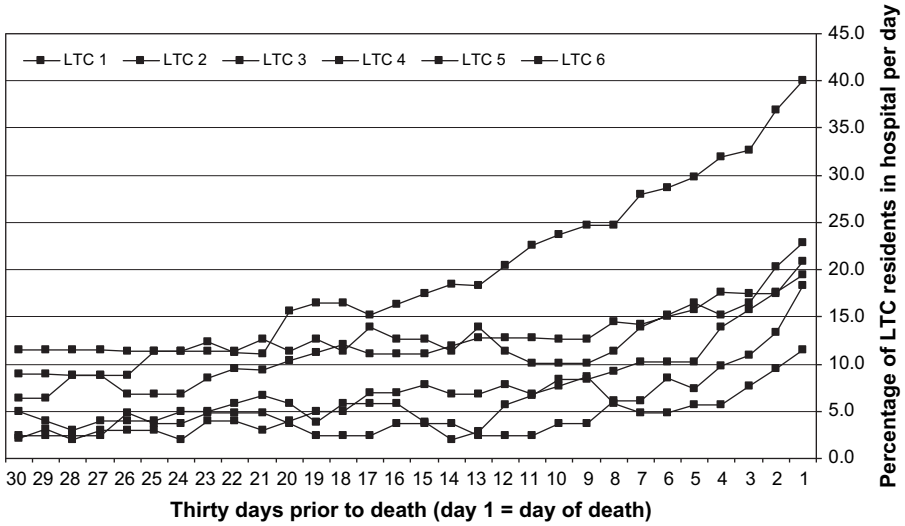

Figure 1. Daily patterns of hospital use for the six largest LTC facilities.

Table 5. Multilevel Regression Results: Number of Hospital Days in the Last 180 Days Before Death

Predictor	Relative Rate	95% CL
Sex		
Men	1.382*	1.097–1.742
Women (reference group)	—	
Age group (y)		
≤74	4.608*	2.883–7.365
75–84	3.809*	2.630–5.518
85–94	2.363*	1.679–3.325
95+ (reference group)	—	
Trajectory group		
Organ failure	1.304*	1.023–1.660
Terminal illness	0.958	0.652–1.407
Sudden death/other	1.319	0.873–1.991
Frailty (reference group)	—	
Level of care		
Levels 1 or 2	1.993*	1.463–2.716
Level 3	1.823*	1.381–2.406
Chronic care	4.566*	1.969–10.59
Level 4 (reference group)	—	
Length of stay in last 180 days	0.994*	0.991–0.997
LTC location		
Urban	0.730	0.490–1.087
Rural (reference group)	—	
LTC ownership†		
Not for profit	0.712	0.485–1.044
For profit (reference group)	—	
LTC institutions		
Parameter estimate (*SE*)	0.245* (0.086)	
Median odds ratio	1.604	

Notes: LTC = long-term care facility; CL = confidence level; *SE* = standard error.

*Significant at $p < .05$.

†Estimates are derived from a separate analysis that included sex, age group, trajectory group, level of care, length of stay, and LTC institutions in the model.

On the facility side, not-for-profit facilities were associated with lower odds of residents dying in hospital, as well as lower odds of being hospitalized. This is consistent with a large body of evidence that has identified problems with the quality of care provided in for-profit facilities (32,33). The present study adds to this literature by demonstrating that type of ownership remains an important issue to examine at the end of life as well.

Several limitations of the present study should be highlighted at this point. Although we examined a number of resident and facility characteristics and their possible relation to hospital transfers at the end of life, we were not able to characterize the LTC facilities more broadly in terms of some of the factors identified in the literature, such as the presence of special care units or having more physicians (24) or advance directives that include do-not-hospitalize orders (26). Because our analyses included only larger LTC facilities, our results may also not generalize to small institutions.

We also did not identify specific reasons for hospitalizations, unlike previous research which has, for example, focused on potentially avoidable hospitalizations (39) or hospitalizations for specific conditions, such as infections (21). A strength of the present study is, however, that we characterized LTC residents in terms of trajectory groups, which are conceptually linked to functional trajectories identified in the literature (29,30). Thus, the study does not merely examine specific causes of death, but rather groups those causes in a way that is meaningfully related to patterns of decline at the end of life. A limitation is that we could not determine disease severity, which would be expected to be also linked to hospital transfers.

With respect to trajectory groups, our finding that LTC residents with organ failure had a greater likelihood of hospitalization than the frailty group suggests that these individuals should be specifically targeted for further investigation to determine the appropriateness of transfers and potential ways to reduce them. A focus on these individuals is particularly important given that they represented 40% of all LTC residents, the second largest group after frailty.

Lastly, an important issue that our study cannot address is the quality of end-of-life care individuals received, be it in the LTC facility or in hospital, such as whether they received adequate symptom management. Nor could we determine what type of treatment, active versus palliative, LTC residents were receiving. Travis et al. (27), for instance, found that the majority of LTC residents in their study met the operational definition for palliative care within the last 12 months before death. However, many were entered into palliative care modes only shortly before death. Given the use of administrative data, we also do not have information on resident and family preferences for care. Thus, hospitalizations may in fact reflect residents' and/or families' preferences.

However, the present study contributes to the limited literature on hospital transfers among LTC residents at the end of life by demonstrating substantial rates of hospitalization in the last 6 months before death. This suggests the need to examine the appropriateness of transfers, as well as the quality of end-of-life care. The finding that increased likelihood of hospitalization is associated with certain resident characteristics (younger age, organ failure, and lower care levels), as well as facility characteristics (for-profit institutions), suggests specific target groups for intervention.

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