

# Who Doesn't Come Home?: Factors Influencing Mortality Among Long-Term Care Residents Transitioning to and From Emergency Departments in Two Canadian Cities

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## Abstract

Residents of long-term care (LTC) whose deaths are imminent are likely to trigger a transfer to the emergency department (ED), which may not be appropriate. Using data from an observational study, we employed structural equation modeling to examine relationships among organizational and resident variables and death during transitions between LTC and ED. We identified 524 residents involved in 637 transfers from 38 LTC facilities and 2 EDs. Our model fit the data, ( $\chi^2 = 72.91$ ,  $df = 56$ ,  $p = .064$ ), explaining 15% variance in resident death. Sustained shortness of breath (SOB), persistent decreased level of consciousness (LOC) and high triage acuity at ED presentation were direct and significant predictors of death. The estimated model can be used as a framework for future research. Standardized reporting of SOB and changes in LOC, scoring of resident acuity in LTC and timely palliative care consultation for families in the ED, when they are present, warrant further investigation.

## Keywords

health services, nursing homes, quantitative methods, transitions, death and dying

## Introduction

Transfers to the emergency department (ED) for persons who reside in long-term care (LTC) facilities (also known as nursing homes), hereafter referred to as residents, are increasingly challenging to manage as health care professionals navigate multiple handovers of clinical care for a complex and vulnerable population (Galvin et al., 2017; United Nurses of Alberta, 2016). While most transferred residents return to LTC following ED visits, approximately one in five die while hospitalized (Abarshi et al., 2010; Bottrell et al., 2001; Klinkenberg et al., 2005; Lamberg et al., 2005). Residents whose deaths are imminent are particularly likely to trigger a transfer to the ED, which may or may not be appropriate, regardless of whether they are already receiving end-of-life care in LTC (Kirsebom et al., 2014). Although we cannot determine if the transitions examined in this study were avoidable, if we consider that most residents prefer to die at their place of residence, identifying the pathways leading to death during transitions is important to improve care during these transitions (Gomes et al., 2012; Klinkenberg et al., 2005; Meeussen et al., 2009).

Previous research has focused on risk factors for death of residents from LTC in various health care environments (Krishnan et al., 2015; LaMantia et al., 2016; Temkin-Greener et al., 2013; Teno et al., 2013; Van Walraven et al., 2012). Studies examining vulnerability and risk of death during acute care transitions have highlighted potential predictors of death during transition related to advanced dementia, cancer, frailty, polypharmacy, and lack of Advance Care Planning

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(Bischoff et al., 2013; Cline, 2016; Krishnan et al., 2015; LaMantia et al., 2016). However, research has not closely examined the relationships of organizational context, process factors, resident demographics, resident condition, and death during transition. Given the lack of confirmatory analysis in this area, we employed structural equation modeling (SEM) to test hypothesized relationships among these factors that lead to resident death during acute care transitions. A better understanding of resident death during acute care transitions is critical to determine potential root causes and priorities for improved care.

Using data from a mixed-methods observational study that examined care transitions of residents from LTC to EDs and back, we aimed to (a) examine and test hypothesized relationships among organizational, process, and resident factors that lead to death during transitions between LTC and ED settings; (b) identify predictors of resident death during these transitions; and (c) identify areas for further investigation and improvement in practice and research.

## Methods

### Design and Data Sources

The parent study has been described in detail elsewhere (Cummings et al., 2012; Reid et al., 2013). Briefly, the study collected data at organizational, unit, and individual levels and from multiple sources during the transition from LTC to the ED and back. The data covered: demographic variables (e.g., age, sex), resident health conditions, LTC care provider factors, family involvement, emergency medical services' variables, ED variables such as tests performed and discharge diagnosis, and data from LTC facilities upon the resident's return. The study was conducted with approval of the University of Alberta Health Research Ethics Board (PRO00017240) and University of British Columbia Okanagan Behavioral Research Ethics Board (UBCO BREB: H10-00127). Operational approval was granted by all participating facilities.

### Setting and Sample

The study was conducted in Edmonton, Alberta and Kelowna, British Columbia. In 2011, Edmonton's population exceeded 1 million compared to Kelowna's 117,000 (Statistics Canada, 2012). The two cities differed in terms of percentage of the population aged 65 and older (11.4% in Edmonton and 19.2% in Kelowna) (Statistics Canada, 2012). In Alberta, the University of Alberta Hospital, one of seven high-volume hospital EDs in Edmonton that receive residents from the 37 LTC facilities in the city, was included. All 37 facilities were approached for inclusion in this study with operators from 25 facilities agreeing to participate. In British Columbia, the Kelowna General Hospital and all 13 LTC facilities were included, for a total of 38 included LTC facilities. We tracked

every emergency transfer from a study LTC to a study ED between July 2011 and July 2012. For residents experiencing multiple transfers during the study period, only data from the last transfer during the study period were included in the analysis.

### Model Development

Using SEM, we integrated relevant organizational, process, demographic, and resident clinical concepts from our previous research, literature review, and clinical experience into a hypothesized theoretical model to examine factors influencing resident death during transition from LTC to ED. Identified theoretical concepts were selected to generate a model on the premise of correct temporal sequencing (Shadish et al., 2002). To generate the measurement model, a single indicator variable was used to measure each latent concept. We assigned measurement errors based on how closely each indicator represented its latent concept, literature review, our previous research, and experience as clinicians (Hayduk, Cummings, et al., 2007). Percentages assessed as measurement error, variance and measurement error variance are provided in Table 1 with variable characteristics.

**Organizational and process variables.** We included three organizational variables: *province*, *ownership status*, and *LTC facility size*. The two cities differ in population size, percentage of persons aged 65+, ED coverage for patients from LTC, and number of beds per facility. As our process variable, we measured *family involvement* in the decision-to-transfer using a three-level ordinal variable. When a family member and/or resident was recorded as deciding that a resident be transferred, family involvement was considered to be high; followed by family involvement in decision (moderate family involvement) and lack of family involvement (low).

**Demographic variables.** Two demographic concepts were measured as *resident age*, a continuous variable captured in years beginning at 65, and *resident sex* categorized as male or female.

**Resident condition variables.** We included seven resident conditions. *Dementia status* was determined using the Cognitive Performance Scale (CPS), a reliable and valid measure of cognitive performance assessed for all residents (Harmaier et al., 1995; Morris et al., 1994). The most recent recorded CPS (assessed at admission to LTC facility and quarterly) was used for this study. *Difficulty swallowing* in LTC was a dichotomous variable recorded in LTC and selected as a variable based on literature review (Bischoff et al., 2013; Björck & Wijk, 2018; Krishnan et al., 2015). *Comorbidities* was derived for each resident from six equally weighted conditions that could predict death during resident transfer: cancer, heart failure, chronic obstructive pulmonary disorder, renal

**Table 1.** Indicators and Measurement Error Specification for Latent Concepts in the Structural Equation Model.

Latent concept	Measure/survey item(s)	% Assessed as measurement error	Variance	Measurement error variance
<b>Exogenous variables</b>				
Province	Alberta = 0; British Columbia = 1	1	0.2280	0.00228
Beds	Small (35–79 beds) = 1; medium (80–120 beds) = 2; large (>120 beds) = 3	5	0.3910	0.01955
Owner operator model	For profit = 0; Not for profit (public/voluntary) = 1	5	0.2440	0.01220
Dementia	Decision-making: Intact = 0, Borderline intact = 1, Mild impairment = 2, Moderate impairment = 3, Moderately severe = 4, Severe impairment = 5 (Cognitive Performance Scale scores)	10	2.427	0.2427
Age	Continuous by year beginning at age 65	5	59.149	2.9574
Sex	Female = 0; Male = 1	1	0.236	0.00236
<b>Endogenous variables</b>				
Difficulty swallowing	No = 0; Yes = 1	10	0.1240	0.0124
Comorbidities	Number of comorbidities (cancer, heart failure, congestive obstructive pulmonary disorder, renal failure, cerebrovascular disorder, diabetes) = 0–6	20	1.138	0.2276
Short of breath in long-term care/emergency department	Neither = 0; Long-term care or emergency department = 1; Both = 2	5	0.352	0.0176
Chest pain in long-term care/emergency department	Neither = 0; Long-term care or emergency department = 1; Both = 2	5	0.114	0.0076
Change in level of consciousness in long-term care/emergency department	Neither = 0; Long-term care or emergency department = 1; Both = 2	5	0.153	0.0057
Family involvement in decision to transfer	Family/resident made decision = 2; Family involved = 1; No family involvement = 0	20	0.487	0.0974
Resident acuity in emergency department	Canadian Triage and Acuity Scale Resuscitation = 1; Emergent = 2; Urgent = 3; Less Urgent = 4; Non-urgent = 5	10	0.6220	0.062
Death	Died during transition from long-term care to hospital No = 0; Yes = 1	5	0.1060	0.00530

Note. Calculated using the analytic sample.

failure, cerebrovascular disorder, and diabetes. These conditions were selected based on literature review, consideration of the Charlson Index (which is an index that weights comorbidities or predictive factors of death and is used to provide risk adjustment in health services research), clinical experience of the authors and data availability (Needham et al., 2005). *Resident acuity* at admission to the ED was assessed by a qualified nurse at ED triage using the Canadian Triage and Acuity Scale (CTAS) (Beveridge et al., 2006; Bullard et al., 2008), a five-point measure of patient acuity that has demonstrated validity and reliability in general populations (Bullard et al., 2008). The lower the score, the more severe the patient's acute condition. *Shortness of breath* (SOB), *chest pain*, and *level of consciousness* (LOC), which have been previously reported as factors associated with ED transition or death of older adults (Christ et al., 2006; Eachempati et al., 2007; Hendriks et al., 2015), were derived from two

variables each on an ordinal level: symptom observed in LTC and in the ED. Cases where the symptom was noted in both the LTC and ED were treated as most severe, those in either LTC or ED less severe, and those not experiencing the symptom as unaffected.

### Data Analysis

Data were managed using SPSS Statistics 23 (SPSS Inc., Chicago, IL). We tested a structural equation model using LISREL 8.8 maximum likelihood estimation, after pairwise deletion (Joreskog & Sörbom, 1996). Using SEM, we developed and validated a model. We evaluated our model fit using chi-square to determine if it fit the empirical data, with a nonsignificant chi-square indicating no significant differences between the theory-derived and empirically derived data matrices (Hayduk, 1987).

## Results

### Sample

We identified 524 residents involved in 637 transfers from 38 LTC facilities over the study period. The mean age of residents during transitions was 84.3 years ( $SD = 7.7$ ), ranging from 65 to 103 years. Overall, 63 (12%) residents died in three sites: the ED (7 [11.1% of all deaths]); Intensive Care Unit (2 [3.2%]); inpatient unit (54 [85.7%]). The most commonly reported causes of death (sourced from patient care records) were cardiac/respiratory failure (23 [36.5%]), sepsis (9 [14.3%]), and complications from pneumonia (9 [14.3%]). In 16 (25.4%) resident deaths, the cause was unknown/not documented. Characteristics of transferred residents are provided in Table 2. The median time from LTC departure to death was 3 days (interquartile range [IQR] = 3.5 days). The highest percentage of deaths (13 [21.0%]) occurred within 1 day of leaving LTC and the longest time to death during the transition process was 31 days after leaving the LTC facility (see Figure 1).

### Model Testing

Our initial model estimation failed to fit. Additional relationships were estimated, namely from SOB, change in LOC, and chest pain to death. Any changes to the model had to be theoretically sound (supported by extant literature, logical, and agreed upon by research team members based on clinical experience and substantive research expertise), have modification indices greater than 5, and not be strongly subject to reciprocal effects (Hayduk, Cummings, et al., 2007; Hayduk, Pazderka-Robinson, et al., 2007). Following model refinement, the final model fit ( $\chi^2 = 72.91$ ,  $df = 56$ ,  $p = .064$ ), and explained 15% of the variance in resident death.

### Model Effects

SOB, change in LOC, and resident acuity were direct predictors of resident death during emergency transitions. A more severe acuity score was significantly associated with resident death. Increased SOB and change in LOC in both LTC and the ED were significant determinants of higher resident acuity (lower score) and significant direct predictors of death. Hypothesized pathways included higher dementia severity and being male both significantly influencing the number of resident comorbidities, which significantly influenced change in LOC, higher acuity and resident death. More severe dementia and larger LTC size were significant predictors of difficulty swallowing. Difficulty swallowing predicted change in LOC. Chest pain in LTC and ED led to higher acuity; however, did not significantly predict resident death during transition. Difficulty swallowing did not lead to higher acuity. Increased family involvement was significantly correlated with a higher resident acuity. We

**Table 2.** Characteristics of LTC Residents During Emergency Transitions.

Characteristic	Deceased <i>n</i> = 63	Alive <i>n</i> = 461
<b>Sex</b>		
Female (row %)	36 (63)	289 (62.8)
Male	27 (37)	171 (37.2)
Missing	0	1
<b>Age (Mean, Standard Deviation [SD])</b>	84.95 (7.34)	84.26 (7.74)
Missing	0	90
<b>Province</b>		
Alberta	47 (74.6)	293 (63.6)
British Columbia	16 (25.4)	168 (36.4)
Missing	0	0
<b>Resident Acuity (Canadian Triage and Acuity Scale (ED_CTAS))</b>		
1—Resuscitation	11 (18.0)	12 (2.6)
2—Emergent	31 (50.8)	126 (27.6)
3—Urgent	18 (29.5)	241 (52.9)
4—Less urgent	0	71 (15.6)
5—Non urgent	1 (1.6)	6 (1.3)
Missing	2	5
<b>Shortness of breath in long-term care and emergency department (trigger event), <i>N</i> (%)</b>		
Both	10 (21.3)	26 (5.9)
Either	20 (29.5)	58 (13.1)
Neither	31 (49.2)	360 (81.1)
Missing	2	17
<b>Change in level of consciousness in long-term care and emergency department (trigger event), <i>N</i> (%)</b>		
Both	4 (6.3)	5 (1.1)
Either	16 (25.4)	36 (7.8)
Neither	42 (66.7)	412 (89.4)
Missing	1	8
<b>Chest pain in long-term care and emergency department (trigger event), <i>N</i> (%)</b>		
Both	59 (93.7)	11 (2.4)
Either	1 (1.6)	11 (2.4)
Neither	1 (1.6)	423 (91.8)
Missing	2	16
<b>Dementia status (Cognitive Performance Scale (Mean, SD))</b>	2.91 (1.53)	2.77 (1.56)
<b>Number of co-morbidities (Mean, SD)</b>	1.23 (1.01)	1.28 (1.08)
0 ( <i>n</i> , %)	16 (25.4)	121 (26.2)
1	22 (34.9)	168 (36.4)
2	22 (34.9)	108 (23.4)
3	1 (1.6)	50 (10.8)
4	1 (1.6)	12 (2.6)
5	1 (1.6)	2 (.4)
Missing	0	0
<b>Difficulty swallowing, <i>N</i> (%)</b>		
Yes	15 (24.5)	60 (13.1)
No	46 (75.5)	397 (86.9)
Missing	2	4

(Continued)



**Table 2. (continued)**

Characteristic	Deceased <i>n</i> = 63	Alive <i>n</i> = 461
Resident's legal substitute decision maker for health care decisions, <i>N</i> (%)		
None	19 (30.2)	165 (36.8)
Wife	8 (13.1)	22 (4.9)
Husband	4 (6.6)	13 (2.9)
Son	6 (9.8)	72 (16.1)
Daughter	9 (14.8)	104 (23.2)
Friend	0	4 (0.9)
Grandson	1 (1.6)	3 (0.7)
Granddaughter	1 (1.6)	0
Niece	1 (1.6)	3 (0.7)
Nephew	0	5 (1.1)
Other relative	3 (4.9)	17 (3.8)
Public guardian	1 (1.6)	8 (1.8)
Multiple substitute decision makers	6 (9.8)	15 (3.3)
Not documented (valid response)	2 (3.2)	17 (3.8)
Missing	2	13
Family involvement in decision to transfer, <i>N</i> (%)		
Insisted on decision	14 (25.0)	43 (9.3)
Involved in decision	7 (12.5)	67 (14.5)
Not involved	35 (62.5)	298 (64.6)
Missing	6	53
Cause of death, <i>N</i> (%)		
Cardiac/respiratory arrest	23 (36.5)	
Complications from pneumonia	9 (14.3)	
Low platelet count	1 (1.6)	
Sepsis	9 (14.3)	
Stroke	5 (7.9)	
Unknown/Not documented	16 (25.4)	

Note. LTC = long-term care; SD = standard deviation; ED\_CTAS = emergency department\_Canadian Triage and Acuity Scale.

had asserted that public or not-for-profit status was not related to other included variables, which was confirmed through model diagnostic results. The final model with all estimated effects is presented in Figure 2. Table 3 presents the covariance and correlational matrices for all variables.

## Discussion

We tested a model of hypothesized relationships among variables that capture elements of LTC facilities, family involvement, and resident condition leading to resident death during emergency transition to acute care. This article adds to the literature through the identification of causal parameters in which death during transitions can be explained by direct and indirect predictors of death.

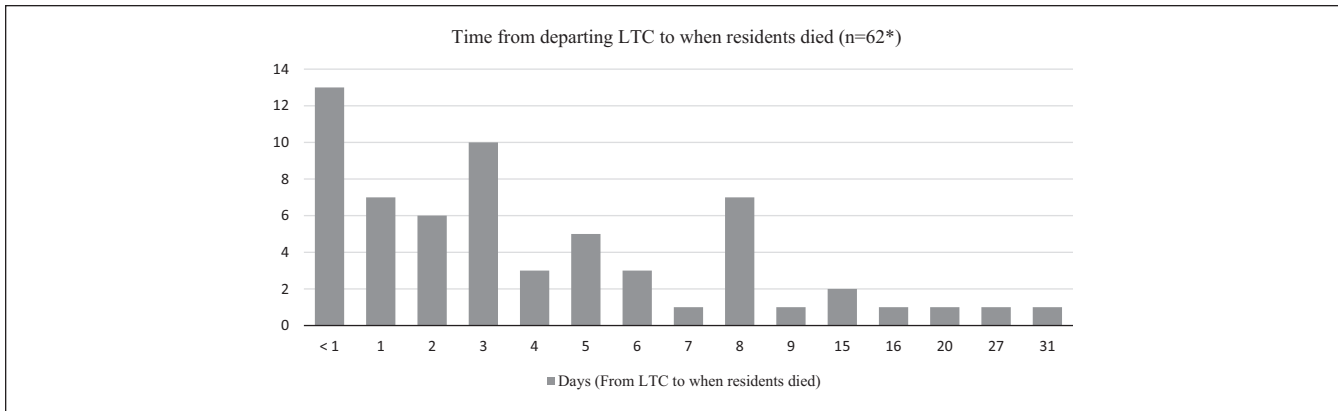
Findings confirmed that resident acuity was a significant predictor of resident death during transitions. Relatively few

studies, with mixed results, have examined the validity, reliability, and effectiveness of triage scales for older populations (Hinson et al., 2019). However, Lee et al. (2011) have validated the CTAS as an appropriate tool for rapid assessment of the need for immediate life-saving treatment for older adults. Exploring the use of the CTAS as part of decision-making processes around whether to transfer a resident from LTC to acute care settings appears warranted. In a recent systematic review, all evaluations of triage scales were conducted with Registered Nurses (Hinson et al., 2019). The amount of specialized training and experience a nurse has is linked to increased use and positive perceptions of the CTAS (Alumran et al., 2020; Hinson et al., 2019). Training on resident acuity scoring for Registered Nurses in LTC settings could be integrated into advance care plans and palliative approaches to ensure that impending signs of potential death are recognized, resident preferences are respected and appropriate care is provided (whether that be emergent transfer to the ED, appropriate care provided in LTC settings).

We expected that SOB and change in LOC would predict resident acuity scores and death (Christ et al., 2006; Eachempati et al., 2007; Hendriks et al., 2015) and our findings confirmed this. Our findings demonstrate that SOB and change in LOC in *both* LTC and ED were significant predictors of resident death. Ensuring these changes in condition are clearly documented during transitions between LTC and the ED is warranted, regardless of primary reason for transfer (Coleman et al., 2003; Karin & Björn-Ove, 2005; Morphet et al., 2014). Well-selected tools, such as the Respiratory Distress Observation Scale, could be used to ensure SOB is consistently identified and documented (Campbell et al., 2018; Lukas et al., 2013).

Significant pathways leading to resident death highlighted that males, as well as those with more severe dementia have a higher number of selected comorbidities (cancer, heart failure, chronic obstructive pulmonary disorder, renal failure, cerebrovascular disorder, and diabetes), which predicted a change in LOC, a direct predictor of death. Our findings suggest that screening for change in LOC in LTC should be part of clinical assessments precipitating decisions to transfer. Literature supports that altered LOC in older adults warrants further standardized assessment to detect potentially life-threatening delirium, cerebrovascular events, and underlying causes, but further work is needed to determine the best screening tools for rapid assessment for persons with cognitive impairments (Hendry et al., 2015; Inouye et al., 2014; Wilber & Ondrejka, 2016).

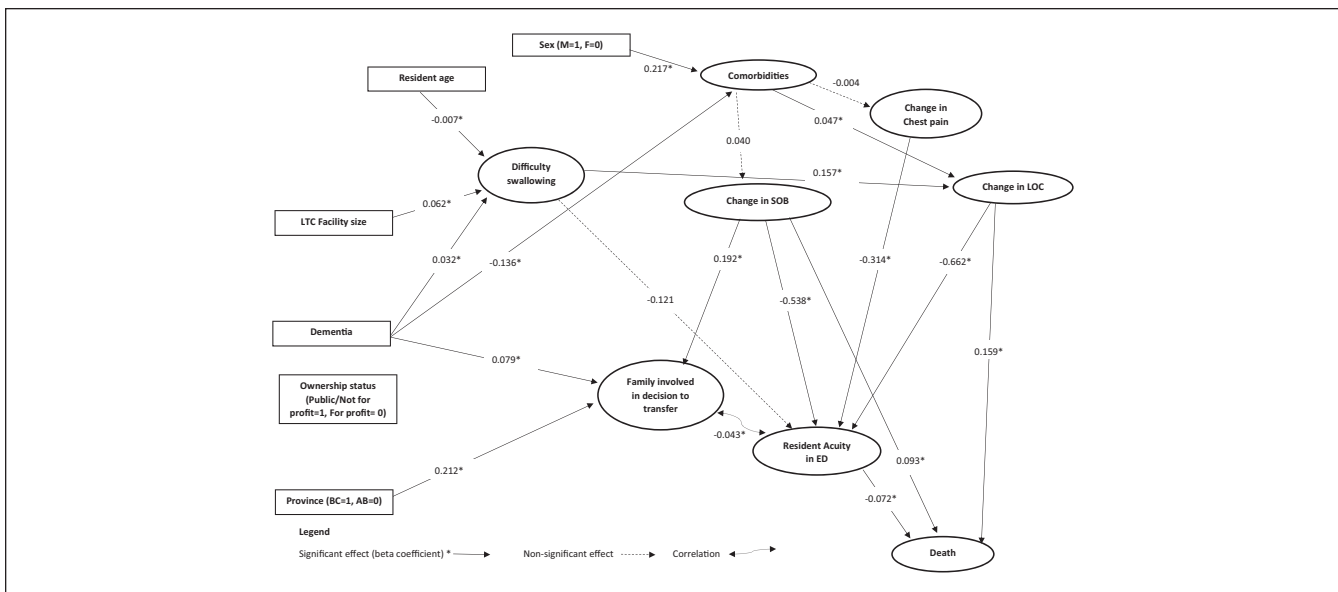
Some studies report that older persons with cognitive impairment, increased comorbidities, complex symptomatology, and high care needs or functional dependency are more likely to die in hospital, despite agreement between both older people and health care professionals that persons prefer to die at their residence (Bischoff et al., 2013; Björck & Wijk, 2018; Krishnan et al., 2015). Problems with eating have been



**Figure 1.** Time to resident death.

Note. In cases where time of death was not recorded, it was counted as midnight. Where time from leaving LTC was not available, time of nurse assessment was used as a proxy (3 cases). LTC = long-term care.

\*One case had no time or date of death.



**Figure 2.** Structural equation model of factors influencing death during transitions.

Note. SOB = shortness of breath; LTC = long-term care; LOC = level of consciousness; BC = British Columbia; AB = Alberta; ED = emergency department.

associated with place of death, and our findings suggest that difficulty swallowing is an important mediating factor within significant pathways leading to resident death during transition. However, difficulty swallowing was not itself a direct predictor of resident acuity during transitions nor death (Krishnan et al., 2015). This suggests that difficulty swallowing, although important to consider in the context of resident condition, should not be used in isolation to identify residents at risk of death during acute care transitions.

Although family involvement was not expected to directly influence death during transition in our model, we expected it to be correlated with higher resident acuity, which did predict resident death. Despite family involvement not directly

influencing death, family involvement was included in this model because research supports that families are often not effectively prepared for end-of-life processes, and family involvement in decisions to transfer have been linked to avoidable transitions (Tate et al., 2020; Trahan et al., 2016). Other studies show resident ED utilization may be more likely upon family request, or when older persons perceive they have low levels of social support (Barken et al., 2016; Dermody et al., 2017; Tate et al., 2020; Trahan et al., 2016). Including this variable in the model provides a preliminary framework for adding other factors related to the interactions between families and health care professionals involved in transition decisions, and advance care planning. As family

**Table 3. Variable Covariances and Correlations.**

Variable	Prov	Beds	Owner	Age	Gender	Dementia	Death	Swallow	CTAS	Fam inv	Comorbid	Change in SOB	Change in LOC	Change in chest pain
Province	.228	-.441	.393	.116	-.035	-.065	-.075	-.124	.007	.263	-.057	-.023	-.004	.006
Beds	-.132	.391	-.336	-.159	.057	.019	.066	.127	0	-.155	-.023	.068	.012	-.005
Owner	.093	-.104	.244	.057	-.054	.002	-.088	-.099	-.023	.258	-.054	-.093	-.008	.005
Age	.426	-.766	.216	59.149	-.152	-.008	.029	-.151	.087	.035	-.028	.001	-.288	.008
Gender	-.008	.017	-.013	-.564	.236	-.074	.038	.01	-.116	-.06	.114	.1	.007	.005
Dementia	-.048	.018	.001	-.093	-.031	2.427	.029	.13	.037	-.043	-.124	-.069	.022	-.029
Death	-.012	.013	-.014	.074	.006	.014	.106	.105	-.282	.057	.009	.224	-.03	.003
Swallow	-.021	.028	-.017	-.41	.002	.071	.012	.124	-.106	.023	-.014	.056	.017	-.007
CTAS	.003	0	-.009	.53	-.044	.047	-.072	-.03	.622	-.118	-.039	-.381	-.097	-.03
Family involvement	.043	-.952	.041	.293	-.017	.147	-.028	.018	-.089	.487	-.026	.058	.02	.002
Comorbidities	-.029	-.007	-.002	-.599	.054	-.305	.005	-.001	-.021	-.026	1.138	.035	.044	-.004
Change in SOB	-.006	.026	-.027	.005	.029	-.064	.043	.012	-.179	-.03	.039	.352	-.005	.003
Change in LOC	-.004	.012	-.008	-.288	.007	.022	-.03	.017	-.097	.02	.044	-.005	.153	-.008
Change in chest pain	.006	-.005	.005	.008	.005	-.029	.003	-.007	-.03	.002	-.004	.003	-.008	.114

Note. Covariances are shaded gray. Prov = province; Owner = long-term care facility owner/operator status; Dementia as measured by the Cognitive Performance Scale; Swallow = Difficulty swallowing; CTAS = Canadian Triage and Acuity Scale; Fam inv = family involvement; Comorbid = comorbidities; SOB = shortness of breath; LOC = level of consciousness.

involvement is significantly correlated with higher resident acuity, we can use our findings to identify situations in which death is likely to occur during transition and family support is needed. Enhanced family involvement in decision-making and resident acuity scores could be used as indicators, in conjunction with changes in LOC and SOB, to expedite palliative care consultations in ED settings. This may improve patient- and family-reported outcomes related to quality of life (Wilson et al., 2020).

Our study highlights provincial differences in family involvement in decision-making. Government and health authority websites in British Columbia emphasize family involvement in the care of LTC residents more explicitly than in Alberta (Alberta Health, 2020; Alberta Health Services, 2018; Government of British Columbia, 2018), reflecting potential differences in policy and messaging around family involvement in resident care. Our work adds to the literature by confirming that certain organizational factors are important in our conceptualization of transitions leading to resident death; however, a lack of available information about LTC facilities to reflect certain concepts hinders our ability to identify precise relationships within our model. For instance, no information on number and qualifications of staff in included facilities, or funding allocations for direct resident care, was available for our study. This lack of organizational information precludes us from making strong policy recommendations based upon our results. Instead, our findings provide a basis for further research.

Given the conflicting reports related to the effect of ownership model and resident death (Anic et al., 2014; Menec et al., 2009), research should explore how ownership model related to staffing levels and staff-mix can influence family involvement in resident care to reduce transitions in instances when quality end-of-life care could be provided on site. Research should determine the influence of regional context in future modeling work (e.g., availability and access to diagnostic services, LTC site proximity to hospital, access to or awareness of alternative health services, resident case-mix in facilities (Avdic, 2014; Cornillon et al., 2016; Tate et al., 2020). Further work is needed to include factors related to advance care planning, such as training or availability of specialized clinicians for this purpose and the number and quality of formal conversations with care teams regarding end-of-life care (Wilson et al., 2020; Bollig et al., 2016).

Research related to death during acute care transitions for older persons is fragmented. Many geriatric screening tools focus on functional decline, and research on place of death focuses on comorbidities and clinical symptoms, while related end-of-life quality indicators highlight ED service utilization and place of death (Galvin et al., 2017). Our findings offer a preliminary model to consolidate and expand on this research. Survival analysis could also be used to determine which factors influence risk of death as a function of time to identify key variables of importance (Shadish et al., 2002).

Our substantive findings support practice recommendations related to: the continued use of the CTAS scoring system with older adults and the exploration of its use in decision-making in LTC settings preceding transfer to the ED; consistent documentation of SOB, regardless of primary reason for transfer, using standardized tools such as the Respiratory Distress Observation Scale (Campbell et al., 2018; Lukas et al., 2013); the use of standardized assessments to detect potentially life-threatening delirium when residents experience changes in LOC (Inouye et al., 2014; Wilber & Ondrejka, 2016); timely palliative care consultation for families in the ED when they are highly involved in the decision to transfer and resident acuity is high with the occurrence of changes in resident LOC and SOB (Wilson et al., 2020).

### Limitations

Aspects of the model may be mis-specified. Although our model fits, the modest amount of explained variance of the death (15%) suggests that other unmeasured factors are involved for which we had no data, or no theoretical rationale to link existing variables to resident death (Hayduk, 1987). We cannot determine if transitions were appropriate, nor did we aim to assess the appropriateness of care delivered in each transition setting. The quality of individual care or diagnostic decisions and procedures may have influenced the likelihood of death during transition. Goals of care designation orders were not implemented consistently, or in both provinces, at the time of the study, so we could not include this variable. We only collected data on residents transferred to particular EDs and these results may be influenced by referral bias at the main tertiary care hospital in one site. If residents died after returning to the LTC facility, we did not capture those data. Missing data and poor reporting (e.g., 11% missing data on family involvement variable, primary reason for transfer being inconsistent, and reported in multiple places) may influence our findings. However, SEM is uniquely equipped to handle missing cases through pairwise deletion and adding a higher measurement error ratio to that variable.

Our findings may not be generalizable to other health care contexts; however, the reasons for transition are similar to those stated in the research literature, and presumed relationships in our model were derived partially from the literature, meaning some results are applicable to similar contexts. That being said, known, numerous or important differences in context or populations (e.g., LTC facilities with the ability to treat conditions of moderate acuity on site versus LTC facilities without that ability) would support additional model testing.

Using SEM did not allow us to account for censoring. However, a fundamental strength of SEM is the ability to conduct an omnibus test through  $\chi^2$  of the maximum likelihood estimates of free coefficients and overall model fit



with the empirical data (Hayduk, 1987; Hayduk, Cummings, et al., 2007; Holtz & Monnerjahn, 2017). Nevertheless, this study presents the careful construction and testing of a model informed by previous research and using a robust data set.

## Conclusions and Implications

The fit of the estimated model supports its use as a preliminary framework to explain relationships among facility context, demographic, and resident factors leading to death during LTC to acute care transitions. Significant pathways leading to death highlighted that males and those with more severe dementia had a higher number of comorbidities, which predicted change in LOC, leading to death. SOB and change in LOC remain significant predictors of resident death and need to be recognized both when deciding whether to transfer a resident, and during transfer, regardless of primary medical issue. Exploring the utilization of the CTAS in LTC settings as part of the decision-making process preceding transition may be considered warranted. More research is needed to determine the specific influences of LTC staff decision to transfer, ownership model, and family involvement on resident death during transitions.

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