ORIGINAL RESEARCH

Factors Associated with Falls in Canadian Long Term Care Homes: a Retrospective Cohort Study

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ABSTRACT

Background

Half of Canadians living in long-term care (LTC) homes will fall each year resulting in consequences to independence, quality of life, and health. The objective in this study was to analyze factors that contribute to, or are protective against, falls in Canadian LTC homes.

Methods

We analyzed of a retrospective cohort of a stratified random sample of Canadian LTC homes in Western Canada from 2011–2017. We accessed variables from the RAI–MDS 2.0 to assess the association of the dependent variable "fall within the last 31–180 days" with multiple independent factors, using generalized estimating equation models.

Results

A total of 28,878 LTC residents were analyzed. Factors found to increase the odds of falling were other fractures (OR 3.64 [95% confidence interval; CI 3.27, 4.05]), hip fractures (OR 3.58 [3.27, 3.93]), moderately impaired cognitive skills (OR 2.45 [2.28, 2.64]), partial support to balance standing (OR 2.44 [2.30, 2.57]), wandering (OR 2.31 [2.18, 2.44]).

Conclusion

A range of factors identified were associated with falls for people living in LTC homes. Individual physical ability represented the largest group of independent factors contributing to falls. Residents who experience any fracture or an acute change in behaviour, mobility, or activities of daily living (ADL) should be considered at increased risk of falls.

Key words: falls, long-term care, older adults, risk factor, fall management

INTRODUCTION

Falls are a leading cause of injury, hospitalization, and admission to long-term care (LTC) homes for older adults across Canada.(1) In Canadian LTC homes, approximately 50% of all residents will fall each year, and of those who fall, 40% will fall two or more times.(2,3) In LTC homes in the United States, between 50 and 75% of residents will fall(4,5) and of those who fall, 1 in 10 will sustain a serious fall-related injury.(6) Injuries from falls require substantial health-care resources due to lengthy hospital stays and rehabilitation, and result in a high burden of costs estimated at $2 billion annually across Canada.(7) Falls also cause a high burden on a resident's quality of life, function, independence, and health, and often lead to increased mortality.(8,9) Fractures are one sustained injury that can result from falls, of which older adults living in LTC are two to four times as likely to experience than older adults living in the community, leading to prolonged hospitalization and rapid decline in physical functioning.(10,11) Falls have also been found to contribute to worse psychological outcomes for older adults including isolation, loss of autonomy, anxiety or fear, confusion, immobilization, and depression.(9)

It is surprising that, given the prevalence and negative impact of falls in LTC, there is inconsistent evidence of interventions for prevention of falls or strategies to reduce risk of falls in this setting. Evidence of exercise interventions has shown that combinations of exercises targeting strength, gait, and balance can be effective at preventing falls.(12) However, exercise has also been shown to potentially increase risk of falling when exercises are not individualized or are performed without adequate LTC staffing supervision.(4,13) Other interventions with mixed results include wearing protective gear, such as appropriate footwear as opposed to going barefoot, or wearing socks and slippers,(14) use of helmets to prevent head injuries,(15,16) and hip protectors to prevent the risk of fractures.(17) Protective gear like hip protectors can reduce

the risk of fractures and have shown to be cost-effective and cost-saving,[18] but compliance within LTC homes remains an issue for older adults and LTC staff.[9,19-21] Although evidence of singular interventions has shown inconsistent effectiveness, strategies using multifactorial interventions (i.e., falls risk assessment, medication review, environmental assessment, exercise, and staff education) have shown greater effectiveness and are associated with significantly decreased number of total falls.[12,22,23]

Falls prevention recommendations are often interpreted and applied in LTC homes by falls teams whose role it is to accurately identify a resident's risk by screening unique factors that may contribute to their overall falls risk profile. Risk factor indicators are commonly part of screening tools and assessments to help clinicians evaluate the likelihood a resident will experience a fall, providing further information for how LTC homes can intervene to reduce and prevent fall incidents from occurring.[1] There are numerous fall risk scales and assessments that have been created for older adults across hospital or LTC settings.[24,25] Assessments created for use in LTC settings commonly focus on intrinsic patient characteristics such as history of falling, medical conditions, polypharmacy, assistive device use, and gait issues; as well as extrinsic factors like environmental hazards that pose a risk for falls.[1] Although many assessment tools have undergone a validity and reliability test, one recent study has found that the interRAI Fall Risk CAP assessment tool delivers the highest predictive accuracy for falls in comparison to the Scott Fall Risk Tool or modified Fall Risk Tool.[1] Results from this study found interRAI Fall Risk CAP provides greater sensitivity for identifying residents across low-, moderate-, and high-risk categories, which allows LTC facilities to prioritize fewer residents at highest risk of falling and reduce the care planning burden for residents considered low risk.[1] While there are a growing number of fall risk assessments available to identify older adults at risk for intervention, prior research focuses on using data from a limited number of LTC homes and has not yet been compared across homes.[1,24]

Fall risk assessments that use a standardized approach to collecting resident information, such as interRAI, are critical for advancing best practices of screening, assessment, and identifying common fall risk factors across LTC settings.[26] Further, the interRAI Falls Risk CAP relies solely on previous history of falls as the predictive risk factor for categorizing residents into low-, moderate-, and high-risk categories.[1,26] There is a need for research to compare accompanying fall risk factors, in addition to history of falls, between LTC settings using standardized data collection tools to advance our understanding of falls risk factors. There are numerous accompanying fall risk factors that could be used to specify characteristics of residents at risk for falling, even if a history of falls is not present.[27,28]

Based on our review of the literature, there are two categories of risk factors that were used to organize the focus of this study. The first category is risk factors that have strong evidence and agreement on their contribution to falls in LTC homes and include previous history of falls,[5,29,30] cognitive impairment,[29-31] polypharmacy,[29,32] psychotropic drug use,[31,33] vision impairment,[5,34] and mood deterioration.[5,30] The second category is risk factors that have conflicting evidence about either the magnitude of risk they represent or whether they influence falls at all and include gender,[5,30,34-36] weight changes,[30,35] wandering,[5,31,35] independent versus dependent for ambulation,[33,35,37,38] independent versus dependent for transfers,[35,38] deterioration in ADL's,[30,34,35] trunk restraint use,[30,33,34,35,39] use of an assistive device for ambulation,[5,30,34,38] hearing impairment,[30,35,40] poor balance,[30,38] behavioural issues (e.g., resisting care, socially inappropriate behaviour),[36,38] contractures,[39] and urinary continence.[5,30,35,36]

The objective of this study is to analyze the effect of various factors on falls in older adults living in LTC homes across the Canadian provinces of Alberta, British Columbia, and Manitoba. This will provide evidence to support previously identified factors contributing to falls, provide further evidence for factors that are in dispute, and investigate the interaction between factors that other studies have not yet explored. These results can contribute to our knowledge about factors that can prevent falls in LTC homes.

METHODS

Study Design

This was a retrospective cohort study, using data collected by the Translating Research in Elder Care (TREC) program. The protocol for the TREC program and its data collection and storage methods have been published previously.[41] The LTC homes participating in TREC are a representative sample of urban facilities in Western Canada, randomly selected and stratified by health region (Calgary and Edmonton Health Zones in Alberta, Fraser and Interior Health Regions in British Columbia, and Winnipeg Regional Health Authority in Manitoba), ownership model (public/voluntary not-for-profit, private for-profit), and bed size (small: <80 beds, medium: 80–120 beds, large: >120 beds). This research uses data from residents living in LTC homes that participated in one or more of the 4 initial waves of data collection (Wave 1: 2007/2008, Wave 2: 2009/2010, Wave 3: 2014/2015, Wave 4: 2017). The number of LTC homes participating in each wave varies, ranging from 30 to 94.

Data Source

The Resident Assessment Instrument (RAI)–Minimum Data Set (MDS) 2.0 is a standardized, multidimensional assessment tool used in LTC homes across Canada, the USA, and Europe.[42] In Canada, LTC homes in many jurisdictions are mandated to use the MDS 2.0. Studies have shown that the RAI-MDS items have adequate reliability for research purposes, but validity does vary depending on the variable examined.[43,44] The RAI-MDS provides a profile of each resident including demographic, clinical, functional, diagnostic, psychosocial, and cognitive status domains. It is completed by trained staff at

admission, annually, and at discharge at each LTC home. Every 90 days a condensed version of the RAI-MDS is completed. Each resident can be tracked longitudinally from admission to discharge, using a unique anonymized numeric identifier, to assess how a resident's RAI-MDS profile changed over time.

Selection of Cohort

We used residents' data from all LTC homes participating with the TREC research program between the dates of October 1st 2011 and September 30th 2017. As of November 22, 2017, the TREC resident sample included a total of 451,889 resident records from 50,487 unique residents.[45] We selected all residents in our data set who met our inclusion criteria: residents who were at or above the age of 65 by the first RAI-MDS entry, residents who had at least one initial assessment and one follow-up assessment, residents whose fall status was known based on criteria J4b (i.e., fall within the last 31–180 days), and residents who were not comatose. We also removed any resident who had a fall coded on initial assessment because no pre-falls data were available to assess factors associated with that fall.

Dependent and Independent Variables

The dependent variable used was found in the accidents (J4) section of the RAI-MDS. This section includes (a) Fell in past 30 days, and (b) Fell in past 31 to 180 days. Variables within the J4 section were coded with 0=No and 1=Yes dichotomy. Previous research has shown that falls data within the RAI-MDS J4 section has a fair reliability for 0–30 days (kappa 0.29) and a moderate reliability for 31–180 days (kappa = 0.5).[46,47] Since the J4b (fall within the last 31–180 days) item had a better reliability, it was chosen as the dependent variable for comparison.

Each independent variable found in the RAI-MDS contains two to five subvariable options and was compared to every independent variable and its respective baseline subvariable. For example, in the variable "B4 Cognitive Skills for Daily Decision Making" the reference category is "Independent", and all other categories were compared to this or "J4c Hip Fracture", "No" was used as the reference category and "Yes" was used as the comparison. All the variables and their subvariables can be found in the RAI-MDS 2.0 and are included within Table 1.

TABLE 1.
Generalized estimating equations analysis for falls risk factors

Variable (RAI-MDS Identifier)	*Sub-Variable*	*Unadjusted Odds Ratio (95% CI)*	*Adjusted[a] Odds Ratio (95% CI)*
Sex (AA2)	Male	1.28 (1.22-1.33)	1.37 (1.31-1.43)
Short Term Memory (B2)	Memory Problem	1.88 (1.79-1.97)	1.82 (1.74-1.91)
Cognitive Skills & Decision-Making (B4, B6)	Modified Independent	1.50 (1.40-1.62)	1.45 (1.35-1.57)
	Moderately Impaired	2.56 (2.38-2.75)	2.45 (2.28-2.64)
	Severely Impaired	1.94 (1.79-2.10)	1.45 (1.35-1.57)
Hearing (C1, C7)	Minimal Difficulty	1.30 (1.23-1.37)	1.20 (1.14-1.26)
	Highly Impaired	[b]1.09 (0.93-1.28)	[b]0.97 (0.83-1.14)
Vision (D1)	Impaired	1.20 (1.14-1.26)	1.16 (1.10-1.22)
	Moderately Impaired	1.14 (1.06-1.24)	1.09 (1.00-1.18)
	Highly Impaired	[b]0.89 (0.79-1.00)	0.84 (0.75-0.95)
Change in Sleep Pattern (E1k)	5 Days/Week	1.62 (1.55-1.69)	1.59 (1.53-1.66)
	6/7 Days/Week	1.88 (1.73-2.04)	1.87 (1.72-2.03)
Change in Mood (E3)	Improved	1.80 (1.71-1.90)	1.82 (1.73-1.92)
	Deteriorated	1.67 (1.62-1.73)	1.67 (1.61-1.72)
Wandering: Frequency (E4aA)	Occurred 1-3 Days	2.11 (2.01-2.21)	2.06 (1.97-2.16)
	Occurred 4-6 Days	2.35 (2.21-2.49)	2.31 (2.18-2.45)
	Occurred Daily	2.24 (2.12-2.37)	2.31 (2.18-2.44)
Social Inappropriate & Disruptive Behaviour (E4dA, E4eA)	Occurred 1-3 Days	1.59 (1.52-1.67)	1.59 (1.51-1.67)
	Occurred 4-6 Days	1.65 (1.55-1.75)	1.67 (1.56-1.78)
	Occurred Daily	1.69 (1.57-1.82)	1.76 (1.63-1.89)
Change in Behavioural Symptoms (E5)	Improved	1.98 (1.88-2.09)	1.99 (1.89-2.10)
	Deteriorated	1.79 (1.73-1.86)	1.78 (1.71-1.84)
Transfers (G1bB)	Setup Help Only	1.34 (1.26-1.43)	1.30 (1.22-1.39)
	1 Person Assist	1.77 (1.69-1.85)	1.73 (1.65-1.81)
	2 Person Assist	1.07 (1.02-1.13)	[b]1.06 (0.99-1.11)
	Did NOT Occur	0.54 (0.44-0.65)	0.53 (0.44-0.64)

TABLE 1. Continued

Variable (RAI-MDS Identifier)	*Sub-Variable*	*Unadjusted Odds Ratio (95% CI)*	*Adjusted[a] Odds Ratio (95% CI)*
Walk in Room (G1cB, G1aB, G1dB, GleB)	Setup Help Only	1.48 (1.40-1.57)	1.43 (1.35-1.51)
	1 Person Assist	2.05 (1.95-2.15)	1.98 (1.89-2.09)
	2 Person Assist	2.50 (2.30-2.73)	2.46 (2.25-2.68)
	Did NOT Occur	[b]0.97 (0.93-1.01)	0.95 (0.91-0.99)
Toilet Use (G1iB)	Setup Help Only	1.40 (1.29-1.53)	1.39 (1.28-1.51)
	1 Person Assist	2.06 (1.94-2.19)	2.02 (1.90-2.15)
	2 Person Assist	1.56 (1.46-1.66)	1.53 (1.43-1.63)
	Activity Did NOT Occur	0.53 (0.42-0.67)	0.53 (0.42-0.67)
Balance While Standing (G3)	Unsteady NO Support	1.68 (1.59-1.78)	1.65 (1.56-1.75)
	Partial Support	2.48 (2.35-2.62)	2.44 (2.30-2.57)
	No Attempt	1.20 (1.15-1.27)	1.19 (1.13-1.26)
Leg AROM (G4d)	Partial Loss	0.82 (0.79-0.85)	0.81 (0.78-0.84)
	Full Loss	0.25 (0.22-0.28)	0.26 (0.23-0.29)
Foot/Ankle AROM (G4e)	Partial Loss	0.69 (0.66-0.73)	0.69 (0.66-0.72)
	Full Loss	0.24 (0.21-0.27)	0.25 (0.22-0.28)
Cane/Walker/Crutch (G5)	Yes	1.25 (1.19-1.31)	1.21 (1.16-1.27)
Change in ADL Function (G9)	Improved	2.19 (2.06-2.32)	2.20 (2.08-2.33)
	Deteriorated	1.97 (1.91-2.03)	1.94 (1.88-2.00)
Bowel Continence (H1a)	Occasionally Incont.	1.54 (1.46-1.62)	1.51 (1.44-1.59)
	Frequently Incont.	1.61 (1.54-1.69)	1.59 (1.52-1.67)
	Fully Incont.	[b]1.00 (0.96-1.05)	[b]1.00 (0.96-1.05)
Bladder Continence (H1b)	Occasionally Incont.	1.84 (1.73-1.95)	1.84 (1.74-1.96)
	Frequently Incont.	2.28 (2.16-2.40)	2.30 (2.18-2.43)
	Fully Incont.	1.56 (1.48-1.64)	1.58 (1.50-1.66)
Change in Urinary Continence (H4)	Improved	1.64 (1.52-1.77)	1.62 (1.51-1.75)
	Deteriorated	1.67 (1.61-1.74)	1.64 (1.58-1.71)
Hip Fracture (J4, J2)	Yes	3.55 (3.24-3.89)	3.58 (3.27-3.93)
Other Fracture (J4) (J2)	Yes	3.57 (3.21-3.97)	3.64 (3.27-4.05)
Weight Gain (K3)	Yes	0.84 (0.80-0.88)	0.86 (0.82-0.90)
Full Bed Rails on all Sides (P4)	Less Than Daily	0.55 (0.43-0.70)	0.54 (0.42-0.69)
	Used Daily	0.35 (0.32-0.38)	0.34 (0.31-0.37)
Trunk Restraint (P4)	Less Than Daily	[b]0.92 (0.72-1.17)	[b]0.94 (0.73-1.20)
	Used Daily	0.84 (0.76-0.92)	0.84 (0.76-0.92)

[a]Adjusted for gender, age, facility size, facility owner-operator status and facility region.
[b]Variable was not significant (p>.05).

Statistical Analysis

The Statistical Package for the Social Sciences version 25 (SPSS, IBM Corps., Armonk, NY) was used for all quantitative data analysis. Descriptive statistics were completed for resident-level demographics and facility-level characteristics, and the output included frequencies, ranges, means, and standard deviations as applicable to the variable. Facility-level characteristics analyzed include facility size, regional location, and owner-operator status. These characteristics were analyzed and used to account for similarities between residents in similar LTC home settings. Then an advanced statistical analysis was used to identify associations of factors between fallers and non-fallers. Generalized Estimating Equation (GEE) models were run with a logit link to account for the dichotomous nature of the dependent variable and for repeated measurements and their intrasubject correlation.[48] First, the GEE models were run unadjusted for any covariates. Next, a multicollinearity assessment was conducted to

remove redundant or highly associated independent variables. A cut-off of greater than 5 on the variance inflation statistics led us to remove a variable due to collinearity. Further, to create a concise model, factors that were deemed redundant were removed after the collinearity assessment. Lastly, another GEE model was run to adjust for age, gender, and facility-level factors including region, size, and owner-operator model.

Ethics

This secondary data analysis study was approved by the Health Sciences Research Ethics Board at Dalhousie University (#2019-4684).

RESULTS

Demographic Characteristics and Descriptive Statistics

Demographic characteristics and descriptive statistics of the sample and the LTC homes are included in Table 2. A total of 28,878 residents in LTC homes across the provinces of Manitoba, British Columbia, and Alberta were included. The cohort consisted of 9,676 (33.5%) males and 19,188 (66.4%) females. The average age of the cohort was 86.0 (SD 7.8, Range 65-116.8). By province, the residents resided in Alberta 13,193 (45.7%), British Columbia 9,837 (34.1%), and Manitoba 5,848 (20.3%). In total there were 102 LTC homes in this analysis. The provincial location of the LTC homes included 45 (44.1%) in British Columbia, 38 (37.3%) in Alberta, and 19 (18.6%) in Manitoba. The home sizes consisted of 23 (22.5%) small, 40 (39.2%) medium, and 39 (38.2%) large homes. The LTC homes owner-operator model consisted of 43 (42.2%) private for-profit, 20 (19.6%) public not-for-profit, and 39 (38.2%) voluntary not-for-profit.

The falls breakdown revealed that 52% of the cohort fell at least once during their stay: 15% had a single fall period coded, while 37% were recurrent fallers. Most of the cohort (70.8%) were moderately to severely impaired in their

TABLE 2.
Demographic and descriptive statistics for the cohort

Variable	*Subvariable*	*N 28,878 (%) or Mean (SD)*
Province of Residence	Alberta	13,193 (45.7%)
	British Columbia	9,837 (34.1%)
	Manitoba	5,848 (20.3%)
Gender	Male	9,676 (33.5%)
	Female	19,188 (66.4%)
Age	Range	86.0 (7.8) 65-116
Age (categorical)	65-74	2,497 (8.6%)
	75-84	7,917 (27.4%)
	85-94	14,255 (49.4%)
	95-104	4,151 (14.4%)
	105+	58 (0.2%)
Number of Medications		9.3 (4.1)
Cognitive Skills for Daily Decisions	Independent	2,300 (8.0%)
	Modified Indep.	6,137 (21.3%)
	Moderate Impaired	11,596 (40.2%)
	Severely Impaired	8,845 (30.6%)
Balance while Standing	Balanced	3,504 (12.1%)
	Unbalanced	2,982 (10.3%)
	Partial Support	4,380 (15.2%)
	Full Support	18,012 (62.4%)
Transfers	Independent	4,171 (14.4%)
	Supervised	1,487 (5.1%)
	1 Person Assist	8,578 (29.7%)
	2 Person Assist	14,079 (48.8%)
	Did Not Occur	563 (1.9%)
Hip Fracture	Yes	1,727 (5.9%)
Other Fracture	Yes	1,451 (5.0%)
Trunk Restraint	Used Less Than Daily	434 (1.5%)
	Used Daily	2,433 (8.4%)
Bed Rails	Used Less Than Daily	560 (1.9%)
	Used Daily	3,562 (12.3%)

cognitive skills for daily decisions. Almost 80% of the cohort required partial or full support when attempting to balance while standing. Within the last 180 days, 10.9% of the cohort experienced a fracture: 6% had a hip fracture, and 5% had another type of fracture.

Factors Associated with Increased Risk for Falls

See Table 1 for the odds ratios of the factors that contributed to falls risk. Overall, 25 risk factors were identified spanning the physical, cognitive, behavioural, and physiological domains. The domain of physical health and ability to perform physical tasks represented the majority of factors associated with increased odds of falling. Having a hip or other fracture in the last 180 days represented the largest magnitude of association with falls risk. Balance with partial physical support required significantly increased the odds of falls. The ability to transfer showed the most risk if the resident needed a one-person assist, with risk decreasing with more dependence and more independence. Walking in the room and on the unit represented an increased risk of falling regardless of the amount of assist required to ambulate. Wandering was significantly associated with falls regardless of the frequency of wandering. Lastly, mobility/ambulation requiring a gait aid increased risk for falls.

Various aspects of cognitive status and behavioural changes were associated with an increased risk of falling. Short-term memory impairment represented increased risk for falls, as did any divergence from independent cognitive skills for daily decision-making. In the behavioural domain, changes in sleep pattern including disturbed sleep represented an increased risk for falls regardless of the frequency of occurrence. Changes in mood, increased frequency of socially inappropriate or disruptive behaviour, and any change in behavioural symptoms either improving or deteriorating showed an increased falls risk.

Factors Associated with Decreased Risk for Falls

Full or partial loss of lower extremity active range of motion and weight gain were associated with reduced risk of falls. There was also a reduction in falls observed when residents were non-ambulatory and when toilet use could not occur. Various restraint types were associated with a reduced risk for falls, including full bed rails on all sides and trunk restraint use.

DISCUSSION

The findings of our study are consistent with previous studies showing that 50% of residents in LTC homes will fall and about 40% will be recurrent fallers.[1,2] Within our cohort, 5.9% of residents had a hip fracture and 5% had any other type of fracture, which reinforces that fractures are an ongoing issue in the LTC setting.[10,11] Findings from this study contribute insights into falls risk and protective factors.

Clinical Significance

Though all risk factors are important to consider when assessing falls risk, the factors with the strongest associations may provide the most clinical value for distinguishing between high-risk residents who would benefit from appropriate person-centred falls management strategies. This study confirms existing evidence that falls teams need to consider accompanying factors to better assess characteristics of a resident's risk profile in LTC homes.[1,27] For instance, in addition to using existing tools such as the interRAI Falls Risk CAP tool, clinicians could weigh accompanying factors, such as wandering, to monitor residents with characteristics that should be flagged as risky, regardless of history of falls.

This study found that the most strongly associated factor with falls is having any type of fracture in the last 180 days. We do know that residents who fall, especially recurrently, are more prone to fracture;[49] however, this study shows that fractures themselves increase the risk for falls. This information is important for adjusting practice guidelines, such as having appropriate interventions like protective gear (e.g., hip protectors) or assistive equipment (e.g., walkers), after a fracture to reduce risk of subsequent falls.[18] Further, "other fractures" have just as high an association with falls as hip fractures. Since this study found that about 6% of residents sustained a hip fracture and 5% sustained any other type of fracture during their LTC home stay, this could be a factor that falls teams may need to consider. Researchers should examine the mechanisms of how various types of prior fractures contributing to falls among people living in LTC homes.

Also of note was the finding that changes in various factors including sleep patterns, mood, behavioural symptoms, ADL function, and urinary continence were all significantly associated to varying magnitudes with falls, regardless of whether that factor improved or deteriorated. An increased fall risk because of a change from a baseline either as an improvement or deterioration is an unexpected finding of this study. Based on this finding, clinicians in the LTC setting may not be able to assume that as a resident's condition improves, they will be protected from falls. This is a preliminary finding that should be interpreted cautiously until further evidence is available.

Findings indicating factors that decrease risk of falls, such as utilizing full bed rails, conflict with existing evidence. Results from this study indicate that when full bed rails were used daily there was a 66% reduction in fall risk, compared with only a 46% reduction in fall risk if they were used less then daily. However, caution should be used when interpreting this association as they are physical restraints. A 2020 meta-analysis reviewing bed rail use in LTC homes concluded that there is insufficient evidence to suggest the use of full bed rails as a falls prevention strategy.[50] There is a body of research that shows physical restraints are associated with death,[8] increased risk of injuries, faster cognitive decline, lower ADL performance, physical decline, increased incontinence, and pressure wounds.[39] In the context of the quality of life and health of an older adult in LTC, research evidence and best practice guidelines support the minimization and/or reduction of restraint use.

Limitations of the Study

One of the main limitations of this study stems from the dependence on the RAI-MDS 2.0. It has been shown to be valid and reliable as a research tool;[43] however, there is still debate in the literature about how valid and reliable certain specific outcomes are for research purposes. Caution may need to be applied when interpreting research using RAI-MDS since it has been shown to under-report falls in LTC homes.[47] This may signify that, within this cohort, the absolute number of falls is under-represented and, as a result, the magnitude of the OR analysis may be altered. The RAI-MDS is also subject to measurement error, where the theoretical aspects of the RAI-MDS may not match the practical data entry by healthcare providers or administrators.

CONCLUSION

This study analyzes the interaction between falls risk factors using standardized RAI-MDS data and compares risk factors across multiple LTC homes in Western Canada using a large longitudinal data set. A range of risk factors for falls were identified, which can help guide clinicians with the application of falls management strategies. Clinicians should focus on the physical domain of falls risk as it represents most of the identified falls risk factors. If a resident sustains any type of fracture, if they wander, if they need an assist to ambulate or toilet, or if they are unbalanced standing, then they should be considered at a higher falls risk. Similarly, any changes in sleep, mood, behavioural symptoms, ADL function, and urinary continence are associated with falling. Although using RAI-MDS 2.0 data has inherent bias, this study identifies accompanying risk factors that could supplement existing risk falls assessment tools to specify characteristics of residents who require specific interventions to reduce falls in the LTC setting.

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CONFLICT OF INTEREST DISCLOSURES

We have read and understood the *Canadian Geriatrics Journal*'s policy on conflicts of interest disclosure and declare that we have none.

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