The Association Between the Presence of Medical Care and Resident Outcomes in Canadian Nursing Homes: a Retrospective Cross-Sectional Analysis

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ABSTRACT

The quality of medical care provided to older residents in nursing homes may depend upon available staffing models; this study examined the relationship between physician and nurse practitioner (NP) presence, care involvement, and resident outcomes. The secondary analysis of data collected in the Translating Research in Elder Care (TREC) study during 2019-20 included items on daily presence of physicians and NPs on units, physician involvement in care planning, and ability to contact physician or NP when necessary linked to routinely collected Resident Assessment Instrument—Minimum Data Set version 2.0 data. Eight logistic regression models tested the association between measures of staffing involvement and each outcome (antipsychotic use without indication (APM), physical restraint use, hospital transfers, and polypharmacy). The sample consisted of 10,888 residents across 320 care units in 90 facilities. Of the units, 277 (86%) reported a physician or NP visited daily, 160 (72.1%) reported that the physician was involved in care planning, and 318 (99%) units reported that the physician or NP could be reached when needed. Following adjustment for multiple confounding variables, there were no statistically significant associations between presence/involvement of medical professionals and resident outcomes (for example, physician or NP presence on the unit and hospitalization transfers [AOR=1.17, 95% CI: 0.46-3.10] or polypharmacy [AOR=1.37, 95% CI: 0.64-2.93]). We found non-significant associations between medical staff presence and involvement and selected resident outcomes, suggesting either the presence of many unaccounted for confounding inter-related resident–care provider variables or underlying insensitivity of the available data.

Key words: physician care, nurse practitioner, nursing home, medical care availability, health services, aging

INTRODUCTION

Nursing homes (NHs) provide care for older adults with significant medical and/or social care need, often in the final stages of life, and a substantial portion have an age-related dementia.[1,2] Despite the increasing complexity of NH residents, physicians or similar providers are typically not on-site at all times and some reports suggest an absence of physicians in the NH.[3,4,5] From 2007 to 2014, Canada saw a drop in family physicians who provided care in NHs from 22.1% to 14.1%,[6] even as the NH population increased in complexity. In interviews with family members of decedent NH residents, Shield and colleagues[2] found that participants reported insufficient responses from physicians which contributed to mistaken diagnoses, poor symptom management, increased hospitalizations, and general dissatisfaction among families. The quality of NH care has frequently been called into question.[7] For example, antipsychotic medications are inappropriately prescribed at times and/or warrant additional monitoring,[8] physical restraints may be used without evidence of benefit, prescriber habits may be suboptimal without planned reviews.[9]

The most commonly reported staff related concerns were communication problems between physicians and family members, inadequate follow up, and barriers to receiving reliable and helpful information from physician.[2] These challenges have been attributed to lack of specialist support, inadequate training in geriatrics, poor remuneration, and excessive paperwork.[8,10,11]

People with relevant lived experience (i.e., family caregivers to NH residents and people living with dementia), care providers, and decision makers have also expressed the need to better understand medical care provider presence in NHs and the potential impact on residents.[12] In response, we set out to examine the relationship between reported physician and nurse practitioner (NP) presence on NH units and selected

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resident outcomes. We hypothesized that greater presence and involvement of medical providers, specifically daily presence of a physician or NP, involvement in care planning, and ability for staff to contact, would be associated with better outcomes among residents, including lower antipsychotic use, less physical restraint use, fewer transfers to hospital, and less frequent polypharmacy.

METHODS

Study Design and Data

This was a retrospective cross-sectional analysis of data collected by Translating Research in Elder Care (TREC) program,[13,14] a longitudinal research program to improve the quality of life and care of NH residents.[3] Data for this study were collected between September 1, 2019 to March 10, 2020.[13] TREC comprises a representative sample of 90 NHs from urban regions in British Columbia, Alberta, and Manitoba.

The TREC Survey is administered to regulated (administrators and nurses) and unregulated (care aides) staff within participating NHs.[13] The survey includes a suite of survey instruments designed to assess organizational context and related factors hypothesized to be important to successful knowledge translation and to achieving better resident, staff, and system outcomes. Facility and unit level data are collected using standardized data collection forms and, for care aides, are administered by trained data collectors.

The Resident Assessment Instrument—Minimum Data Set version 2 (RAI MDS 2.0) is a routinely collected clinical assessment completed by care teams upon admission, quarterly intervals, or following significant change. The assessment includes items on clinical signs and symptoms, physical function, cognition, and mood.[3,7] RAI-MDS 2.0 data are linked to the TREC Survey such that residents and staff can be nested within corresponding units and facilities.[15]

Resident Level Characteristics

All resident variables were obtained from the RAI-MDS 2.0 including age, sex, marital status, medical conditions, and outcome scales including the Cognitive Performance Scale (CPS), Activities of Daily Living (ADL) short form, Changes in Health, and the End-Stage Disease and Signs and Symptoms of medical problems (CHESS). The CPS describes cognitive status through assessment of memory and orientation items[8] and ranges from 0-6, with higher scores indicating greater impairment.[15] The ADL short form described resident self-performance on activities such as toilet use, locomotion, and eating; scores ranging from 0-16 with higher scores indicating more severe impairment.[5] The CHESS outcome scale detects health instability and risk of serious decline.[16]

NH and Unit Level Characteristics

NH administrators provided details on facility structure, including number of beds and ownership model. NHs are categorized as public not for profit, private for profit, and voluntary not for profit and were grouped as small (<80 beds), medium (80–120 beds), or large (>120 beds).[13] Units are categorized by bed number (small (9–30 beds) medium (31–60 beds), or large (>61 beds),[13] and type (general LTC, dementia, secure mental health/psychiatric, and other).

Medical Care Provider Variables

Three relevant measures of medical care provider presence are defined.

Physician and NP Presence on a Typical Weekday

To capture the regular presence of a medical care provider, two items were used—one asked about physician presence and the other about NP presence. NPs are registered nurses by training who undertake further graduate nursing training to effectively treat, diagnose, and care for patients.[17] To help offset the human resources burden due to the lack of medical trainees specializing in caring for and treating the complex nursing home population, NPs are recruited and employed in this sector in either managerial or clinical roles.[17]

Respondents were asked, "On a typical weekday, is at least one [physician or NP] having routine visits with residents on this unit?"; response options were "yes" or "no." Since we anticipated that physician and NP presence were not mutually exclusive, a single measure based on the presence of both, either, or neither on the unit each day was created.

Care Management

To capture physician involvement in care planning, the item "generally, the residents' physicians are actively involved in managing care planning for residents on this unit" with response options: "strongly agree", "agree", "disagree", "strongly disagree", "neither agree or disagree", and "other". The response options were combined into two categories: "strongly agree or agree" and "other".

Ability to Contact Physician

To assess staffs' perceived ability to contact a physician, the item "most of the time our staff is able to contact a physician when a resident has a problem" was used. The response options included "strongly agree", "agree", "disagree", "strongly disagree", "neither agree or disagree", and "other." Again, the response options were divided into "strongly agree or agree" and "other." This item showed no variability in preliminary analysis and was excluded from subsequent analyses.

Outcome Variables

Four physician and nursing practice sensitive outcomes[18] obtained from the RAI-MDS 2.0 were chosen: 1) antipsychotics administered (O4a) without indication of schizophrenia (I1ii), Huntington's disease (I1x) (APM), or hallucinations (J1i) in the week prior to assessment; 2) physical restraints defined as having had trunk, limb, and/or chair restraint used in the week prior to assessment (Pfa-e)[14]; 3) hospital transfer in the 90 days prior to assessment (P5 and P6); and 4) polypharmacy, defined as nine or more medications in the week prior to assessment (item O1).

Analysis

Descriptive statistics were used to characterize the residents, units, and NH and medical care provider variables at unit level and by unit type. To test associations between each medical care provider variable and outcome, logistic regression fit with a generalized estimating equation, which allowed residents to be nested within units and units to be nested within facilities, was used. The model results are presented as odds ratios (ORs) and 95% confidence intervals (CI). Estimates were adjusted for: total number of beds in facility, owner-operator model, project facility size, diagnoses, number of beds, province, sex, CPS, CHESS, and age at assessment.

Statistical Package for the Social Sciences (SPSS v26, Amos v26; IBM SPSS Statistics, Armonk, NY) was used for all analyses.

This research was approved by the Research Ethics Board at the University of Alberta (Pro00037937).

RESULTS

The sample included 90 NHs, with mean (SD) number of beds 126 (66) and 40% were large (N=36). Twenty-two per cent of NH (N=90) were public not-for-profit, 42.2% were private for-profit, and 35.6% were voluntary not-for-profit. Of the 320 clinical care units, 223 (69.7%) were "general" units, 45 (14.1%), secure dementia, 10 (3.1%), non-secure dementia, and 39 (12.2%) were classified as "other." Over half of units were small, 46.5% were classified as medium and large. The 10,888 residents (Table 1), had a mean (SD) age of 84.8 (10.4) years, 67% were female, 46.9% were widowed, and 62.5% had diagnosed Alzheimer's disease or another dementia. Sixty per cent had mild or moderate cognitive impairment, and 84.5% were highly dependent, defined as ADL score > 4. The other most common diagnoses were depression (31.4%) and diabetes (22.1%). Ninety per cent of NHs reported having a physician or a roster of physicians visit residents, 55.6% reported that residents were visited by their own community-based family physician rather than a physician allocated to them upon entry to the home, and 15.6% reported having a NP.

Fifteen per cent of units reported that at least one NP makes routine visits with residents on a typical weekday and 86% reported the same for physicians. Data by unit type showed 91.5% of all general units (N=223) reported at least one physician having routine visits with residents on a typical weekday compared to 85.5% (N=55) and 61.9% (N=42) of dementia and other units, respectively. Seventy per cent of general units, 69.1% of dementia units, and 73.8% of other units reported that residents' physicians "are actively involved in care planning". All general units, 98.2% of dementia units, and 100% of "other" units reported that they were able to contact a physician for residents' routine needs.

Almost twenty-three per cent (22.9%) of residents had APM use without indication, 60.2% had physical restraint use (including bed rails), 14.5% experienced hospital transfer, and

TABLE 1.
Summary of sample: resident characteristics of 10,888 residents in the nursing home from Sept 1, 2019 to March 10, 2020

Variables	*Total (N=10,888) N(%)*
Demographic Characteristics	
Age Assessment	
Age in years, mean(SD)	84.8 (10.4)
Age (in yrs)	
20-29	6 (0.1)
30-29	23 (0.2)
40-49	47 (0.5)
50-59	175 (1.8)
60-69	573 (5.7)
70-79	1,649 (16.5)
80-89	3,679 (36.9)
90 and over	3,829 (38.4)
Sex, n (%)	
Female	7,195 (67.0)
Male	3,692 (33.0)
Marital Status	
Married	2,819 (25.9)
Widowed	5,104 (46.9)
Divorced	1,072 (9.8)
Separated	429 (3.9)
Never Married	914 (8.4)
Unknown	550 (5.1)
Activities of Daily Living Impairment, N (%)	
Independent (ADL_H<2)	629 (5.7)
Medium dependent (ADL_H 2-4)	1,064 (9.8)
Highly dependent (ADL_H>4)	9,195 (84.5)
CHESS Scale Score, n (%)	
0	5,319 (48.9)
1	3,387 (31.1)
2	1,501 (13.8)
3	480 (4.4)
4+	201 (1.8)
Pain Scale	
No pain	8,058 (74.0)
Less than daily pain	2,139 (19.6)
Daily pain but not severe	605 (5.6)
Severe daily pain	86 (0.8)
Cognitive Performance Scale (CPS)	
Relatively intact cognition (CPS<2)	2,113 (19.4)
Mild/moderate impairment (CPS 2-3)	6,599 (60.6)
Severe Impairment (CPS ≥4)	2,176 (19.9)
Medical Diagnoses, N (%)	
Alzheimer's disease or other dementia	6,767 (62.5)
Congestive heart failure	1,309 (12.1)
Cancer	479 (4.4)
Diabetes	2,404 (22.1)
Depression	3,419 (31.4)
Renal Failure	895 (8.3)
Stroke	2,127 (19.5)

TABLE 1.
Summary of sample: resident characteristics of 10,888 residents in the nursing home from Sept 1, 2019 to March 10, 2020

Variables	*Total (N=10,888) N(%)*
Facility Characteristics (N=90), N(%)	
Owner Operator Model	
Public not for profit	20 (22.2)
Private for profit	38 (42.2)
Voluntary not for profit	32 (35.6)
Facility Size	
Total number of LTC beds (mean,SD)	126 (66)
Small (<80 beds)	21 (23.3)
Medium (80-120 beds)	33 (36.7)
Large (>120 beds)	36 (40.0)
Unit Characteristics (N=320), N(%)	
Unit Bed Size	
Small (9-30)	171 (53.4)
Medium (31-60)	147 (45.9)
Large (>61)	2 (0.6)
Unit Type	
General LTC	223 (69.7)
Secure Dementia	45 (14.1)
Non Secure Dementia	10 (3.1)
Secure mental health/psychiatric	3 (0.9)
Non-secure mental health/psychiatric	0 (0.0)
Other	39 (12.2)

48.4% experienced polypharmacy. At the unit level, 15% of units reported residents with APM, 57.2% reported physical restraint use, 10.3% reported hospital transfer, and 34.7% reported polypharmacy.

Association between Physician and NP Presence and Resident Outcomes

For residents on units where a physician or NP visited daily (N=1,416), 23.0% (N=325) had APM use without indication, 57.3% (N=811) had physical restraint use, 11.6% (N=165) had hospital transfer, and 46.6% (N=660) reported polypharmacy. Residents residing on units that did not report daily visits by either (N=1,063), 29.5% (N=314) of residents had APM without indication, 32.5% (N=346) physical restraints, 12.4% (N=132) hospital transfer, and 46.2% (N=491) polypharmacy. No associations were observed between daily visits and any of the four outcomes.

On units where staff reported that physicians were involved in care planning, 22.1% (N=1,771) of residents experienced APM, 58.9% (N=4,747) restraints, 14.6% (N=1,175) hospital transfer, and 47.4% (N=3,821) polypharmacy relative to 25.5% (N=722), 62.9% (N=1,780), 13.7% (N=389), 50.7% (N=1,435) among those units that did not report physician involvement in care planning. No associations were observed between physician involvement and any of the outcomes, either in crude or adjusted models (Tables 2 and 3).

TABLE 2.
Unadjusted and adjusted[a] association between units that reported residents having at least one physician or nurse practitioner having routine visits with residents on the unit and the practice sensitive outcomes in Wave 5 (N=10,888)

	On a Typical Weekday Would at Least One Physician And/Or Nurse Practitioner Have Routine Visits on Unit											
	Physician Only (N=8,253)			*NP Only (N=156)*			*Either (N=1,416)*			*Neither (N=1,063)*		
	N (%)	*OR (CI)*	*AOR (CI)*	*N (%)*	*OR (CI)*	*AOR (CI)*	*N (%)*	*OR (CI)*	*AOR (CI)*	*N (%)*	*OR (CI)*	*AOR (CI)*
APM use without indication	1,784 (21.6	0.68 (0.50-0.90)	0.80 (0.60-1.06)	42 (26.9)	1.23 (0.53-2.86)	1.18 (0.56-2.53)	325 (23.0)	0.83 (0.34-1.99)	0.78 (0.36-1.73)	314 (29.5)	REF	REF
Any physical restraint use including bed rails	5,324 (64.5)	1.65 (0.62-4.38)	1.42 (0.54-3.75)	37 (23.7)	1.98 (0.24-16.34)	2.08 (0.26-2.10)	811 (57.3)	605 (14.0)	0.33 (0.05-2.48)	346 (32.5)	REF	REF
Any hospitaliz-ations/ED transfers within 90 days	1,251 (15.2)	0.88 (0.58-1.31)	0.92 (0.63-1.36)	15 (9.6)	0.66 (0.25-1.73)	1.13 (0.45-2.83)	165 (11.6)	1228 (13.4)	1.45 (0.55-3.83)	132 (12.4)	REF	REF
Poly-pharmacy	4,051 (49.1)	1.25 (0.86-1.83)	0.99 (0.74-1.32)	37 (23.7)	0.88 (0.36-2.17)	0.79 (0.38-1.64)	660 (46.6)	1.04 (0.41-2.62)	1.37 (0.64-2.93)	491 (46.2)	REF	REF

[a]Confounding variables included: total number of beds in facility, owner-operator model, project facility size, diagnoses, number of beds, province, sex, CPS, CHESS and age at assessment.
OR (CI) = Odds Ratio (Confidence Interval); AOR (CI) = Adjusted Odds Ratio (Confidence Interval).

TABLE 3.
Unadjusted and adjusted[a] odds ratios of the association between units that reported residents' physicians being actively involved in managing care planning and the practice sensitive outcomes in Wave 5 (N=10,888)

	Generally, Residents' Physicians Are Actively Involved in Manage Care Planning					
	Strongly Agree or Agree (N=8,057)			*Other (N=2,831)*		
	N (%)	*OR (CI)*	*AOR (CI)*	*N (%)*	*OR (CI)*	*AOR (CI)*
APM use without indication	1,771 (22.1)	0.82 (0.74-0.91)	0.92 (0.75-1.12)	722 (25.5)	REF	REF
Any physical restraint use including bed rails	4,747 (58.9)	0.81 (0.74-0.89)	1.34 (0.67-2.67)	1,780 (62.9)	REF	REF
Any hospitalizations/ED transfers within 90 days	1,175 (14.6)	1.03 (0.91-1.16)	0.93 (0.74-1.18)	389 (13.7)	REF	REF
Any polypharmacy use	3,821 (47.4)	0.86(0.79-0.94)	0.93 (0.77-1.12)	1,435 (50.7)	REF	REF

[a]Confounding variables included: total number of beds in facility, owner-operator model, project facility size, diagnoses, number of beds, province, sex, CPS, CHESS and age at assessment.
OR (CI) = Odds Ratio (Confidence Interval); AOR (CI) = Adjusted Odds Ratio (Confidence Interval).

DISCUSSION

In this study of 320 NH units in three Canadian provinces, staff reported that physicians and NPs were regularly present on units, were engaged in care planning, and could be contacted regarding resident needs, with little variation across unit type. There was no association between these measures of medical professional presence or involvement in care and any of the practice sensitive outcomes that we considered.

Despite our NH and resident sample being comparable to those reported elsewhere,[19] our findings were surprising. Others have shown that both family members and staff report limited presence of physicians.[20] From the caregiver's perspective, Shield *et al*.[2] reported limited physician care given to loved ones in the NH, and Bolt *et al*.[21] reported on neglect of residents whether that was due to lack of physician presence or changes in the physician providing care. Studies which have examined medical models of care provision and clinical outcomes in NH have shown that the presence of nurse practitioners in long-term care facilities has led to enhanced quality of life and reduced resident pain, with varying outcomes regarding emergency department transfers.[22] On the other hand, incorporating primary care physicians proved advantageous in reducing hospitalizations and emergency department visits. However, these findings were based on studies with a limited number of residents exposed to the interventions, generally fewer than 350. The largest study, conducted in Canada, involved 5,617 residents across 52 long-term care homes and showed that providing same-day physician access resulted in decreased hospitalizations and emergency department visits compared to delayed physician visits.[22]

Other research reports that long-term care facilities incorporating advanced practice nurses experienced lower rates of depression, urinary incontinence, pressure ulcers, restraint use, and aggressive behaviors among residents.[23] Additionally, a higher proportion of residents reported improvements in meeting personal goals, and family members expressed greater satisfaction with medical services provided.[23] From a cost-saving analysis perspective, the first study to analyze the financial impact of adverse events that are responsive to nurse practitioner care in long-term care settings found significant cost savings resulting from the decrease in adverse events following the introduction of nurse practitioners. These findings underscore the importance of government consideration in utilizing nurse practitioners to prevent adverse events and enhance quality and safety in long-term care facilities.[24]

The lack of significant association found here may reflect that responses to the survey did not reflect the true nature of medical provider involvement or presence. Unit level data on physicians and NPs largely came from surveys of care aides, who may have different perceptions and/or expectations of physician and NP presence than other staff or family members. It is also possible that the unit level items on medical provider presence were too "global" and not a sufficient measure of care received by individual residents. This may have been particularly apparent in homes where residents retained their community family physician, a variable for which we were unable to control. The lack of significant relationships found here might also reflect the fact that medical involvement in care provision for the NH resident population is multiprofessional, and outcomes may be less dependent upon physicians or NP involvement. Although there has been an increase in NP employment in the sector, at the time of the survey there were few employed in NHs in Alberta.[25] Regardless, there remains a clear need for greater understanding of the role of medical care providers, the impact of different funding models, and the implications for NH resident outcomes. TREC's own priority setting work has shown that stakeholders, in particular those with lived experience, have identified a need for greater understanding of these issues.

It is also important to consider that the practice sensitive outcomes may not have been sensitive to the medical care variables available in the TREC Survey. As part of routine

clinical care, the RAI-MDS 2.0 is a system that captures relevant information surrounding resident physical and mental health and functional status at admission, quarterly intervals, and following major health-related events.[26] It is important to be mindful of the potential limitations of the quality indicators derived from the RAI-MDS 2.0 items, especially studies such as this one. At both the level of the assessor and the instrument, validity, and reliability need attention. Further, the selected outcome measures do not represent processes of care that may be more relevant to resident and family experience of quality.

CONCLUSIONS & IMPLICATIONS

No associations were identified between the measures of medical care provider presence and selected resident outcomes; however, our findings are difficult to interpret within the limited available research describing medical care in the NH setting. The continued increase in the proportion of frail and complex NH residents will bring challenges to the organization of medical care for residents. Research exploring optimal medical care provision will lead to better health-care delivery for this vulnerable population.

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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 there are none.

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