© Health Research and Educational Trust

DOI: 10.1111/1475-6773.13020

RESEARCH ARTICLE

Quality Changes after Implementation of an Episode of Care Model with Strict Criteria for Physical Therapy in Ontario's Long-Term Care Homes

Caitlin McArthur , John Hirdes, Ashok Chaurasia, Katherine Berg, and Lora Giangregorio

Objectives. To describe the proportion of residents receiving rehabilitation in long-term care (LTC) homes, and scores on activities of daily living (ADL) and falls quality indicators (QIs) before and after change from fee-for-service to an episode of care model; and to evaluate the effect of the change on the QIs.

Data Sources. Secondary data were collected from all LTC homes in Ontario, Canada, between January 1, 2011 and March 31, 2015. Variables of interest were the proportion of residents per home receiving physical therapy (PT), and the scores on seven ADL and one falls QI.

Study Design. Retrospective, longitudinal study.

Data Extraction. All data were extracted from the Resident Assessment Instrument Minimum Data Set.

Principal Findings. Fewer residents received PT after the policy change (84.6 percent, 2011; 56.6 percent, 2015). The policy change was associated with improved performance on several ADL QIs. However, having a large proportion of residents receive no PT or little PT was associated with poorer performance on two of the QIs measuring improvement in ADLs [No PT: -0.029 (-0.043 to -0.014); -0.048 (-0.068 to -0.027). PT <45 minutes per week: -0.012 (-0.026 to -0.002); -0.026 (-0.045 to -0.007); $p < .01$].

Conclusions. While controversial, the policy and subsequent PT service delivery change appears to be associated with improved performance on several ADL QIs, except in homes where a large proportion of residents receive no PT and low time-intensive PT.

Key Words. Long-term care, nursing homes, physical therapy, occupational therapy, policy

There is significant debate around the best model of funding and delivery of health care services nationally and internationally, including long-term care (LTC). For example, in the late 1990s the United States (US) experienced a shift to prospective payment in the LTC sector. Funds were allocated based on the resident characteristics that relate to the intensity of care and services that the resident required (Cunningham 1999; White 2003). Receipt of rehabilitation, based on the number of minutes received over a 7-day period, was the only service provided within LTC homes that classified residents into resource groups. Not surprisingly, there was an increase in the number of residents receiving rehabilitation after the prospective payment system was implemented. Much debate has been generated with some advocating that payment for rehabilitation should be tied not only to amount provided but also to appropriateness of services (Cunningham 1999). Indeed, there continues to be a transformation in the US health care system from fee for service to value-based reimbursement methods including bundling services for episodes of care (Mayes 2011; Kuhn and Lehn 2015). In Canada, providing value-based rather than volume-based reimbursement has also been identified as a priority (Prada and Brown 2012; Hellsten et al. 2016). With growing health care costs, value-based, block funding encourages health care providers to be accountable for the quality of services provided by presenting a financial incentive for improved coordination of care and avoidance of unnecessary costs (Prada and Brown 2012; Kuhn and Lehn 2015). While change to a block-based payment system has resulted in reduced costs and improved coordination of care (Casale et al. 2007; Struijs and Baan 2011; Hellsten et al. 2016), the effect on the quality of care has not been evaluated.

A new policy was implemented for publicly funded physical therapy (PT) in Ontario, Canada, in August 2013 (Ontario). Most residents in Canadian LTC homes are long stay (i.e., reside in the home for more than 90 days), have multiple comorbidities, and remain in the home until end of life (Hirdes et al. 2011). Publicly funded PT was removed from the Ontario health insurance act and was reformed to a budget-based program. PT service providers

Address correspondence to Caitlin McArthur, Ph.D., M.Sc.P.T., GERAS Centre for Aging Research, McMaster University, 88 Maplewood Avenue, Hamilton, ON, Canada L8M 1W9; e-mail: cmcarthu@uwaterloo.ca. John Hirdes, Ph.D., and Ashok Chaurasia, Ph.D., are with the School of Public Health and Health Systems, University of Waterloo, Waterloo, ON, Canada. Katherine Berg, Ph.D., is with the Department of Physical Therapy, University of Toronto, Toronto, ON, Canada. Lora Giangregorio, Ph.D., is with the Department of Kinesiology, University of Waterloo, Waterloo, ON, Canada; Toronto Rehabilitation Institute, University Health Network, Toronto, ON, Canada; and the Schlegel-UW Research Institute for Aging, Waterloo, ON, Canada.

now receive a block of funds per bed per year, rather than the previous fee-for-service model that was directly billed to the Ontario Health Insurance Plan (OHIP) (Alliance 2013; Ontario 2016). The new model includes strict eligibility criteria where PT is to be used to improve physical function and mobility rather than providing maintenance and exercise programs. Residents now must be discharged once therapeutic goals are achieved or can be achieved in other programs such as exercise, falls prevention, or activation (e.g., therapeutic recreation programs; Ontario 2016). An additional per diem allotment was provided for residents to participate in general falls prevention and exercise classes that may or may not be provided by a physical therapist (Alliance 2013; CARP 2013).

The intention of the change was to improve access to publicly funded rehabilitation services across Ontario, to improve efficiency and accountability, and to shift from a volume-based billing model fraught with potential and real abuse to a block-based model placing resources where they are most needed (Casale et al. 2007; Ontario 2016). While the reform was designed to improve PT service delivery in LTC and was supported by the Ontario Physiotherapy Association (Smart A 2013), the resultant changes were controversial with court cases attempting to challenge the reform (Boyle 2013) and potential indirect disruption to other rehabilitation services such as occupational therapy (Ontario Society of Occupational Therapists 2018). Unanswered questions remain regarding the effect of the policy and funding change for PT in LTC in Ontario. Therefore, the objectives of this study were (1) to describe and examine the proportion of residents receiving rehabilitation services, and the ADL and falls QIs performance before and after the policy change; and (2) to evaluate the effect of the policy change on facility-level ADL and falls QIs. Facility-level ADL and falls QIs were chosen as they are the most commonly used construct to evaluate the effect of rehabilitation interventions in LTC (Crocker et al. 2013a), and have previously been identified as potential measures of quality of rehabilitative care. We hypothesized that the proportion of residents receiving PT and OT would decrease after the policy change and that there would be a decrease in performance on the ADL QIs, specifically the ones measuring mid-loss ADL performance.

METHODS

The study was a retrospective, secondary data analysis. Data were obtained from the Resident Assessment Instrument Minimum Data Set (RAI) 2.0

(Centers for Medicare & Medicaid Services, Baltimore, MD) for all LTC homes in Ontario. Complex-continuing care facilities were excluded from the analyses, as their levels of service provision are different from those of LTC homes and they did not experience the same change in service provision. The RAI 2.0 is a valid and reliable standardized assessment tool administered by trained assessors within LTC homes, which combines chart review with interaction with residents, their families, and the clinicians who work with them (Morris et al. 1997; Poss et al. 2008; Mor et al. 2011). The RAI 2.0 is administered in Canadian LTC homes within 14 days of admission, on a quarterly basis thereafter, or if there is a significant change in status.

For this study, QIs are defined as aggregated resident-level data expressed as a fraction where the numerator is the number of residents with a particular outcome, and the denominator is the number of residents at risk for developing that outcome who are not otherwise excluded (Berg et al. 2002; Frijters et al. 2013). QIs have been shown to have adequate to good reliability and to validly capture quality of care activities and strategies within the home (Mor et al. 2003a, b). The calculated QIs were risk adjusted through restriction, indirect standardization, and stratification with direct standardization to allow for fair comparison across residents and facilities (Jones et al. 2010). Restriction excludes residents that do not reflect the quality of care within a home (e.g., new admissions). Residents are then sorted into strata based on their risk level (i.e., low, medium, and high) relative to a cross-national standardization sample. Indirect standardization was performed within each stratum by performing multivariable adjustment for individual resident-level characteristics (e.g., cognition). While some researchers have expressed concern that risk adjustment allows poor quality to be adjusted away, we feel the importance of fair comparisons between homes and across resident populations outweighs this concern. Additionally, previous work has demonstrated the validity of third-generation risk adjustment (Jones et al. 2010), while no work to date has confirmed this concern. Table 1 provides a detailed description of covariates used for adjustment for each QI. Regression coefficients were used to determine the expected number of residents triggering the QI in a given facility, and strata-specific scores were combined using weights from the standard population, to provide a final absolute value between zero and one (Jones et al. 2010). Homes with QI denominators with a value fewer than 30 were excluded, as the estimate becomes unstable at this point. Table 1 provides a description of the seven ADL and one falls QI that were calculated for each facility in Ontario for all fiscal quarters (3-month periods) between the period of January 1, 2011 to March 31, 2015.

Table 1: Description of Quality Indicators Used as Response Variables

Description of Quality Indicator	Risk Adjustment			
	Numerator	Denominator	Exclusions	Individual-Level Covariates
				Facility-Level Stratification
Proportion of residents with worse late-loss ADLs	Residents with worse late-loss ADL self-performance compared to last assessment	Residents whose late-loss scores could decline (i.e., did not have maximum score on last assessment)	Comatose, end of life	Age < 65 ADL long form*
Proportion of residents with improved or remained independent in mid-loss (transfer and locomotion) ADLs	Residents with improved mid-loss ADL self-performance compared to prior assessment, or a score of 0 on both prior and current assessment	Resident with valid assessments	Comatose, end of life	Age < 65, CPS ADL long form*
Proportion of residents with improved or remained independent in early-loss (dressing and personal hygiene) ADLs	Residents with improved early-loss ADL self-performance compared to prior assessment, or a score of 0 on both prior and current assessment	Resident with valid assessments	Comatose, end of life	Age < 65, RUG late-loss ADL scale CPS
Proportion of residents with improved late-loss ADLs	Residents with improved late-loss ADL self-performance compared to prior assessment	Residents whose late-loss ADL score could improve (i.e., did not have maximum score on last assessment)	Comatose, end of life	PSI – Subset 1 – diagnoses CPS RUG behavior RUG cognitive impairment Age < 65 CMI
Proportion of residents with worse or remained completely dependent in mid-loss (transfer and locomotion) ADLs	Residents with worse mid-loss ADL self-performance as compared to prior assessment or a score of 0 on both prior and current assessment	Residents with valid assessments	Comatose, end of life	Not totally dependent in transferring, locomotion problem, PSI-subset 2 nondiagnoses, age < 65 CMI

continued

Table 1. Continued

Description of Quality Indicator	Risk Adjustment		
	Numerator	Denominator	Individual-Level Covariates
Proportion of residents with worse or remained completely dependent in early-loss (dressing and personal hygiene) ADLs	Resident with worse early-loss ADL self-performance as compared to prior assessment, or a score of 0 on both prior and current assessment	Resident with valid assessments	Not totally dependent in transferring, locomotion problem, PSI-subset 2 nondiagnoses, age <65, CPS
Proportion of residents with worse ADLs long-form score	Residents with worse ADL self-performance (ADL long-form score) as compared to prior assessment	Residents with valid assessments	Not totally dependent in transferring, locomotion problem, PSI-subset 2 nondiagnoses, age <65
Proportion of residents who fell in the last 30 days	Residents who had a fall in the last 30 days on the current assessment	Residents with valid assessments	Not totally dependent in transferring, locomotion problem, PSI-subset 2 nondiagnoses, any wandering, unsteady gait/cognitive impairment, age <65

*ADL long form is measure of overall ADL performance. ADL, activities of daily living; CMI, case mix index; CPS, cognitive performance scale; PSI, patient safety indicator; RUG, resource utilization group.

The proportion of residents receiving rehabilitation services (PT, occupational therapy, nursing rehab, therapeutic recreation, and speech-language pathology) in Ontario is presented as percentages for each fiscal quarter (3-month periods) from January 1, 2011 to March 31, 2015. The proportion of residents receiving PT at four levels is also presented and was calculated in accordance with the Resource Utilization Groups-III (RUG-III) rehabilitation classifications: (1) those receiving no PT; (2) those receiving <45 minutes on <3 days of the week; (3) those receiving 45–150 minutes on 3–5 days of the week; (4) those receiving more than 150 minutes on more than 5 days of the week (Fries et al. 1994). The proportion of residents receiving each rehabilitation service was calculated by dividing the number of residents receiving the service by the number of assessments within the home.

To describe the ADL and falls QIs over time, a box plot for each QI across each fiscal quarter was created. As the 20th and 80th percentile and median are clinically meaningful for QI interpretation (Zimmerman 2003), the box plot was created such that the bottom on the box represents the 20th percentile, the top represents the 80th, and the line inside the box indicates the median. A linear mixed regression model using a Toeplitz covariance structure (Hedeker and Gibbons 2006) was run to test the effect of policy change on the QIs, and random intercept and slope models were tested. The policy change variable was treated as a binary predictor (1 for the quarters after the second fiscal quarter of 2013 or 0 otherwise). As the main hypothesis pertains to PT and how the policy change affected the amount of PT received, our mixed models included interaction effects between PT and the policy change, while adjusting for facility-level covariates. The facility-level covariates were as follows: the size of the LTC home (medium: 30–99 beds, or large: 100+ beds), whether the facility was in an urban (>100,000 people in a metropolitan area) or rural (10,000–100,000 people) location (du Plessis et al. 2002), the health region the home in which the home is located (the fourteen local health integrated networks in Ontario), and the neighborhood income quintile. Variables were retained within the model at a significance level of 1 percent. All statistical analyses were conducted in *SAS* version 9.4 (SAS Institute Inc., Cary, NC).

RESULTS

The effective sample size was 589 homes. Most homes had over 100 beds ($N = 363$; 61.6 percent) and were in urban areas ($N = 462$; 78.4 percent).

Rehabilitation Services over Time

After the policy change, fewer residents received PT overall (Figure 1). Prior to the change, 84.6 percent of residents received any amount of PT (on average) across homes, compared with 56.6 percent afterward (Figure 1). In the fiscal quarter from October 1 to December 31, 2010, residents who received PT received a mean of 49.1 minutes of PT over 2.9 days, and a median of 45.0 minutes of 3.0 days. From January 1 to March 31, 2015, residents who received PT received a mean of 44.2 minutes of PT over 2.5 days, and a median of 45.0 minutes over 3.0 days. Therefore, fewer residents are now receiving PT overall, but the residents are (on average) receiving similar amounts of PT. There was an increase in the proportion of residents receiving the lowest amount of PT (<45 minutes on <3 days per week) from 18.2 to 22.2 percent, and a decrease in those receiving 45 to 150 minutes over 3–5 days of the week from 65.8 to 32.9 percent (Figure 1). However, the proportion of residents receiving more than 150 minutes over more than 5 days remained very small (0.5–0.2 percent; Figure 1).

Figure 1: The Proportion of Residents Receiving Four Amounts of Physical Therapy from 2011 to 2015

Note: PT, Physical Therapy.

There was a steady decrease in nursing rehab from more than 42.0 percent to 16.8 percent from 2011 to 2015 (Figure 2). However, the decrease does not appear to be influenced by the policy change (Figure 2). Similarly, the proportion of residents receiving therapeutic recreation services decreased from 9.8 percent to 6.3 percent and did not appear to be affected by the policy change (Figure 2). Less than 5 percent and <1 percent of residents received occupational therapy and speech-language pathology services, respectively,

Figure 2: Proportion of Residents Receiving Rehabilitation (Occupational Therapy, Speech-Language Pathology, Nursing Rehab, and Therapeutic Recreation) from 2011 to 2015 [Color figure can be viewed at wileyonlinelibrary.com]

Note. NR, Nursing Rehab; OT, Occupational Therapy; Q, Quarter; SLP, Speech-language Pathology; TR, Therapeutic Recreation.

regardless of time (Figure 2). Yet, the proportion of residents receiving occupational therapy decreased from 2.5 percent to 1.0 percent, and the decrease was steeper after the policy change (Figure 2). The proportion of residents receiving speech-language pathology remained at 0.3 percent across time (Figure 2).

QIs over Time

Figure 3a shows the QIs where higher scores reflect higher quality, while Figure 3b shows the QIs where lower scores reflect higher quality. The change in median values for the QIs measuring improvement in early-loss (0.21–0.18), mid-loss (0.32–0.30), and late-loss (0.11–0.90) ADLs, and worse mid-loss (0.32–0.34) ADL function all demonstrated worse quality from 2011 to 2015 (Figure 3b). Conversely, the QIs measuring the proportion of residents with worse early-loss and late-loss ADLs improved over time, with median scores decreasing from 0.35 to 0.30 and 0.18 to 0.16 from 2011 to 2015, respectively (Figure 3a). The QIs measuring the proportion of residents with worse ADLs overall and who have fallen in the last 30 days fluctuated over time, but essentially remained unchanged from 2011 to 2015, with median scores around 0.34 and 0.15, respectively. The spread between the 80th percentile and 20th percentile scoring homes remained approximately the same for all QIs (Figure 3a and b), indicating the difference between homes scoring excellent and poor remained unchanged over time.

Effect of the Policy Change on QIs

At the bivariate level, a higher proportion of residents not receiving any PT was the only predictor variable that was significantly associated with poorer performance on the QIs measuring the proportion of residents with worse overall ADLs and who had fallen in the last 30 days (Table 2). However, the interaction between the proportion of residents receiving no PT and the policy change was significant for the QIs measuring the proportion of residents with improved late-loss and early-loss ADLs, with higher proportions of residents not receiving PT associated with worse performance on the QIs (Table 2).

The proportion of residents receiving PT at the lowest amount (<45 minutes over <3 days) did not have a statistically significant relationship with any of the QIs in any of the bivariate models (Table 2). However, once entered into the models as an interaction term between the lowest amount of PT and the policy change, there was a statistically significant ($p < .01$) relationship

Figure 3: (a) Distribution of Quality Indicator Scores from 2011 to 2015, for Quality Indicators Where a Higher Score Indicates Better Performance. (b) Distribution of Quality Indicator Scores from 2011 to 2015, for Quality Indicators Where a Lower Score Indicates Better Performance [Color figure can be viewed at wileyonlinelibrary.com]

Note: The top of the box represents the 80th percentile, the bottom represents the 20th, and the center bar represents the median. ADL, activities of daily living; QI, quality indicator.

Figure 3: (continued)

Note: The top of the box represents the 80th percentile, the bottom represents the 20th, and the center bar represents the median. ADL, activities of daily living; QI, quality indicator.

with improved performance on the QIs measuring the proportion of residents with worse late-loss, early-loss, and overall ADLs (Table 2). This means that there is a positive relationship between the lowest amount of PT and improved performance on the QIs measuring prevention of late- and early-loss ADL

decline. Conversely, the interaction between the proportion of residents receiving the lowest amount of PT and the policy change was significantly associated with poorer performance on the QIs measuring the proportion of residents with improved late- and early-loss ADLs. That is, after the policy change, the proportion of resident receiving the lowest amount of PT was associated with better performance for preventing early- and late-loss ADL decline but worse performance at improving the same ADLs.

In the bivariate models, the proportion of residents receiving the second most time intensity of PT (45–150 minutes over 3–5 days) was associated with improved performance on the QI measuring the proportion of residents with worse overall ADLs and falls, and with poorer performance for worse early-loss and improved early-loss ADLs. The interaction with the policy change and the second amount of PT was statistically significantly associated with improved performance on the QIs measuring the proportion of residents with worse late-loss, and improved late- and early-loss ADLs (Table 2). In conclusion, after the policy change, the second amount of PT was associated with better performance on the QIs measuring prevention of late-loss ADL decline, and improvement of late- and early-loss ADLs.

Contrarily, the proportion of residents receiving the highest amount of PT (more than 150 minutes over more than 5 days) only remained significant in the bivariate models where it was associated with improvement on all the QIs measuring a decline in ADL status and falls (Table 2). There was no statistically significant relationship with the interaction between the highest amount of PT and the policy change for any of the QIs.

DISCUSSION

Our study explored the change in rehabilitation services and QIs over time, and the effect of a policy change that occurred in Ontario, Canada, in 2013. The results of our study indicate that the policy change may have improved some elements of care, but there is still room for improvement in delivering rehabilitative care in LTC. The overall proportion of residents receiving PT in LTC decreased after the policy change in 2013. Fewer residents received more time-intensive PT, but the residents receiving PT received the same amount on average. The policy and subsequent change in delivery of PT was associated with improved performance on several of the ADL QIs, but worse performance on others. The proportion of residents receiving more time-intensive PT was associated with improved performance on QIs measuring

Table 2: Bivariate and Interaction with Policy Change Estimates for All Quality Indicators at Each Level of Physical Therapy Provision

		<i>Quality Indicators – Proportion of Residents with:</i>		
<i>Parameter (Proportion of Residents per Home)</i>	<i>Model</i>	<i>Worse Late-Loss ADLs Estimate (95% CL)</i>	<i>Worse or Remained Dependent in Mid-Loss ADLs Estimate (95% CL)</i>	<i>Worse or Remained Dependent in Early-Loss ADLs Estimate (95% CL)</i>
Receiving no physical therapy	Bivariate	0.006 (–0.004, 0.016)	–0.011 (–0.022, 0.000)	–0.0153 (–0.028, –0.003)
	Interaction with policy change	–0.010 (–0.028, 0.007)	–0.006 (–0.025, 0.013)	0.028 (0.005, 0.051)
Receiving physical therapy for <45 minutes on <3 days	Bivariate	0.008 (–0.001, 0.018)	0.008 (–0.003, 0.018)	–0.004 (–0.016, 0.008)
	Interaction with policy change	–0.026*✓ (–0.043, –0.009)	–0.007 (–0.026, 0.011)	–0.003*✓ (–0.055, –0.013)
Receiving physical therapy for 45–150 minutes on 3–5 days	Bivariate	–0.006 (–0.014, 0.001)	0.003 (–0.005, 0.011)	0.017* (0.007, 0.027)
	Interaction with policy change	–0.019*✓ (0.005, 0.034)	0.011 (–0.005, 0.027)	0.007 (–0.011, 0.025)
Receiving physical therapy for >150 minutes on >5 days	Bivariate	–0.158* (–0.227, –0.088)	–0.167* (–0.243, –0.091)	–0.201* (–0.285, –0.117)
	Interaction with policy change	–0.085 (–0.289, 0.118)	–0.053 (–0.276, 0.169)	–0.076 (–0.335, 0.181)

Notes: Models are adjusted for health region, facility size, income quintile, and rurality, and their interaction terms with the policy change.
* $p < .01$; ✓ denotes association with improved performance on the quality indicator;
✗ denotes association with worse performance on the quality indicator.
ADLs, activities of daily living; CL, 95% confidence limits.

improvement of ADL function, and the proportion of residents receiving less time-intensive PT was associated with prevention of ADL decline. However, the proportion of residents receiving no PT and the least time-intensive PT was also associated with poorer performance on ADL QIs measuring improvement. Our analyses were conducted at the facility level. Thus, the results must be interpreted with caution to avoid ecological fallacy, where observations made at the facility level are interpreted at the resident level (Saunders et al. 2016).

The policy change has begun to move rehabilitation in LTC in Ontario in the right direction by increasing accountability and better targeting of services. However, we need to continue to determine how to best help residents improve their ADLs. Although the policy change was associated with improvement in QIs measuring prevention of ADL decline, it was also associated with worsening of the QIs measuring ADL improvement for the proportion receiving no PT and the lowest amount of PT. Additionally, over the

<i>Worse ADLs Long-form score Estimate (95% CL)</i>	<i>Falls in the Last 30 days Estimate (95% CL)</i>	<i>Improved Late-loss ADLs Estimate (95% CL)</i>	<i>Improved or Remained Independent in Mid-loss ADLs Estimate (95% CL)</i>	<i>Improved or Remained Independent in Early-loss ADLs Estimate (95% CL)</i>
0.018*	0.010*	0.005	0.008	0.011
(0.005, 0.031)	(0.003, 0.016)	(-0.003, 0.013)	(-0.005, 0.020)	(-0.000, 0.022)
-0.014	0.008	-0.029* χ	-0.009	-0.048* χ
(-0.036, 0.008)	(-0.003, 0.019)	(-0.043, -0.014)	(-0.031, 0.013)	(-0.068, -0.027)
0.015	0.007	0.006	0.003	0.013
(0.003, 0.027)	(0.000, 0.013)	(-0.002, 0.014)	(-0.009, 0.015)	(0.001, 0.024)
-0.036* χ	-0.010	-0.012* χ	-0.025	-0.026* χ
(-0.057, -0.014)	(-0.021, 0.000)	(-0.026, -0.002)	(-0.047, -0.005)	(-0.045, -0.007)
-0.016*	-0.008*	-0.006	-0.006	-0.013*
(-0.026, -0.007)	(-0.013, -0.004)	(-0.013, 0.000)	(-0.015, 0.003)	(-0.022, -0.005)
0.02	-0.006	0.024* χ	0.019	0.039* χ
(0.002, 0.039)	(-0.015, 0.003)	(0.012, 0.035)	(0.002, 0.037)	(0.023, 0.055)
-0.3*	-0.107*	-0.069	-0.020	-0.065
(-0.344, -0.167)	(-0.151, -0.063)	(-0.126, -0.012)	(-0.114, 0.074)	(-0.155, 0.025)
-0.08	0.032	-0.087	-0.068	-0.067
(-0.337, 0.174)	(-0.099, 0.163)	(-0.252, 0.078)	(-0.312, 0.175)	(-0.286, 0.153)

4 years included in our study, QIs measuring improvement in all levels of ADLs (i.e., early-, mid-, and late-loss ADLs) are demonstrating worse performance over time irrespective of PT involvement. Although the magnitude in improvement and decline were both small at around 2–3 percent, there is no reported clinically meaningful change for any of the QIs, and interpretation of QIs is more meaningful relative to the sample mean (Berg et al. 2002; Zimmerman 2003). Additionally, QIs are indicators of potential problems and a starting point for further clinical investigation (Zimmerman 2003). Therefore, interpretation of the change in QIs over time should not be placed on the magnitude but on the direction of the change. It is concerning that on average, Ontario's LTC homes are performing worse at improving residents' ADLs. This is especially concerning for the subgroup of residents that have the potential to improve. Therefore, we urge policy makers to continue to dialogue with and support researchers around determining the best model of funding and delivery of rehabilitation in LTC to support residents to improve their ADLs.

Prior to the policy change, a large proportion of residents in Ontario LTC homes received PT services in comparison with other Canadian provinces. Indeed, over 80 percent of residents in Ontario received PT, while the proportion of residents in the other provinces ranges from 5.8 to 29.5 percent (McArthur et al. 2015). Although rates decreased to 55 percent after the policy change, Ontario still has the highest percentage of residents receiving PT services. The decrease in residents receiving PT services is expected given the shift to an emphasis on strict eligibility criteria (Alliance 2013; Ontario 2016).

Although a smaller proportion of residents are receiving services, our study demonstrated there was an association with a decreased proportion receiving the second most time-intensive PT and better performance on the QIs measuring ADL improvement. Conversely, after the policy change, the proportion of residents receiving no PT and the least time-intensive amount of PT (<45 minutes over <3 days) was associated with worse performance on QIs measuring improvement in ADL function, but also improved performance on QIs measuring prevention of ADL decline. Our results suggest that less time-intensive PT may be more effective at preventing decline rather than facilitating improvement. Indeed, small positive effects on ADLs have only been seen in studies where interventions were delivered two to three times per week for 45–75 minutes (Crocker et al. 2013b). Physical therapists and other rehabilitation professionals practicing in LTC should ensure they are delivering services that are appropriate and sufficiently intense to induce change if the residents' goal is to improve their ADLs. Therefore, if the goal of treatment is to improve ADLs, residents should be receiving more time-intensive PT.

Perhaps these associations are related to the focus on strict eligibility, so residents who would benefit most from time-intensive PT are receiving it. Unfortunately, LTC homes in Ontario do not use supports built into the RAI 2.0 for assisting with clinical decision making around targeting of rehabilitation services called clinical assessment protocols (CAPs). Additionally, one of the items for the current ADL CAP to be triggered to facilitate improvement is that the resident is receiving PT; a circular argument for referring someone to PT. Advances need to be made in developing tools to assist clinicians in determining who to target for rehabilitation services in LTC. Researchers should continue to develop the RAI 2.0 CAPs to ensure residents who would benefit from more intense rehabilitation services are receiving those services. Specifically, receiving PT should be removed as a trigger for the ADL CAP, and future trials should examine the effect of using the CAPs to identify those eligible for time-intensive PT and those eligible for maintenance programs (e.g., exercise classes) on resident outcomes. Alternatively, a separate "Rehab

CAP” could be developed that triggers for residents that delineate which rehabilitation services the resident should be referred to. Items that could be included in the CAP are recent fluctuations in status such as falls, pneumonia, worsening ADL performance, or increasing pain.

An aim of the policy change was to shift away from PT services functioning as maintenance and prevention programs, and rather focus on improving physical function and mobility (Ontario 2016). Residents are to be discharged to other programs within the home for maintenance, such as exercise classes, once their therapy goals have been met (Ontario 2016). Granted, there may be a higher proportion of residents receiving low volume “maintenance” PT services because of a lag of paradigm shift from providers who worked before the policy change, or there may be a lack of other programs available in the home to accommodate the change. For example, in our study OT services decreased after the policy change and there was no change in therapeutic recreation or nursing rehab services to adjust for the reform. Therapeutic recreation or nursing rehab categories likely do not capture the extent to which exercise classes within the home are being delivered by other professionals, such as fitness instructors or kinesiologists. Nonetheless, a recent study revealed that the effects of 3 months of an individually tailored exercise program are reversed within 3 months of detraining (Frandin et al. 2016). Therefore, future work should determine whether residents who are discharged from PT are supported by other programs within the home, such as exercise classes or nursing rehab, and if these programs are effective at preventing functional decline.

There are parallels between the PT policy change in Ontario and other initiatives in the United States that have shifted from volume- to value-based funding, such as bundled payment for care improvement (BPCI) initiatives and accountable care organizations (ACOs). Briefly, BPCI refers to grouping medical services across a prespecified episode of care (e.g., acute or postacute periods) with the goal of reducing cost while improving health care quality (Dummit et al. 2016; Siddique and Mehta 2017; The Lewin Group 2017; Centers for Medicare & Medicaid Services 2017). ACOs are groups of health care providers (e.g., physicians, allied health) who work together to ameliorate the value of care (Nyweide et al. 2015; Siddiqi et al. 2017). BPCI initiatives have demonstrated reduced health care costs (Dummit et al. 2016; McLawhorn and Buller 2017; Siddiqi et al. 2017) and improved quality outcomes such as decreased length of stay (Iorio et al. 2016; Mouille, Higuera, and Woichevich 2017), rates of 30-day readmission (Mouille, Higuera, and Woichevich 2017), and increased rates of discharge to home (Iorio et al. 2016; Mouille, Higuera, and Woichevich 2017). ACOs have also demonstrated cost savings, but the

effect on quality outcomes is less evident (Nyweide et al. 2015; Siddique and Mehta 2017). BPCI and ACO policies are similar to the Ontario policy change in that they provide reimbursement for an episode of care rather than health care providers billing for individual patient interactions, with the goal of improving quality and reducing costs. Our findings are consistent with those of BPCI data, suggesting that there are improved quality outcomes because of shifting to an episode of care model.

However, there are also several differences between the policy change in Ontario, our analyses, and the US policies. First, the policy change was specific to the provision of PT services only, rather than the provision of all health care services within the LTC home. This continues to leave the Ontario LTC sector fragmented, and there is a lack of emphasis on multidisciplinary care. Physical therapists are often contracted into LTC homes in Ontario limiting their ability to interact with the interdisciplinary team, and the new policy does not promote a team approach to rehabilitation including other professionals like occupational therapists, kinesiologists, and nurses. Also, aside from our analyses, there is no routine measurement and reporting of quality outcomes with the new PT policy to ensure resident care is not being compromised, while rehabilitation costs are being saved. Second, bundled care is applied for discrete episodes or diagnoses. Indeed, the most common clinical episodes for BPCIs in the United States were joint replacement, pneumonia, congestive heart failure, chronic obstructive pulmonary disease, and sepsis (Greenwald et al. 2016). While funding discrete conditions may be appropriate for acute episodes, such as after joint arthroplasty, it is not applicable to residents in LTC who have several chronic conditions that affect their everyday functioning (Hirdes et al. 2011). Only 9.6 percent of residents are discharged to the community from Ontario LTC homes (Hirdes et al. 2011), as such most of the care provided is chronic. Additionally, BPCI and ACOs base their quality assessment on claims-based outcomes, such as length of stay or discharge to home, rather than clinical data such as ADLs or falls which we used in our analyses and are more relevant to the LTC sector.

A limitation of our study is that we were only able to report the amount of PT received in the 7 days prior to assessment. We had no data on the goals of PT, or what the PT intervention entailed. Our study may underestimate the proportion of residents receiving PT if they received in the last 3 months, but not in the last 7 days prior to assessment. We were unable to control for corporate ownership of LTC homes, which may have affected the rehabilitation services provision patterns before and after the policy change. Previous work has demonstrated the effect of for- and not-for-profit status on QIs, and

rehabilitation patterns could vary based on ownership patterns (Liu, Feng, and Mor 2014; Tanuseputro et al. 2015). We were also unable to gather information on the proportion of residents receiving other programs provided within the home, such as exercise, falls prevention, and activation. We were not able to capture differences in how professionals in each home collect data in the RAI 2.0, which may affect the validity of interfacility comparisons. However, each home does receive standardized training regarding how to accurately code and enter data in the RAI 2.0, and the Canadian Institute of Health Information completes data quality checks at regular intervals. Additionally, we were not able to follow residents who were discharged from the LTC home to the community and were only able to capture the 4 years included in our study as this is when the RAI 2.0 was implemented in Ontario. Finally, we were not able to gather the resident perspective on quality of care or the policy change given the nature of our data. However, our study was the first to describe the change in PT services before and after a policy change in the Ontario LTC context and to explore the relationship over time between the proportion of residents receiving services and the performance on QIs.

CONCLUSION

After the 2013 PT policy change in Ontario, fewer residents received PT overall. While controversial, the policy and subsequent PT service delivery change appears to be associated with improved performance on several ADL QIs. However, having a large proportion of residents receive no PT and the least time-intensive PT was associated with poorer performance on two of the ADL QIs after the policy change. More work is needed to determine the best funding and service delivery model to support residents to improve their ADLs.

ACKNOWLEDGMENTS

Joint Acknowledgment/Disclosure Statement: This work was completed as partial completion of Caitlin McArthur's doctoral work. It has been presented as a webinar for the Falls Loop Community of Practice, at the Ontario Physiotherapy Association's annual InterACTION conference, April 2018, the Canadian interRAI Conference, May 2018, and the Canadian Physiotherapy Association's Congress, November 2018. Caitlin McArthur was supported by an Ontario Graduate Scholarship to complete this work. Ashok Chaurasia, John Hirdes, and Katherine Berg

have no disclosures. Lora Giangregorio is funded by a Canadian Institute of Health Research New Investigator Award, and the Canadian Frailty Network.

Disclosures: None.

Disclaimer: None.

REFERENCES

- Alliance, R. C. 2013. "Update on Physiotherapy" [accessed on July 12, 2018]. Available at http://rehabcarealliance.ca/uploads/Image/Reports/Update_on_Physiotherapy_Reforms_-_Sept_2013.pdf
- Berg, K., V. Mor, J. Morris, K. M. Murphy, T. Moore, and Y. Harris. 2002. "Identification and Evaluation of Existing Nursing Homes Quality Indicators." *Health Care Financing Review* 23 (4): 19–36.
- Boyle, T. 2013. "Private Physio Clinics to Ask Courts to Stop Changes by Ontario Government." *Toronto Star*. [accessed on July 12, 2018]. Available at http://www.thestar.com/news/queenspark/2013/07/23/private_physio_clinics_to_ask_courts_to_stop_changes_by_ontario_government.html
- CARP. 2013. "Further Clarifications on Ontario Changes to Physiotherapy and Exercise/Fall Prevention Programs" [accessed on July 12, 2018]. Available at <http://www.carp.ca/2013/08/23/further-clarifications-on-ontario-changes-to-physiotherapy-and-exercisefall-prevention-programs/>
- Casale, A. S., R. A. Paulus, M. J. Selna, M. C. Doll, A. E. Bothe Jr, K. E. McKinley, S. A. Berry, D. E. Davis, R. J. Gilfillan, B. H. Hamory, and G. D. Steele Jr. 2007. "ProvenCareSM: A Provider-Driven Pay-for-Performance Program for Acute Episodic Cardiac Surgical Care." *Annals of Surgery* 246 (4): 613–21.
- Centers for Medicare & Medicaid Services. 2017. "Bundled Payments for Care Improvement (BPCI) Initiative: General Information|Center for Medicare & Medicaid Innovation" [accessed on January 8, 2018]. Available at <https://innovation.cms.gov/initiatives/bundled-payments>
- Crocker, T., A. Forster, J. Young, L. Brown, S. Ozer, J. Smith, J. Green, J. Hardy, E. Burns, E. Glidewell, and D. C. Greenwood. 2013a. "Physical Rehabilitation for Older People in Long-Term Care." *Cochrane Database Systematic Review* 2: CD004294.
- Crocker, T., J. Young, L. Forster, S. Brown, S. Ozer, and D. C. Greenwood. 2013b. "The Effect of Physical Rehabilitation on Activities of Daily Living in Older Residents of Long-Term Care Facilities: Systematic Review with Meta-Analysis." *Age and Ageing* 42 (6): 682–8.
- Cunningham. 1999. "HCFA Concerned That SNFs Are Limiting Therapy to PPS Patients, Using OMRA's to Change PPS Payments." *National Report on Subacute Care* 7 (21): 4–5.
- Dummit, L. A., D. Kahvecioglu, G. Marrufo, R. Rajkumar, J. Marshall, E. Tan, M. J. Press, S. Flood, L. D. Muldoon, Q. Gu, A. Hassol, D. M. Bott, A. Bassano, and P. H. Conway. 2016. "Association Between Hospital Participation in a Medicare

- Bundled Payment Initiative and Payments and Quality Outcomes for Lower Extremity Joint Replacement Episodes." *JAMA* 316 (12): 1267–78. <https://doi.org/10.1001/jama.2016.12717>
- Frandin, K., H. Gronstedt, J. L. Helbostad, A. Bergland, M. Andresen, L. Puggaard, K. Harms-Ringdahl, R. Granbo, and K. Hellström. 2016. "Long-Term Effects of Individually Tailored Physical Training and Activity on Physical Function, Well-Being and Cognition in Scandinavian Nursing Home Residents: A Randomized Controlled Trial." *Gerontology* 62 (6): 571–80.
- Fries, B. E., D. P. Schneider, W. J. Foley, M. Gavazzi, R. Burke, and E. Cornelius. 1994. "Refining a Case-Mix Measure for Nursing Homes: Resource Utilization Groups (RUG-III)." *Medical Care* 32 (7): 668–85.
- Frijters, D. H., H. G. van der Roest, I. G. Carpenter, H. Finne-Soveri, J.-C. Henrard, A. Chetrit, J. Gindin, and R. Bernabei. 2013. "The Calculation of Quality Indicators for Long Term Care Facilities in 8 Countries (SHELTER Project)." *BMC Health Services Research* 13: 138.
- Greenwald, A. S., A. Bassano, S. Wiggins, and M. I. Froimson. 2016. "Alternative Reimbursement Models." *Journal of Bone Joint Surgery* 98 (11): e45.
- Hedeker, J., and R. Gibbons. 2006. *Longitudinal Data Analysis*, Vol. 451. Hoboken, NJ: John Wiley & Sons Ltd.
- Hellsten, E., S. Chu, R. T. Crump, K. Yu, and J. M. Sutherland. 2016. "New Pricing Approaches for Bundled Payments: Leveraging Clinical Standards and Regional Variations to Target Avoidable Utilization." *Health Policy* 120 (3): 316–26.
- Hirdes, J. P., L. Mitchell, C. J. Maxwell, and N. White. 2011. "Beyond the 'Iron Lungs of Gerontology': Using Evidence to Shape the Future of Nursing Homes in Canada." *Canadian Journal on Aging* 30 (3): 371–90.
- Iorio, R., A. J. Clair, I. A. Inneh, J. D. Slover, J. A. Bosco, and J. D. Zuckerman. 2016. "Early Results of Medicare's Bundled Payment Initiative for a 90-Day Total Joint Arthroplasty Episode of Care." *Journal of Arthroplasty* 31 (2): 343–50.
- Jones, R. N., J. P. Hirdes, J. W. Poss, M. Kelly, K. Berg, B. E. Fries, and J. N. Morris. 2010. "Adjustment of Nursing Home Quality Indicators." *BMC Health Services Research* 10: 96.
- Kuhn, B., and C. Lehn. 2015. "Value-Based Reimbursement: The Banner Health Network Experience." *Frontiers of Health Services Management* 32 (2): 17–31.
- The Lewin Group. 2017. "CMS Bundled Payments for Care Improvement Initiative Models 24: Year 3 Evaluation & Monitoring Annual Report."
- Liu, C., Z. Feng, and V. Mor. 2014. "Case-Mix and Quality Indicators in Chinese Elder Care Homes: Are There Differences between Government-Owned and Private-Sector Facilities?" *Journal of the American Geriatrics Society* 62 (2): 371–7.
- Mayes, R. 2011. "Moving (realistically) from Volume-Based to Value-Based Health Care Payment in the USA: Starting with Medicare Payment Policy." *Journal of Health Services Research and Policy* 16 (4): 249–51.
- McArthur, C., J. Hirdes, K. Berg, and L. Giangregorio. 2015. "Who Receives Rehabilitation in Canadian Long-Term Care Facilities? A Cross-Sectional Study." *Physiother Canada* 67 (2): 113–21.

- McLawhorn, A. S., and L. T. Buller. 2017. "Bundled Payments in Total Joint Replacement: Keeping Our Care Affordable and High in Quality." *Current Reviews in Musculoskeletal Medicine* 10 (3): 370–7.
- Mor, V., O. Intrator, M. A. Unruh, and S. Cai. 2011. "Temporal and Geographic Variation in the Validity and Internal Consistency of the Nursing Home Resident Assessment Minimum Data Set 2.0." *BMC Health Services Research* 11: 78.
- Mor, V., K., Berg, J. Angelelli, D. Gifford, J. Morris, and T. Moore. 2003a. "The Quality of Quality Measurement in U.S. Nursing Homes." *Gerontologist* 43: 37–46.
- Mor, V., J. Angelelli, R. Jones, J. Roy, T. Moore, and J. Morris. 2003b. "Inter-Rater Reliability of Nursing Home Quality Indicators in the U.S." *BMC Health Services Research* 3 (1): 20.
- Morris, J. N., S. Nonemaker, K. Murphy, C. Hawes, B. E. Fries, V. Mor, and C. Phillips. 1997. "A Commitment to Change: Revision of HCFA's RAI." *Journal of the American Geriatrics Society* 45 (8): 1011–6.
- Mouille, B., C. Higuera, L. Woicevovich and M. Deadwiler. 2016. "NEW RISK, NEW BUSINESS MODELS: How to Succeed in Bundled Payments for Total Joint Replacement" NEJM Catalyst [accessed on July 12, 2018]. Available at <https://catalyst.nejm.org/how-to-succeed-in-bundled-payments-for-total-joint-replacement/>
- Nyweide, D. J., W. Lee, T. T. Cuedon, H. H. Pham, M. Cox, R. Rajkumar, and P. H. Conway. 2015. "Association of Pioneer Accountable Care Organizations vs. Traditional Medicare Fee for Service with Spending, Utilization, and Patient Experience." *JAMA* 313 (21): 2152.
- Ontario. 2016. "Improving Physiotherapy Access, Value and Accountability. Amendments To Regulation 552 of Health Insurance Act (HIA)" [accessed on July 12, 2018]. Available at https://www.ontariocanada.com/registry/view_posting.jsp;jsessionid=M-fXcXjlRRzI65-zcyo0CY?postingId=13002.
- Ontario Society of Occupational Therapists. 2018. Restoring Access to OT in Long-Term Care Homes. [accessed on July 12, 2018]. https://www.ontariocanada.com/registry/view_posting.jsp;jsessionid=M-fXcXjlRRzI65-zcyo0CY?postingId=13002
- du Plessis, V., R. Beshiri, R. D. Bollan, and H. Clemenson. 2002. *Definitions of "Rural"*, Vol. 61. Ottawa, ON: Statistics Canada – Agricultural Division.
- Poss, J. W., N. M. Jutan, J. P. Hirdes, B. E. Fries, J. N. Morris, G. F. Teare, and K. Reidel. 2008. "A Review of Evidence on the Reliability and Validity of Minimum Data Set Data." *Healthcare Management Forum* 21 (1): 33–9.
- Prada, G., and T. Brown 2012. "The Canadian Health Care Debate: A Survey and Assessment of Key Studies." The Conference Board of Canada [accessed on July 12, 2018]. Available at <https://www.conferenceboard.ca/CASHC/research/2012/healthcaredebate.aspx?AspxAutoDetectCookieSupport=1>
- Saunders, C. L., M. N. Elliott, G. Lyratzopoulos, and G. A. Abel. 2016. "Beyond the Ecological Fallacy: Potential Problems When Studying Healthcare Organisations." *Journal of the Royal Society of Medicine* 109 (3): 92–7.
- Siddiqi, A., P. B. White, J. B. Mistry, C. U. Gwam, J. Nace, M. A. Mont, and R. E. Delanois. 2017. "Effect of Bundled Payments and Health Care Reform as Alternative Payment Models in Total Joint Arthroplasty: A Clinical Review." *Journal of Arthroplasty* 32 (8): 2590–7.

- Siddique, S. M., and S. J. Mehta. 2017. "Market Evaluation." *Anesthesiology Clinics* 35 (4): 715–24.
- Smart A. 2013. "Smart: Thumbs up from Ontario Physiotherapists" [accessed on July 12, 2018]. Available at <http://www.lfpress.com/2013/07/25/smart-thumbs-up-from-ontario-physiotherapists>
- Struijs, J. N., and C. A. Baan. 2011. "Integrating Care Through Bundled Payments—Lessons from The Netherlands." *New England Journal of Medicine* 364 (11): 990–1.
- Tanuseputro, P., M. Chalifoux, C. Bennett, A. Gruneir, S. E. Bronskill, P. Walker, and D. Manuel. 2015. "Hospitalization and Mortality Rates in Long-Term Care Facilities: Does For-Profit Status Matter?" *Journal of the American Medical Directors Association* 16 (10): 874–83.
- White, C. 2003. "Rehabilitation Therapy in Skilled Nursing Facilities: Effects of Medicare's New Prospective Payment System." *Health Affairs (Millwood)* 22 (3): 214–23.
- Zimmerman, D. R. 2003. "Improving Nursing Home Quality of Care Through Outcomes Data: The MDS Quality Indicators." *International Journal of Geriatric Psychiatry* 18 (3): 250–7.

SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section at the end of the article.

Appendix SA1: Author Matrix.