Exploring Variation in Rates of Polypharmacy Across Long-Term Care Homes

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Abstract

Objective: Use of multiple, concurrent drug therapies, often referred to as polypharmacy, is a concern in the long-term care (LTC) setting, where frail older adults are particularly at risk for adverse events. We quantified the scope of this practice by exploring variation in the use of nine or more drug therapies across LTC homes.

Design: Cross-sectional analysis of LTC home census data.

Setting: All LTC homes in Ontario, Canada.

Participants: A total of 64,394 LTC residents aged 66 years and older residing in 589 LTC homes in the fall of 2005.

Measurements: Facility-level rates of polypharmacy were compared with rates of use of Beers criteria and antipsychotic drug therapies. Multivariate logistic regression models were used to assess predictors of polypharmacy across residents and LTC homes.

Results: Nine or more drug therapies were dispensed concurrently to 10,007 (15.5%) of LTC home residents. Compared with those dispensed fewer drugs, residents receiving 9 or more drug therapies were more likely to have multiple comorbidities. There was threefold variation in polypharmacy rates across homes (26.2% versus 7.9%) and facility-level rates of polypharmacy were modestly correlated with rates of use of Beers criteria drugs ($r = 0.27$, $P < .001$) and antipsychotic drug therapies ($r = 0.16$, $P < .001$). Controlling for resident factors, those living in LTC homes with high polypharmacy rates were more likely to receive 9 or more drug therapies (odds ratio 1.9, 95% confidence interval 1.7–2.0).

Conclusion: Residents in Ontario LTC homes commonly received nine or more concurrent drug therapies, particularly residents with multiple chronic conditions. The threefold variation in rate across homes suggests a role for this measure in guiding drug review at the facility level.

Keywords:
Long-term care polypharmacy variation

One enduring quality of care issue, with older adults more broadly and in long-term care (LTC) homes in particular, is the appropriate use of drug therapies.\textsuperscript{1–4} An area of particular concern is the use of multiple, concurrent drug therapies: a treatment pattern often referred to as polypharmacy.\textsuperscript{5,6} Research has shown that as the total number of drug therapies dispensed to older adults...
rises, both the use of inappropriate drug therapies\(^7\) and risk of adverse drug events\(^8,9\) increases. In frail LTC home residents, the likelihood of polypharmacy is increased owing to the number of chronic conditions that co-occur. This multimorbidity potentially leads to separate treatment strategies for each condition, which are not always mutually beneficial.\(^10,11\) Inherent in the definition of polypharmacy, therefore, is a tension between limiting the over-prescribing of inappropriate drug therapies while at the same time avoiding underuse of beneficial drug therapies.\(^12\)

Assessing the extent of polypharmacy in LTC homes has figured prominently in reports on the quality of care in LTC.\(^13,14\) In this setting, a common measure of polypharmacy is the concurrent prescription of nine or more drug therapies. Recent research has found that rates of polypharmacy increased among older adults newly admitted to LTC, and that the odds of being dispensed nine or more drug therapies was greatest for individuals with multiple chronic conditions and for those prescribed drugs by multiple physicians.\(^15,16\) This measure of polypharmacy has also been shown to be a risk factor for adverse drug reactions in geriatric LTC-home residents.\(^17\) Use of this measure as an indicator of care quality, however, is controversial primarily because of concerns about content validity and precision.\(^18,19\) It must also be acknowledged that this threshold should not be used as an arbitrary quota, but rather as a starting point for reviewing the concomitant use of unnecessary medications.

To explore the usefulness of polypharmacy as a marker of quality of care in LTC homes, we set out to quantify the extent to which nine or more drug therapies were concurrently dispensed to Ontario LTC residents, to identify resident and LTC home characteristics associated with polypharmacy, to explore the variation in polypharmacy across LTC homes, and to consider the relationship between polypharmacy and other published indicators of prescribing quality.

**Methods**

**Setting**

In Ontario, publically funded residential LTC is available for individuals who require access to 24-hour nursing care and supervision within a secure setting.\(^20\) The provincial government sets standards for care, inspects homes annually, and sets the rules governing eligibility through a centralized admission process. Payments are based on a resident needs-based formula and cover nursing and personal care, quality of life programs, food, and accommodation costs. Residents also pay a fixed copayment for accommodation.

**Study Design and Population**

We performed a cross-sectional study within a population-based cohort assembled from four large, linked health care administrative databases housed at the Institute for Clinical Evaluative Sciences (www.ices.on.ca). These included clinical, functional, and behavioral information on LTC residents from an annual census of all LTC residents: the Levels of Care Resident Classification System Database (LOC); demographic data from the Ontario Registered Persons Database (the provincial health insurance plan registry); drug information from the Ontario Drug Benefit Program (which administers public drug insurance benefits for Ontarians aged 65 years and older); and use of acute care hospitals from the Canadian Institute for Health Information Hospital Discharge Abstract Database. Encrypted unique identifiers common between databases were used to link information for residents in the study. This study received approval from the Research Ethics Board of Sunnybrook Health Sciences Centre, Toronto, Ontario.

The census date from the LOC served as the reference date for our study and allowed us to identify 68,939 prevalent residents of 589 LTC homes in the fall of 2005, the most recent year that a complete census of LTC residents is available. Before 2006, the LOC system was used for case-mix reimbursement and it was required that the charts of all residents in all LTC facilities undergo the census process. As prescription drug benefits begin on an Ontarian’s 65th birthday, residents younger than 66 at the time of the census were excluded (n = 4545) to avoid incomplete medication records. A cohort of 64,394 prevalent residents remained for analysis.

**Identifying the Prevalence of Polypharmacy**

For each resident, all drug therapies dispensed in 2005 were identified. A medication was counted in the prevalence estimates if a course of therapy overlapped the date of the LTC census. In general, this count did not include nonprescription medications. For descriptive purposes, drug therapies were grouped according to subclass based on an adaptation of the pharmacologic-therapeutic classification system of the American Hospital Formulary Service, American Society of Health-System Pharmacists.\(^21\) Polypharmacy was defined as taking nine or more distinct drug therapies at the time of the census.

**Resident Characteristics**

Resident characteristics included age, gender, and low income level (based on Ontario Drug Benefit Plan copayment criteria).\(^21\) Recent discharge (≤30 days) from an acute care hospital and length of stay in LTC at census were also computed. The Deyo-Charlson comorbidity score\(^22\) was calculated based on diagnoses recorded during acute care hospitalizations in the five years preceding the census; residents who had no hospitalizations in this time frame were separately identified. Data obtained from the LOC census instrument\(^23\) included regular family visitors to the LTC facility, concurrent clinical diagnoses, evidence of memory loss, activities of daily living, and selected behaviors (wandering,

### Table 1

**Top 10 Prevalent Drug Subclasses Dispensed to Residents of Ontario Long-Term Care Homes in 2005**

<table>
<thead>
<tr>
<th>By Subclass Name</th>
<th>N</th>
<th>%</th>
<th>By Subclass Name</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>To residents with at least 1 drug claim (n = 62,559)</strong></td>
<td></td>
<td></td>
<td><strong>To residents with 9 or more concurrent drug claims (n = 10,007)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diuretics</td>
<td>24,263</td>
<td>37.7</td>
<td>Diuretics</td>
<td>6827</td>
<td>68.2</td>
</tr>
<tr>
<td>Antipsychotic agents</td>
<td>21,080</td>
<td>32.7</td>
<td>Proton pump inhibitors</td>
<td>5480</td>
<td>54.8</td>
</tr>
<tr>
<td>Angiotensin-converting enzyme inhibitors</td>
<td>19,229</td>
<td>29.9</td>
<td>Angiotensin-converting enzyme inhibitors</td>
<td>5170</td>
<td>51.7</td>
</tr>
<tr>
<td>Proton pump inhibitors</td>
<td>17,990</td>
<td>27.9</td>
<td>Beta blockers</td>
<td>4325</td>
<td>41.2</td>
</tr>
<tr>
<td>Selective serotonin reuptake inhibitors</td>
<td>16,397</td>
<td>25.5</td>
<td>Benzodiazepine derivatives</td>
<td>4156</td>
<td>41.5</td>
</tr>
<tr>
<td>Benzodiazepine derivatives</td>
<td>13,780</td>
<td>21.4</td>
<td>Selective serotonin reuptake inhibitors</td>
<td>4115</td>
<td>41.1</td>
</tr>
<tr>
<td>Beta blockers</td>
<td>13,650</td>
<td>20.5</td>
<td>Calcium channel blockers</td>
<td>3878</td>
<td>38.8</td>
</tr>
<tr>
<td>Cholinesterase inhibitors</td>
<td>13,319</td>
<td>20.7</td>
<td>Antipsychotic agents</td>
<td>3750</td>
<td>37.5</td>
</tr>
<tr>
<td>Hypothyroidism therapy</td>
<td>13,168</td>
<td>20.2</td>
<td>Statins</td>
<td>3693</td>
<td>36.9</td>
</tr>
<tr>
<td>Calcium channel blockers</td>
<td>12,548</td>
<td>19.5</td>
<td>Opiate agonists</td>
<td>3249</td>
<td>32.5</td>
</tr>
</tbody>
</table>
aggression, agitation, depression, anxiety). We also tracked the total number of unique prescribing physicians listed for each resident's medications.

Variation in Polypharmacy Across LTC Homes

We calculated the percentage of residents who were dispensed 9 or more drug therapies concurrently at each LTC facility. A funnel plot was produced to visually examine variation in polypharmacy across LTC homes.24 We plotted the proportion of residents dispensed 9 or more drug therapies against the number of residents per facility and superimposed exact inverse binomial limits to generate 95% control limits for the facility-level polypharmacy rates. This method took into account not only the facility-specific polypharmacy rates, but also the number of residents included in the calculation for each facility (as there was less statistical stability in the rates calculated for smaller facilities). This precision was reflected in the funnel shape of the control limits, where facilities with few residents had wider limits (ie, less likely to be an outlier at a given cut point) and facilities with more residents had narrower limits. LTC homes that fell above or below the 95% control limits were defined as “high-rate facilities” or “low-rate facilities,” respectively. LTC homes within the 95% control limits were classified as having “expected rates.” Residents were classified according to the polypharmacy category of their LTC home.

Additional Indicators of Prescribing Quality

The Beers criteria are an explicit list of drug therapies, dosages, and durations of therapy that should be avoided in elderly persons.2,25 Now more than 10 years old, this list was reviewed in 2003 to reevaluate the severity ratings of existing drug therapies and to add new products and information.3 The Beers criteria list of drug therapies are frequently used as a measure of quality of care.4,26 To test the validity of nine or more concurrent drug therapies as a facility-level marker of quality, we assessed the correlation between a LTC home’s polypharmacy category and its residents’ use of Beers criteria drugs. Another drug therapy quality measure that has received considerable discussion is the use of antipsychotics to manage LTC residents’ symptoms of dementia.27–29 To further validate our polypharmacy measure, we compared it with a facility-level measure of antipsychotic use.30

Statistical Analysis

Descriptive statistics were used to document prescription patterns and to compare resident and facility characteristics across the prescribing categories. Multilevel logistic regression models, which accounted for the clustering of residents within LTC homes, were used to identify independent predictors of polypharmacy across homes. Rate ratios and Pearson correlation coefficients were used to compare the use of Beers criteria drugs and antipsychotic drug therapies with rates of polypharmacy. All statistical analyses were performed at the Institute for Clinical Evaluative Sciences using SAS 9.1 (SAS Institute Inc., Cary, NC).

Results

In our cohort, 10,007 (15.5%) of prevalent LTC residents were concurrently dispensed nine or more drug therapies and, among these individuals, 1294 (2.0% of all residents) received 13 or more drug therapies. Few residents (1835 or 2.9%) received no drug therapy and the remaining 52,552 (81.6%) were dispensed between one and eight drugs. Table 1 highlights the most commonly dispensed drug therapies by subclass. Among LTC residents with at least one drug claim, diuretics (37.7%), antipsychotic agents (32.7%), and angiotensin-converting enzyme inhibitors (29.9%) were the most common drug therapies dispensed. Among residents who received nine or more drug therapies concurrently, diuretics (68.2%), proton pump inhibitors (54.8%), and angiotensin-converting enzyme inhibitors (51.7%) were the most commonly dispensed drug therapies. Psychoactive drugs were also prevalent.

Table 2

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Number (%) Residents</th>
<th>Number (%) Residents</th>
</tr>
</thead>
<tbody>
<tr>
<td>9 Drugs</td>
<td>692 (6.9)</td>
<td>1,427 (2.6)</td>
</tr>
<tr>
<td>0 Drugs</td>
<td>82.6 ± 6.9</td>
<td>84.8 ± 7.5</td>
</tr>
</tbody>
</table>

Demographic characteristics

Age at index (years), mean ± SD

Age group

66–74 years 1,343 (13.4) 5,278 (9.7)
75–84 years 4,535 (45.3) 19,925 (36.6)
85+ years 4,129 (41.3) 29,184 (53.7)

Male 2,771 (27.7) 14,941 (27.5)

Low income 4,607 (46.0) 22,314 (41.0)

Weekly family contact 8,162 (81.6) 40,838 (75.1)

Medical history

Discharged from acute care hospital in prior 30 days 692 (6.9) 1,427 (2.6)

Length of stay in long-term care

≤ 90 days 1,063 (10.6) 3,987 (7.3)
91–365 days 2,309 (23.1) 11,260 (20.7)
>365 days 6,635 (66.3) 39,140 (72.0)

Charlson comorbidity score<sup>c</sup>

0 1,604 (16.0) 13,529 (24.9)
1 1,915 (19.1) 12,438 (22.9)
2 or more 5,705 (57.0) 16,069 (29.6)

No prior hospitalizations 783 (7.8) 12,351 (22.7)

Current clinical diagnoses<sup>1</sup>

Blood diseases 755 (7.5) 4,361 (8.0)
Circulatory diseases 8,204 (82.0) 33,478 (61.6)
Digestive disorders 2,112 (21.1) 9,720 (17.9)
Endocrine & metabolic disorders 5,504 (55.0) 17,920 (33.0)
Genitourinary disorders 1,256 (12.6) 5,078 (9.3)
Mental disorders 5,366 (53.6) 36,913 (67.9)
Musculoskeletal disabilities 5,439 (54.4) 29,218 (53.7)
Neoplasms 1,035 (10.3) 5,527 (10.2)
Neurological motor functioning 3,752 (37.5) 17,750 (32.6)
Pulmonary diseases 2,311 (23.1) 7,356 (13.5)
Sensory disorders 1,952 (19.5) 11,802 (21.7)
Skin diseases 273 (2.7) 2,028 (3.7)
Congenital anomalies 29 (0.3) 216 (0.4)
Infectious diseases 160 (1.6) 740 (1.4)

Memory impairment

Cannot locate room 2,717 (27.12) 25,444 (46.8)
Does not recognize staff 2,054 (20.5) 22,270 (41.0)
Cannot remember immediate instruction 1,733 (17.3) 19,095 (35.1)

Assistance with daily living

Constant assistance with eating 2,778 (27.8) 23,342 (42.9)
Assistance with toileting 7,184 (71.8) 37,435 (68.8)
Does not use toilet 784 (7.8) 7,222 (13.4)

Major assistance with transferring 4,795 (47.9) 28,579 (52.6)

Constant assistance with dressing 8,768 (87.6) 48,951 (90.0)

Behaviors

Wandering 749 (7.5) 7,187 (13.2)
Aggression 1,456 (14.6) 9,411 (17.3)
Agitation 1,215 (12.1) 7,801 (14.3)
Resists treatment 788 (7.9) 20,732 (38.3)
Acts sad or depressed 5,233 (52.3) 22,273 (41.0)
Anxious behavior 2,471 (24.7) 10,591 (19.5)

<sup>c</sup>Charlson comorbidity score components (Deyo RA, Cherkin DC, Ciol MA. Adapting a clinical comorbidity index for use with ICD-9-CM administrative databases. J Clin Epidemiol 1992;45:613–619) based on hospitalizations during the previous 5 years.

<sup>1</sup>Clinical diagnoses based on disease grouping provided on the Levels of Care census instrument.
among residents with polypharmacy, including benzodiazepine derivatives (41.5%), selective serotonin reuptake inhibitors (41.1%), and antipsychotic agents (37.5%).

**Resident Characteristics**

The demographic characteristics of residents who were dispensed 9 or more drug therapies were similar to those who received fewer drugs (Table 2), although the proportion of "younger" older adults was higher among polypharmacy recipients (13.4% versus 9.7%). There was no difference in the proportion of women represented in the two groups. Medical history indicated that those dispensed nine or more drug therapies were more likely to have been recently discharged from an acute care hospital (6.5% versus 2.6%), more likely to have had a length of stay in LTC of 90 days or fewer (10.6% versus 7.3%), and more likely to have a Deyo-Charlson comorbidity score of 2 or more (57.0% versus 29.6%). Cardiac, endocrine, and pulmonary diseases were also more common in polypharmacy recipients than among those receiving fewer drug therapies (Table 2). Memory problems and need for assistance with daily activities were less common in those with polypharmacy. Depression (52.3% versus 41.0%) and anxious behavior (24.7% versus 19.5%) were more prevalent in those receiving nine or more drug therapies.

**Variation in Polypharmacy Rates Across LTC Homes**

Sixty-five LTC homes (accounting for 8273 residents) were identified by the funnel plot as high-rate facilities for polypharmacy and 116 LTC homes (accounting for 14,286 residents) were identified as low-rate facilities; the remaining LTC homes had rates within the control limits (Table 3). Given that the control limits followed a funnel shape, there was some overlap in the range of polypharmacy estimates across low-, high-, and expected-rate categories. The average rate of polypharmacy varied threefold between high-rate and low-rate LTC homes (26.2% to 7.9% of residents). Relative to homes with low rates of polypharmacy, those with high rates were more likely to involve multiple prescribers. Facility-level rates of polypharmacy were modestly correlated with the other measures of prescribing quality. The correlation coefficient with Beers criteria drug therapies was 0.27 (P < .001) and there was 1.7-fold variation in Beers rates between high- and low-rate LTC homes. The correlation between polypharmacy and antipsychotic drug use at the facility level was statistically significant when use was examined among those with a history of dementia (ρ = 0.16, P < .001) but not significant when antipsychotic use was examined among those with no potential indication (ρ = 0.07, P = .09).

**Identifying Factors Associated with Polypharmacy in LTC Home Residents**

Figure 1 shows the factors associated with an increased likelihood of polypharmacy in individual LTC home residents as identified by multiple logistic regression. A Charlson comorbidity score of 2 or more was associated with increased odds of polypharmacy (odds ratio [OR] 2.3, confidence interval [CI] 2.1—2.4), as were several of the clinical diagnoses. Anxious behaviors (OR 1.3, CI 1.2—1.4) and feelings of depression (OR 1.4, CI 1.3—1.4) had smaller but significant association with polypharmacy in LTC home residents.

The model results also indicate that, after controlling for these resident-specific clinical conditions and behaviors, residents living in LTC homes with high rates of polypharmacy were much more likely to receive 9 or more concurrent drug therapies (OR 1.9, CI 1.7—2.0) than those living in LTC homes with expected rates (reference group) or lower rates (OR 0.5, CI 0.4—0.5). In addition, receiving prescriptions from multiple physicians (OR 1.7, CI 1.6—1.8) was another contextual factor strongly associated with increased likelihood of polypharmacy in LTC home residents.

**Discussion**

Our population-based study found that 15% of long-term care home residents were dispensed nine or more drug therapies concurrently. Although drug therapies used to treat chronic conditions (such as diuretics, proton pump inhibitors, and angiotensin-converting enzyme inhibitors) were most prevalent in this subgroup of residents, psychoactive drug subclasses (such as benzodiazepine derivatives and antipsychotic agents) were also common. There was considerable variation in the rate of polypharmacy across LTC homes: threefold variation was reported in the average polypharmacy rate between high-rate and low-rate LTC homes (26.2% to 7.9% of residents respectively) and this variation was modestly correlated with other indicators of prescribing quality. In adjusted models, high rates of polypharmacy in individual residents were not fully explained by clinical characteristics, and other contextual factors, such as the rate of polypharmacy in the LTC home

### Table 3

**Variation in Polypharmacy and Drug Quality Indicators Across Ontario Long-Term Care Homes by Facility-Level Rate of Polypharmacy**

<table>
<thead>
<tr>
<th>Category</th>
<th>Low-Rate LTC Homes</th>
<th>Expected-Rate LTC Homes</th>
<th>High-Rate LTC Homes</th>
<th>Rate Ratio (high/low)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of residents</td>
<td>14,286</td>
<td>41,835</td>
<td>8273</td>
<td>—</td>
</tr>
<tr>
<td>Number of long-term care homes</td>
<td>116</td>
<td>408</td>
<td>65</td>
<td>—</td>
</tr>
<tr>
<td>Rates of concurrent medication dispensing</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Range of polypharmacy rates across long-term care homes (%)</td>
<td>0%—11%</td>
<td>7%—31%</td>
<td>21%—50%</td>
<td>—</td>
</tr>
<tr>
<td>Rate across residents (%)</td>
<td>1123 (7.9%)</td>
<td>6719 (16.0%)</td>
<td>2165 (26.1%)</td>
<td>3.3</td>
</tr>
<tr>
<td>Drug quality indicators (n = 64,394 residents)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beers criteria drugs (%)</td>
<td>554 (3.9%)</td>
<td>2404 (5.8%)</td>
<td>544 (6.6%)</td>
<td>1.7</td>
</tr>
<tr>
<td>Antipsychotic use with diagnosis history of dementia (%)</td>
<td>2564 (18.0%)</td>
<td>8771 (21.0%)</td>
<td>1861 (22.5%)</td>
<td>1.3</td>
</tr>
<tr>
<td>Antipsychotic use with no diagnosis history of psychoses or dementia (%)</td>
<td>196 (1.4%)</td>
<td>836 (2.0%)</td>
<td>200 (2.4%)</td>
<td>1.8</td>
</tr>
<tr>
<td>Number of prescribing physicians (n = 61,957 residents)</td>
<td>11,967 (83.8%)</td>
<td>32,330 (77.3%)</td>
<td>6188 (74.8%)</td>
<td>0.9</td>
</tr>
<tr>
<td>2+ (%)</td>
<td>1390 (9.7%)</td>
<td>6677 (16.0%)</td>
<td>1231 (19.0%)</td>
<td>1.5</td>
</tr>
<tr>
<td>No drugs dispensed (%)</td>
<td>627 (4.4%)</td>
<td>1083 (2.6%)</td>
<td>125 (1.5%)</td>
<td>0.3</td>
</tr>
</tbody>
</table>

*Cut points for categories of facility-level dispensing determined by control limits on funnel plot. Because of this funnel shape, there was some overlap in the range of polypharmacy estimates across low-, high-, and expected-rate categories, as facilities with rates calculated on fewer residents had wider limits than those calculated on more residents.

*Excludes 2437 residents who did not have a unique physician identifier on claim.
and the number of prescribing physicians, remained associated with increased odds of receiving nine or more drug therapies. The threefold variation in polypharmacy rates across LTC homes presented in this study suggests that reductions in polypharmacy rates across Ontario facilities are likely feasible.

Our findings regarding the prevalence of polypharmacy are generally consistent with those reported elsewhere for seniors and long-term care home residents.\textsuperscript{16,31,32} One recently published study,\textsuperscript{15} however, reported much higher rates of polypharmacy—close to 40% of LTC home residents—but identified similar resident predictors. Our study was a point-prevalence study: we examined concurrent medication use on a single day, and therefore our estimates of polypharmacy appear slightly lower than other studies that examined monthly\textsuperscript{32} or yearly\textsuperscript{31} prevalence of drug use. In addition, the utilization rates that we reported were exclusively for prescription drugs; over-the-counter medications are not covered by the Ontario Drug Benefit Plan and were not included in our study. Although our estimates are conservative in terms of appraising total drug burden over time, they do present a snapshot of the daily prescription drug burden among a typical long-term care home resident.

This study builds on prior work by extending analyses to compare polypharmacy rates at the facility level; in particular by exploring the correlation between rates of use of 9 or more medications and other potential indicators of prescribing quality. We acknowledge that the technical definition of polypharmacy can result in much debate. For example, raw counts of drug therapies can be limited in terms of content validity (ie, Are over-the-counter medications and herbal/supplements included?) and imprecision (ie, Are drug

![Fig. 1. Odds of polypharmacy among Ontario long-term care residents in 2005.](image-url)
therapies or drug classes being counted). Furthermore, reporting simple frequencies of medications does not account for the appropriateness of the drug therapies selected. In particular, for many of the prevalent conditions identified in this study, treatment often requires multiple concomitant medications. For example, older patients with diabetes may require two or three oral agents or insulin for glycemic control: a statin, aspirin, and an angiotensin-converting enzyme inhibitor or angiotensin receptor blocker (ARB), at a minimum, and omission of any of these could represent mismanagement. Therefore, evidence-based standards of medical care should not be undermined when counts of drug therapies are calculated across patients.

Conceptually, however, our proposed use of nine or more medications as a proxy of drug burden is consistent with recent efforts to reframe the management of the medications of clinically complex elders and, as such, in the absence of an expert-derived medications as a proxy of drug burden is consistent with recent calculated across patients. Mismanagement. Therefore, evidence-based standards of medical insulin for glycemic control: a statin, aspirin, and an angiotensin-quality in LTC. This concept can be extended to include how the increasing involvement of multiple specialists can influence the quality of drug prescribing. Our finding of an increased risk of polypharmacy among residents with multiple prescribers highlights the need for future work in this area.

There are important limitations to this study. The linked databases do not include information on the indication for drug therapies and therefore we are unable to draw inferences about the appropriateness of polypharmacy in individual residents. Second, this study examined polypharmacy as a broad occurrence and did not identify specific combinations of drug therapies known to be associated with adverse events. Future work could be strengthened by linking variations in polypharmacy patterns to variations in related adverse events across facilities. Third, the quality indicators that were chosen as comparators are commonly used but are also subject to similar limitations regarding indication and appropriateness. Finally, future studies should further explore the important observation that polypharmacy is not only associated with overprescribing of potentially harmful medications, but has also been linked to an increased risk of underprescribing of potentially beneficial medications.

Conclusion

Residents in Ontario LTC homes commonly received 9 or more drug therapies concurrently. Although the practice of polypharmacy at the resident level is likely appropriately concentrated in individuals with multiple chronic conditions, the high rate of polypharmacy in certain facilities, the threefold variation in use across provincial LTC homes, and the correlation with other measures of inappropriate prescribing suggest a role for this measure in guiding drug review at the facility level. Measuring and reporting on the quality of drug prescription is important for large-scale efforts focused on improving quality in LTC.

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