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Pharmacist-directed home medication reviews offer an effective mechanism to address the pharmacotherapy issues of patients taking multiple chronic medications and can potentially identify medication management issues that may be otherwise missed during a review conducted in the pharmacy.

*Les examens à domicile des médicaments effectués par le pharmacien constituent un mécanisme efficace pour répondre aux problèmes pharmacothérapeutiques des patients prenant plusieurs médicaments pour des affections chroniques et pourraient permettre de cerner des problèmes de gestion des médicaments qui passeraient sinon inaperçus lors des examens effectués en pharmacie.*

# Medication management issues identified during home medication reviews for ambulatory community pharmacy patients

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## ABSTRACT



**Background:** The health risks associated with poor medication practices in the home suggest that patients would benefit from home-based medication reviews that could detect and resolve these issues. However, remuneration for home visits often excludes ambulatory, nonhomebound patients. A subset of these patients have issues that cannot be adequately identified and resolved during the course of a typical pharmacy-based medication review.

**Purpose:** This study aims to characterize the prevalence and nature of “hidden in the home” medication management issues in nonhomebound patients.

**Methods:** Pharmacists facilitated subject enrollment among patients at 6 community pharmacies in Toronto over a 15-month period, from January 2016 to March 2017. Patients taking 5 or more chronic medications who were ambulatory (able to visit the pharmacy) and scored 3 points or higher on a prescreening questionnaire were invited to participate. Visits included a standard

medication review, the identification of drug therapy problems and an assessment of the patient’s medication and organization/storage practices, followed by a medication cabinet cleanup.

**Results:** One hundred patients were recruited, with a mean age of 76.9 years and taking on average 10 chronic medications. Pharmacists identified a total of 275 drug therapy problems (2.75 per patient). The most common issues reported additional therapy required (23.6%), nonadherence (23.3%) and adverse drug reactions (17.8%). For those patients 65 years or older (87%), 32% were found to be using at least 1 medication on the Beers Criteria list, while 6% were using 3 or more. Sulfonylureas, non-steroidal anti-inflammatory drugs and short-acting benzodiazepines were the most commonly implicated drugs. Medications were removed from the homes of 67% of the patients, with expiry of medication being the most common reason for removal (54.2%). The mean duration of a home visit was 49.5 minutes.

**Conclusion:** Pharmacist-directed home medication reviews offer an effective mechanism to address the pharmacotherapy issues of patients taking multiple medications. These findings highlight the frequency of medication management issues in this group and suggest that home medication reviews could serve to minimize inappropriate use of medication and maximize health care cost savings in this unique patient population. *Can Pharm J (Ott)* 2019;152:334-342.

## Introduction

The World Health Organization (WHO) estimates that by the year 2050, nearly 1 in 5 individuals

will be aged 60 years or older.<sup>1</sup> Since 2011, Canada’s aging population has continued to grow with a 20% increase in the number of individuals

older than 65 years, outpacing the 5% growth experienced by the population as a whole.<sup>2</sup> An aging population has implications on health care service and medication utilization, as the elderly tend to have a higher burden of chronic disease, including diabetes and hypertension, physical disabilities, mental illnesses and other comorbidities.<sup>3,4</sup> Invariably, these individuals are treated with complex pharmacotherapy, often involving numerous medications, which increases the risk for actual and potential drug therapy problems (DTPs).

Several examples in the literature describe the types of medication management issues uncovered during the course of home-based medication reviews. Many of these issues, because of their nature, could be considered to be “hidden,” in that they may not be identified during a typical medication review performed in a community pharmacy. For example, we previously reported the outcomes of home medication reviews of 43 homebound community pharmacy patients<sup>5</sup> and found that 58% of patients were keeping medications in the home that were expired, that were duplicates of other current medications or that were no longer therapeutically appropriate. Other studies identified similar medication issues in patients’ homes.<sup>6–8</sup> Many of the issues identified create the possibility for medication administration errors, including incorrect dosing, use of medications that are no longer indicated, therapeutic duplication and polypharmacy. Indeed, the retention of discontinued or duplicated medications, hoarding and having multiple storage locations for medications have been associated with poor health outcomes.<sup>8</sup>

The health risks associated with poor medication management practices in the home suggest that patients would benefit from home-based medication reviews that could detect and resolve these issues. A 2007 meta-analysis concluded that pharmacist-directed home medication reviews have a positive impact on patient knowledge, adherence and medication storage practices and reduce the use of unnecessary drugs and the incidence of DTPs.<sup>9</sup> Other studies have found that home medication reviews reduce the incidence of polypharmacy,<sup>10,11</sup> the number of DTPs<sup>12</sup> and the incidence of falls<sup>13</sup> and hospitalizations<sup>14–17</sup> in elderly patients.

Currently, only homebound patients in Ontario are eligible to receive government-funded home medication review services from

## KNOWLEDGE INTO PRACTICE



- A subset of patients has drug therapy issues that cannot be adequately identified and resolved during the course of a typical pharmacy-based medication review.
- Nonhomebound patients are also at risk from home-centred medication management issues and may also benefit from home medication reviews.
- A total of 275 drug-therapy problems (DTPs) were identified by pharmacists through the home visits. The 3 most common DTP classifications were additional therapy required, nonadherence and adverse drug reaction.
- Roughly one-third of patients older than 65 years were using at least 1 medication listed in the Beers Criteria.

pharmacists through Ontario’s MedsCheck at Home program.<sup>18</sup> This limitation in funding eligibility is problematic, as it reduces the likelihood that nonhomebound patients will receive home medication reviews. Indeed, evidence in the literature is not limited exclusively to homebound patients and suggests that nonhomebound patients are also at risk from home-centred medication management issues and may also benefit from home medication reviews.<sup>19</sup> This study aims to characterize the prevalence and nature of “hidden in the home” medication management issues in “MedsCheck at Home ineligible” (i.e., nonhomebound) patients and to help guide the development of screening criteria for pharmacists to identify ambulatory patients who would most benefit from a home medication review.

## Methods

Patients were recruited opportunistically at 6 Shoppers Drug Mart community pharmacies in Toronto, Ontario, that offered home visits as part of their professional services program. Patients who were Ontario residents taking 5 or more chronic medications, ambulatory (able to visit the pharmacy), willing to receive a pharmacist home visit and who scored 3 points or higher on a prescreening questionnaire were invited to participate. The prescreening questionnaire was developed based on a literature review of risk factors for DTPs related to how medications are used in the home and is provided in Appendix 1 (available in the online version of the article).

Home visits included a standard medication review, the identification of actual and potential DTPs and generation of recommendations for

## MISE EN PRATIQUE DES CONNAISSANCES



- Un sous-ensemble de patients fait face à des problèmes de pharmacothérapie qui ne peuvent pas être cernés de manière adéquate ni être résolus lors d'un examen classique des médicaments en pharmacie.
- Les patients qui ne sont pas confinés à domicile sont également exposés à des problèmes de gestion des médicaments pris à domicile et pourraient également profiter d'examen des médicaments à domicile.
- Au total, 275 problèmes de pharmacothérapie ont été cernés par des pharmaciens lors de visites à domicile. Les trois catégories de problèmes de pharmacothérapie les plus courants sont le besoin d'un traitement supplémentaire, la non-observance et les effets indésirables.
- Environ un tiers des patients de plus de 65 ans utilisaient au moins un médicament figurant sur la liste des critères de Beers.

their management and a detailed assessment of the patient's medication inventory and organization/storage practices, followed by a medication cabinet cleanup. Medications were removed from the home for proper disposal at the pharmacy with patient consent. To ensure that visits were standardized, each pharmacist received training on the medication review and inventory assessment process and proper completion of the data collection form. Primary care physicians were contacted when changes to medication therapy were recommended that were outside of the pharmacist's scope, as per usual practice. Ethics approval was obtained from the Office of Research Ethics at the University of Waterloo.

Data collection was performed using a form hosted on Google Docs, with descriptive analyses performed using Microsoft Excel, version 2016. Outcomes of interest included patient demographics (age, sex, medical history), number of regularly scheduled and as-needed medications taken and drug classes, medication organization and compliance aids used, difficulties related to the ability to adhere to medications as prescribed and number of medications removed from the homes and reasons for their removal. Pharmacists also documented the duration of each visit.

### Results

The pharmacy team conducted a total of 100 home visits over a 15-month period, from January 2016 to March 2017. The mean age of the patients receiving a visit was 76.9 years, and

patients were taking a mean of 10 (range, 5-22) chronic medications (Table 1). Of the 87 seniors aged  $\geq 65$  years, 28 (32%) were found to be using at least 1 medication on the Beers Criteria list, with 5 (6%) using 3 or more. Sulfonylureas were the most commonly implicated drug, followed by nonselective nonsteroidal anti-inflammatory drugs (NSAIDs) and benzodiazepines. Twenty-six patients received assistance with medication administration from a caregiver or family member, while 31 obtained their medication in compliance packaging. Common barriers to medication adherence included difficulty understanding the medication regimen and administration (62%) and difficulty swallowing (10%).

A total of 275 DTPs (2.75 per patient) were identified by pharmacists through the home visits. The 3 most common DTP classifications were additional therapy required (23.6%), non-adherence (23.3%) and adverse drug reaction (17.8%; Table 2). Of the DTPs, pharmacists were able to resolve 144 (52.4%), with the remaining 131 (47.6%) requiring physician intervention. Physicians accepted 53.4% of pharmacists' recommendations, with 36 (27.5%) recommendations rejected by the physician and 25 (19.1%) lost to follow-up.

A total of 277 medications were removed from the homes of 67 patients (Table 2). The most common reason for medication removal was expired medication (54.2%). On average, 1.5 medications were removed from those homes that had a caregiver providing assistance with medication use compared with 3.1 in those homes without. The average duration of each visit was 49.5 minutes.

### Discussion

We have previously reported the benefits of a pharmacist-directed home medication review program targeting homebound patients (Meds-Check at Home).<sup>5</sup> However, observations in daily practice led us to hypothesize that nonhomebound patients may also be affected by medication management issues that can reasonably be identified only during a home-based medication review, and these issues may be inadequately addressed under current practice, since health system resources are generally targeted toward those who are homebound. Our study is the first in Canada to explore the prevalence of DTPs identified through home visits in this broader group of ambulatory patients. During the home

**TABLE 1** Patient demographics ( $N = 100$ )

<b>Demographics (n)</b>	
Mean age, years	76.9
≥65 years	87
Male	42
Number of medications taken, $n$ (range)	10 (5-22)
<b>Medical conditions (n)*</b>	
Hypertension	78
Dyslipidemia	71
Cardiovascular disease	50
Diabetes	46
GERD	37
Mood/behaviour	31
Osteoporosis	27
Osteoarthritis	23
Asthma/COPD	22
Hypothyroidism	18
Neurodegenerative diseases	15
Glaucoma	13
Cancer	9
Chronic kidney disease	7
Other <sup>†</sup>	46
<b>Medication administration practices (n)</b>	
Medical devices	
Uses ≥1	36
Difficulty using medical device	35
Visits ≥1 pharmacy	10
Uses compliance packs	30
Difficulty swallowing	10
Limited understanding of medications	62
Caregiver status	
Yes	84
No	26

(continued)

TABLE 1 (continued)

Medication history among those $\geq 65$ years ( $n = 87$ )	
Beers Criteria medications, $n$ (%)	
$\geq 1$	32 (36.8)
$\geq 3$	6 (6.9)
High-risk medications, $n$ (%)	
Sulfonylurea	17 (19.5)
Non-selective NSAID	11 (12.6)
Benzodiazepine	7 (8.0)
Alpha blocker	4 (4.6)
Tertiary tricyclic antidepressant	4 (4.6)
Skeletal muscle relaxant	4 (4.6)
First-generation antihistamine	2 (2.3)
Antiparkinson agent	1 (1.1)

COPD, chronic obstructive pulmonary disease; GERD, gastroesophageal reflux disease; NSAID, nonsteroidal anti-inflammatory drug.

\*Sum may exceed 100, as more than one may be present per patient.

<sup>†</sup>Individual medical conditions grouped as "other" did not exceed  $\geq 0.1\%$ .

visits, pharmacists identified 275 DTPs in 100 patients, with the most common being additional therapy required (23.6%), nonadherence (23.3%) and adverse drug reactions (17.8%). Among those patients 65 years or older, 32% were using at least 1 medication on the Beers Criteria list, with 6% using 3 or more. Medications were removed from the homes of 67% of patients, most commonly because of product expiry. This suggests that these MedsCheck at Home-eligible, ambulatory patients, still have significant DTPs that can be unearthed by a home medication review.

In comparison with our previous work, the prevalence of DTPs and their classification were similar in this ambulatory cohort to the previously studied homebound population related to need for additional therapy (23.6% vs 19.4%) and adverse drug reaction (17.8% vs 20.9%). In contrast, nonadherence was reported much more frequently among homebound patients than ambulatory patients (40.3% vs 23.3%). The high rate of nonadherence in the homebound population may be explained by the lack of regular interaction with a community pharmacist and speaks to the value that the pharmacist can have on understanding the importance of

taking medications appropriately and managing side effects. Moreover, pharmacists identified an average of 2.75 DTPs per patient per home visit in this study, which is substantially higher than what was observed in the homebound population examined in the previous study (1.4 DTPs per patient). This discrepancy is notable, especially considering that the ambulatory cohort was taking fewer medications than the homebound cohort (10 vs 11.7, respectively). Generally, polypharmacy is correlated with an increased risk of DTPs<sup>20</sup>; however, the number of medications alone does not appear to be the only factor driving the incidence of DTPs. This suggests that simply using the number of medications as a screening criterion for identifying patients who may benefit from a home visit may not be optimal. Other factors are almost certainly equally, if not more, important. Specific to our ambulatory population, we were able to explore trends involving comorbidities, device use and class of medications.

The top 3 medical conditions contributing to DTPs were diabetes (16.4%), hypertension (9.5%) and asthma/chronic obstructive pulmonary disease (COPD; 8.4%). Although not entirely surprising, given that these all represent

**TABLE 2** Classification of drug therapy problems and interventions

<b>Drug therapy problems (N = 275)</b>	
Mean per patient, <i>n</i> (range)	2.75 (0-8)
Category, <i>n</i> (%)*	
Additional therapy required	65 (23.6)
Nonadherence	64 (23.3)
Adverse drug reaction	49 (17.8)
Unnecessary drug therapy	34 (12.4)
Suboptimal response	30 (10.9)
Abuse/overuse/high dose	17 (6.2)
Inappropriate medication	16 (5.8)
Medical condition involved, <i>n</i> (%)*	
Diabetes	45 (16.4)
Hypertension	26 (9.5)
Asthma/COPD	23 (8.4)
Osteoporosis	22 (8.0)
GERD	16 (5.8)
Cardiovascular disease	16 (5.8)
Mood/behaviour	12 (4.4)
Neurodegenerative diseases	11 (4.0)
Osteoarthritis	7 (2.6)
Glaucoma	6 (2.2)
Hypothyroidism	5 (1.8)
Chronic kidney disease	3 (1.1)
Dyslipidemia	3 (1.1)
Other	80 (29.1)
<b>Interventions, <i>n</i> (%)</b>	
Pharmacist intervention	144 (52.4)
Physician intervention required	131 (47.6)
Accepted	70 (53.4)
Rejected	36 (27.5)
No response	25 (19.1)
<b>Medication cabinet clean-up</b>	
Patients requiring medication removal	67
Medications removed, <i>n</i> (%)	
Expired	150 (54.2)
Unnecessary	127 (45.8)

COPD, chronic obstructive pulmonary disease; GERD, gastroesophageal reflux disease.

\*Sum may exceed 100, as more than 1 may be present per patient.



chronic conditions requiring long-term therapy, this finding did contradict our original hypothesis. We felt that psychiatric conditions affecting mood and behaviour, such as depression and anxiety, or neurodegenerative diseases, such as early-onset dementia and Parkinson's, would have had a larger impact on the required interventions in ambulatory patients. Psychotropic medications, particularly antipsychotics and antidepressants, have been reported as common inappropriately prescribed medications,<sup>21-24</sup> and given the nature of our screening criteria (Appendix 1) and the propensity of these medications to cause confusion, we anticipated that this class would have had higher representation of DTPs.

This study identified a number of factors that should be included in any home-based medication review. For example, while 62% of patients identified that they did not have a clear understanding of the purpose of their medications and proper administration, only 30% reported using a compliance aid. In addition, difficulty using a medical device was reported as a significant issue in 35% of patients, while 36% reported using more than 1 device. The 3 conditions most commonly implicated in DTPs identified (Table 2)—diabetes, hypertension and asthma/COPD—require patients to use glucometers, blood pressure meters or inhalers, respectively. It appears that the challenges that patients have operating these devices at home are more easily identified during a pharmacist-directed home visit and could positively affect adherence, medication safety and efficacy. Medication reviews in all settings should include a discussion about device use, and patients should be encouraged to bring their devices to the community pharmacy for appointment-based medication reviews in order to review technique.

In addition, roughly one-third of patients older than 65 years were using at least 1 medication listed in the Beers Criteria. Sulfonylureas, nonselective NSAIDs and benzodiazepines were the most commonly inappropriately prescribed medications. Generally, these agents place older adults at risk for hypoglycemia, gastrointestinal adverse effects, nephrotoxicity and falls, respectively.<sup>25-31</sup> Evidence also suggests a strong correlation between the use of Beers criteria medications and poor patient outcomes, including increased adverse drug reactions, hospitalizations and mortality.<sup>25</sup> The use of these medications puts an already vulnerable patient population at increased

risk and affords an additional opportunity for intervention by pharmacists during home visits.

As part of the home visit process, pharmacists were asked to conduct a medication cabinet cleanup. Removal of medication was required in the homes of 67% of patients, which exceeded the 58% of homebound patients who required medication removal in the previous study.<sup>5</sup> A higher percentage of medication was removed from the homes of those patients without a caregiver, suggesting that caregiver status is a valuable screening criterion for patients who would benefit from a home visit. Inappropriate handling of expired and unused medication represents a significant patient safety risk, and the community pharmacist is ideally positioned to mitigate this risk by identifying medications that are no longer appropriate to keep in the home.

Overall, physicians were highly receptive of the pharmacist-initiated recommendations. The acceptance rate was 53.4% and reflected that of other studies that have reported similar response and success rates.<sup>32,33</sup> A recent Swedish paper explored the importance of clinical pharmacists' recommendations on drug-related problems identified during primary care medication reviews. The study showed that 96% of the recommendations provided by pharmacists were deemed to be clinically significant, suggesting that pharmacists have the potential to increase overall prescribing quality.<sup>34</sup> However, the major limitation of our study was our inability to evaluate the clinical significance of pharmacist interventions on actual patient health outcomes and health care cost savings, as our study took a descriptive and cross-sectional approach. We used the frequency of drug-related problems as the primary outcome measure, which is a surrogate, not direct, measure of clinical impact. Also, the screening tool that was used was unvalidated but was created using parameters from the initial study to facilitate consistent enrollment across all the sites. Anecdotally, feedback from both patients and physicians was very positive, with several patients reporting that they felt the visits were very informative and improved their overall understanding of their medical conditions, although this was not formally evaluated in the study. Nevertheless, it would be useful in future studies to evaluate whether the pharmacist interventions described here have been associated with objectively improved clinical and economic outcomes. The findings are also limited to Ontario

pharmacists and may not be generalizable to different practice settings and jurisdictions, given the variation in pharmacy scope of practice across Canada. Finally, while pharmacists documented the mean duration of home visits in our study, this does not include time required to travel to and from the patients' homes and documentation of care provided. Future research should aim to capture this information to determine the cost of providing the service and subsequent remuneration that would be appropriate for the MedsCheck at Home and related services.

## Conclusion

As the most accessible primary care practitioner, community pharmacists are well positioned to identify patients who would benefit from medication management services both within the pharmacy and in patients' homes.

Pharmacist-directed home medication reviews offer an effective mechanism to address the pharmacotherapy issues of patients taking multiple chronic medications and can potentially identify medication management issues that may be otherwise missed during a review conducted in the pharmacy, such as medication storage practices and the retention of expired or discontinued medications. Currently, the Meds-Check at Home program in Ontario is based on a patient's homebound status and the number of medications taken; however, our results suggest that other criteria such as caregiver assistance and use of medical devices should be considered, and future research should examine the return on investment of home visits for ambulatory adults, with the goal of establishing similar remuneration for ambulatory patients with risk factors for medication management issues. ■

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