Provision of Clinical Pharmacy Services in the Home to Patients Recently Discharged from Hospital: A Pilot Project

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ABSTRACT

Background: Home care is an increasingly important component of Canada's health care system. Despite the array of often-complex medication regimens used in home care, pharmacists have not traditionally been members of home care teams. Also, there is minimal literature describing pharmacist involvement in home care in Canada.

Objectives: To determine the rate of identification of medication-related issues by a pharmacist providing home care, the rate of acceptance of the pharmacist's recommendations and the significance of those recommendations, the types of clinical pharmacy services performed and the resources required to do so, and the satisfaction of patients and the health care team with the services provided by the pharmacist.

Methods: Clinical pharmacy services were provided at home to patients who had recently been discharged from hospital and who were at high risk of adverse drug events. Services were provided for at least 3 weeks. Examples of services included comprehensive or focused assessment of the medication regimen, assessment of adverse drug events, and assessment of adherence. The pharmacist kept detailed records of the clinical pharmacy services provided to each patient, which were subsequently analyzed to determine the frequency of particular problems and the outcome of the pharmacist's recommendations to resolve them.

Results: Thirty patients were initially identified, but the analysis is based on the 27 patients (mean age 81.1 years) who received at least one visit from the pharmacist. The mean number of medications per patient was 11.9, the mean number of medication-related issues identified was 3.6, and the mean number of recommendations was 4.3. Of the 53 recommendations made to physicians, 39 (74%) were accepted, and 3 (6%) were rejected; the response to 11 (21%) of the recommendations was unknown. On a scale of 1 to 6, the mean significance of the recommendations was 4.1. Overall satisfaction scores (on a scale from 0 to 10) were 9.6 for health care team members and 9.9 for patients.

Conclusions: A variety of medication-related issues were identified for home care patients who had recently been

RÉSUMÉ

Historique : Les soins à domicile occupent une part de plus en plus important du système de soins de santé canadien. Malgré une panoplie souvent complexe de traitements médicamenteux utilisés à domicile, les pharmaciens ne font pas partie traditionnellement des équipes de soins à domicile. De plus, la littérature fait peu état de la participation des pharmaciens aux soins à domicile.

Objectifs : Déterminer le taux d'identification des problèmes liés à la pharmacothérapie par un pharmacien qui participe à la prestation des soins à domicile, le taux d'acceptation des recommandations du pharmacien, l'importance de ces recommandations, les types de services de pharmacie clinique et les ressources utilisées pour leur prestation, ainsi que la satisfaction des patients et de l'équipe de soins envers les services du pharmacien.

Méthodes : Des services de pharmacie clinique ont été fournis à domicile à des patients qui venaient d'obtenir leur congé de l'hôpital et qui présentaient un risque élevé d'événements indésirables liés aux médicaments. Les services ont été fournis pendant au moins trois semaines, et comprenaient notamment une évaluation exhaustive ou ciblée des traitements médicamenteux, une évaluation des événements indésirables des médicaments et une évaluation de l'observance thérapeutique. Le pharmacien a consigné minutieusement les services de pharmacie clinique fournis à chaque patient, puis ces dossiers ont été subséquemment analysés pour déterminer la fréquence de certains problèmes et le résultat des solutions recommandées par le pharmacien.

Résultats : Trente patients ont d'abord été sélectionnés pour participer à ce projet, mais l'analyse n'a porté que sur les 27 patients (âge moyen de 81,1 ans) qui ont reçu au moins une visite du pharmacien. Le nombre moyen de médicaments par patient était de 11,9, celui des problèmes liés à la pharmacothérapie identifiés de 3,6, et le nombre moyen de recommandations de 4,3. Des 53 recommandations formulées aux médecins, 39 (74 %) ont été acceptées, et 3 (6 %) rejetées; on ignore quelle a été la réponse à 11 (21 %) de recommandations. Sur une échelle de 1 à 6, l'importance moyenne des recommandations était de 4,1. La cote de satisfaction globale

discharged from hospital, and many of the clinically significant recommendations that the pharmacist made to optimize medication regimens were accepted. Patients and other members of the health care team were very satisfied with the clinical pharmacy services provided.

Key words: clinical pharmacy, home care, hospital discharge, medication-related issues

(sur une échelle de 0 à 10) était de 9,6 pour les membres de l'équipe de soins et de 9,9 pour les patients.

Conclusions : Divers problèmes liés à la pharmacothérapie ont été identifiés chez les patients qui venaient de recevoir leur congé de l'hôpital et qui recevaient des soins à domicile, et un grand nombre des recommandations significatives sur le plan clinique que le pharmacien a formulées pour optimiser les traitements médicamenteux ont été acceptées. Les patients et les membres de l'équipe de soins étaient très satisfaits des services de pharmacie clinique.

Mots clés : pharmacie clinique, soins à domicile, congé de l'hôpital, problèmes liés à la pharmacothérapie

INTRODUCTION

Home care is a rapidly expanding and increasingly complex component of Canada's health care system. This complexity can be attributed to a variety of factors, including aging of the population, de-institutionalization of health care delivery, increasing complexity of medical technology, and reduction in the number of informal caregivers for those requiring assistance in the home.[1,2] Although many patients receiving home care services have complicated medication regimens, pharmacists have not traditionally been members of home care teams in Canada.

In its final report, the Commission on the Future of Health Care in Canada (the Romanow Commission) stated that one priority type of home care service to be included under the *Canada Health Act* is post-acute home care.[1] This focus reflects recent medical literature demonstrating the increased risk of adverse events in the period immediately following a hospital stay.[3,4] In fact, in their Canadian study, Forster and others[3] found that 23% of medical patients experienced an adverse event within the first month after discharge from hospital, of which adverse drug events were the most common type, accounting for 72% of all adverse events. Therefore, intervention by pharmacists during this post-acute care period may help to minimize problems with pharmacotherapy, optimize medication regimens, and maximize medication safety.

Surprisingly, few descriptions or evaluations of the role of pharmacists in home care in Canada have been published.[5] Indeed, MacKeigan and others[5] found that the provision of clinical pharmacy services within the home care setting was uncommon in Canada. Researchers at the Institute of Health Promotion Research (University of British Columbia) have described the impact of home visits by pharmacists and nurses on patients recently discharged from hospital (McGowan P, Green L, Beattie BL, Chappell N, Clarke H, Gayton D, et al. High-risk patient intervention program. Summary of evaluation results. Vancouver [BC]: University of British Columbia, Institute of Health Promotion Research; 2001 Oct. Unpublished report). Their report highlights a reduction in hospital visits and a net saving per patient with this form of intervention. In Canada, the idea of pharmacists providing clinical services in the patient's home is relatively new, as pharmacists have typically focused on acute care settings (e.g., hospitals), chronic care settings (e.g., nursing homes), and community settings (e.g., community pharmacies or ambulatory clinics). However, a variety of studies from other countries have addressed this concept.[6-20] These studies have had various patient populations, interventions, and outcomes, but they have generally shown a positive impact of pharmacist involvement. For example, Stewart and others[8,15] have described the impact of a home visit by a pharmacist or nurse about 1 week after hospital discharge for patients with heart failure. The visits positively affected patient outcomes such as unplanned readmissions and out-of-hospital deaths, as well as the number of hospital days for readmissions (unplanned and elective). In contrast, the HOMER randomized controlled trial published in 2005 showed, counterintuitively, that pharmacist medication reviews conducted in the homes of elderly patients who had recently been discharged from hospital were associated with an increased risk of hospital readmissions.[21]

In contrast to the relative scarcity of data evaluating the impact of pharmacists in home care, ample evidence is available to support the clinical roles of pharmacists in the hospital setting[22-28] and in a variety of outpatient settings.[29] Various studies have demonstrated that pharmacist interventions in these settings have positive effects on

outcomes such as mortality, length of hospital stay, medication error rates, and costs.[22-29]

Given the extensive work demonstrating the positive impact of clinical pharmacy services across a variety of settings, the present project was undertaken to investigate the impact of providing such services in the home care setting. To this end, the Pharmacy Services department at the authors' institution realigned resources to create a 0.5 full-time equivalent (FTE) pharmacist position. This position was used, in the context of a pilot project, to provide clinical pharmacy services to patients who had recently been discharged from hospital.

The primary objective was to characterize the impact of clinical pharmacy services in the home care setting by determining the rate of identification of medication-related issues by the pharmacist, the acceptance rate of the pharmacist's recommendations, and the clinical significance of the pharmacist's recommendations. The secondary objectives were to determine the types of clinical pharmacy services performed, the resources required to provide such services at different stages after discharge from hospital, and the levels of satisfaction with the clinical pharmacy service among patients and the rest of the health care team.

METHODS

Approval for this pilot project was received from the Research Ethics Board of the South-East Regional Health Authority.

Patient Population

The target sample size for this pilot project was 30 patients. Eligible patients were those being discharged from the Family Practice & Geriatrics Program or from various internal medicine programs (excluding oncology) to the local home care program. Patients meeting the following criteria were considered for inclusion: expected to be receiving home care services for 3 weeks or longer, not living in facilities where medication assistance was provided by a health care professional, had a family physician who was practising with the regional health authority, had a residential phone line, able to communicate fluently in English, and deemed to be at high risk of adverse drug events, by meeting at least one of the following criteria (with the number of patients identified by home care nurses as meeting each criterion specified in parentheses): age 80 years or older (n = 18), using 5 or more medications (n = 28), using high-risk medications such as warfarin (n = 23), having a chronic condition associated with substantial risk of readmission to hospital

(e.g., diabetes mellitus or heart failure) (n = 26), having suboptimal medication adherence (n = 8), expected to benefit from medication education (n = 15), having changes to the preadmission medication regimen during the hospital stay (n = 14), and having unresolved medication-related issues upon hospital discharge (n = 0). Overall, individual patients met from 1 to 6 of these criteria (mean 4.4, standard deviation [SD] 1.4).

Reason for Referral

The home care nurses were responsible for referring patients for clinical pharmacy services. At the time of referral, the nurse was asked to specify one or more of the following reasons for the referral (with the number of patients for each referral reason specified in parentheses): comprehensive review of the medication regimen (n = 6), focused medication review (n = 7), assessment of medication adherence (n = 14), medication monitoring for efficacy and/or toxic effects (n = 2), assessment of a suspected adverse drug event (n = 1), education (n = 17), and other reasons (n = 5). The number of referral reasons for each patient ranged from 1 to 4 (mean 1.7, SD 0.8).

Visit Schedule

Thirty patients were identified for inclusion in the pilot project. The pharmacist (S.M.) completed an initial chart review for each patient, but 3 of the patients were discharged from the home care program before the pharmacist made the initial home visit. Therefore, all subsequent analyses are based on the remaining 27 patients. The study protocol stated that each patient would receive a total of 3 visits or consultations with the pharmacist, the first being a home visit conducted as soon as possible after the referral (given that the pharmacist worked 2.5 days per week). The other 2 interactions were to be either home visits or telephone consultations and were to be performed at approximately weekly intervals. A total of 15 patients received 3 home visits. The other 12 patients received either fewer than or more than 3 visits: 2 patients received 1 visit (one of these patients was readmitted to hospital, and the other patient died before receiving additional visits or consultations), 3 patients received 2 visits (2 of these patients were readmitted to hospital, and the third was discharged from the home care program before receiving additional visits or consultations), 5 patients received 4 visits, and 2 patients received 5 visits because of continuing medication-related issues. The types of services provided during these visits varied according to the patient's needs. After each visit, a patient-specific care plan and implementation strategies were developed.

Data Collection
Patient Care Activities

The pharmacist kept extensive records of all activities associated with providing clinical pharmacy services before, during, and after the home visits or telephone consultations. The following key data were collected: preparation time (i.e., the time required to review the home care chart and the electronic medical record and perform other preparatory work), travel time, visit duration, and whether the pharmacist completed a medication history, assessment of medication adherence, or patient or caregiver education. Time required for development of the care plan, implementation of the care plan, documentation, contacting the community pharmacist, performing administrative tasks, responding to drug information questions, and performing other miscellaneous tasks was also recorded. A timeline of activities performed was plotted, visit by visit, to identify the types of services that patients needed at different stages within the first month or so after discharge from hospital.

Medication-Related Issues

The pharmacist recorded all medication-related issues that were identified at each visit or consultation. The issues were later classified according to the Hepler and Strand model,[30] which comprises 8 categories of drug-related problems: untreated indication, improper drug selection, subtherapeutic dose, failure to receive a needed medication, overdose, adverse drug reaction, drug interaction, and drug use without an indication. An additional category ("other") was used to capture medication-related issues that did not fit within any of these 8 categories.

Pharmacist's Recommendations

The pharmacist recorded all of the recommendations that were made to optimize patients' medication regimens. The recommendations were classified according to the following categories: start medication, discontinue medication, change medication, change dose or instructions, perform testing for and/or monitor laboratory parameters or monitor patient symptoms, provide education to patient or caregiver, and monitor or provide instruction about adherence. The recipient of each recommendation (i.e., the physician, the nurse, or the patient or caregiver) was also recorded, along with an indication of whether the recommendation was accepted. For physicians only, a further distinction was made between recommendations that were actively rejected and those for which the outcome was unknown (for example,

if the patient was readmitted to hospital or the medical situation changed before the recommendation could be processed, the status of the recommendation was classified as unknown).

Significance of Pharmacist's Recommendations

The clinical significance of the pharmacist's recommendations was rated (by the first author, S.M.) according to a published 6-point scale,[31] where 1 = adverse significance (may lead to adverse outcome), 2 = no significance (informational), 3 = somewhat significant, 4 = significant (in line with standards of practice), 5 = very significant (potential or existing major organ dysfunction), and 6 = extremely significant (life-or-death situation). A second pharmacist, who was not involved with the study, independently rated the recommendations for 6 patients, such that 37 (32%) of the 116 recommendations were rated by both individuals; the 2 raters agreed on 32 of the 37 joint ratings (86% agreement). For the 5 ratings with disagreement, the raters disagreed by 1 point on the scale, and agreement was reached through discussion.

Satisfaction Ratings

After completion of the visits, a research assistant telephoned the patients or caregivers to determine their satisfaction with 5 aspects of the clinical pharmacy services provided (rated on a scale of 0 [not at all satisfied] to 10 [completely satisfied]): overall satisfaction, satisfaction with the pharmacist's knowledge about medications, satisfaction with the pharmacist's medication-taking advice, satisfaction with the pharmacist's professionalism, and satisfaction with the pharmacist's friendliness. Next, respondents were asked to rate (on a scale ranging from 0 [not at all important] to 10 [extremely important]) the importance of the pharmacist's knowledge, the pharmacist's medication-taking advice, the pharmacist's professionalism, the pharmacist's friendliness, and the pharmacist's visits. Finally, respondents were asked to rate (on a scale ranging from 0 [not at all useful] to 10 [extremely useful]) the usefulness of the pharmacist's visits. A parallel written survey was distributed at the end of the pilot project to nurses and other home care professionals involved in caring for the patients who had participated in the project.

Maintenance of Study Database

A study clerk maintained the project database by entering relevant information for each patient (e.g.,

demographic characteristics, number and types of medication-related issues and recommendations, number of recommendations accepted, and patient satisfaction scores). Each patient was assigned a study code to ensure that personal identifiers were not included in the project database. Data management and analyses were carried out with SPSS software, version 13.

RESULTS
Patient Characteristics

Background information about the patients was collected during the first home visit (Table 1). In general, patients were older, had multiple medical conditions, were taking multiple medications, and had been discharged from hospital a mean of 11.7 days before the pharmacist's first home visit. Medical conditions and medication categories were determined from patients' home care charts, interviews with patients and/or caregivers, community pharmacy records, and the electronic medical records used within the regional health authority. Medical conditions and medication categories that were present in at least one-third of the patients are listed in Table 2. Cardiovascular disease and diabetes mellitus were common, which is consistent with the high prevalence of these diseases in Canada.

Patient Care Activities

The number of patients receiving successive numbers of visits declined, with 27 patients receiving a first visit, 25 patients receiving a second visit, 22 patients receiving a third visit, 7 patients receiving a fourth visit, and 3 patients receiving a fifth visit. After each visit, a pharmacy care plan was developed for all (100%) of the patients in the study, according to each person's unique medication-related issues. Medication histories were recorded for all (100%) of the patients at visit 1, and at subsequent visits all patients were asked if there had been any medication changes in the week since the previous visit; however, complete medication histories were recorded for only 12% (3/25) of the patients remaining in the study at visit 2, for none of the patients at visit 3, for 14% (1/7) of the patients at visit 4, and for 33% (1/3) of the patients at visit 5. Adherence was assessed for 70% (19/27) of patients at visit 1, for 44% (11/25) of patients at visits 2, for 41% (9/22) of patients at visit 3, for 29% (2/7) of patients at visit 4, and for none of the 3 patients at visit 5. Finally, patient and/or caregiver education was carried out with all (100%) of the patients at visit 1, 80% (20/25) of patients at visit 2, 68% (15/22) of patients at visit 3, 43% (3/7) of patients at visit 4, and 67% (2/3) of the patients at visit 5. Although the project protocol indicated that visits after the initial visit

Table 1. Characteristics of 27 Home Care Patients Who Received Clinical Pharmacy Services

Characteristic	Mean ± SD (Range) or No. (%) of Patients	
Age (years)	81.1±7.1	(60–91)
Creatinine clearance (mL/min)	35.0±14.8	(13–71)
No. of medications	11.9±4.0	(7–24)
Days after discharge* (n = 26)	11.7±5.4	(4–31)
Sex (no. [%] of men)	9	(33)
Current smoker (n = 25)	2	(8)
Influenza vaccination received†	16	(59)
Independent medication management	17	(63)
Living arrangements		
Alone	14	(52)
With spouse or partner	7	(26)
With a family member	6	(22)
Use of adherence tool		
Dosette	6	(22)
Blister packaging	11	(41)
Calendar	2	(7)

SD = standard deviation.
*No. of days between hospital discharge date and date of first home visit by the pharmacist.
†In the most recent influenza season.

Table 2. Medical Conditions and Medication Categories Among 27 Home Care Patients

Condition or Medication	No. (%) of Patients	
Medical condition		
Ischemic heart disease	17	(63)
Hypertension	14	(52)
Gastroesophageal reflux disease, PUD, gastritis	13	(48)
Dyslipidemia	12	(44)
Diabetes mellitus (type 2)	12	(44)
Insomnia	11	(41)
Anemia	9	(33)
Atrial fibrillation	9	(33)
Medication categories		
ß-Blocker	17	(63)
Angiotensin-converting enzyme inhibitor	16	(59)
Vasodilator	15	(56)
Antiplatelet agent	15	(56)
Diuretic	14	(52)
HMG CoA reductase inhibitor	11	(41)
Oral antidiabetic agent	11	(41)
Oral anticoagulant	11	(41)
Levothyroxine	11	(41)
Acetaminophen	10	(37)
Calcium channel blocker	9	(33)
$ß_2$-Agonist	9	(33)

PUD = peptic ulcer disease,
HMG CoA = hydroxymethylglutaryl coenzyme A.

Figure 1. Mean workload per patient for different activities at successive visits. "Care plan" represents both development and implementation of the care plan.

could be either home visits or telephone consultations, almost all were conducted in the home setting.

The total amount of time that the pharmacist spent on each patient's case was also tracked. This value included preparation time before the home visit, travel time, the home visit itself, and any post-visit activities linked to caring for the patient, including development of the care plan and contacting other health care professionals. The average amount of time spent per patient declined significantly from visit 1 (mean 226.7 min, SD 135.9 min) to visit 2 (mean 128.2 min, SD 61.9 min) (pairwise t_{24} = 3.71, p = 0.001). Although there was a further decline by visit 3 (mean 113.9 min, SD 78.8), it was not statistically significantly different from the time required for visit 2 (pairwise t_{21} = 0.71, p = 0.49). The complexity of the cases that required follow-up beyond 3 visits explains the large amounts of time spent per patient at visit 4 (mean 102.1 min, SD = 50.0 min) and visit 5 (mean 139.3 min, SD 29.6 min). To better understand the pharmacist's workload across the weeks after hospital discharge, 3 main activities were chosen for analysis: preparation, visit, and development and implementation of the care plan. The time required for all 3 of these activities decreased somewhat after visit 1 (Figure 1); the decline was most dramatic for pre-visit preparation time, particularly from visit 1 to visit 2.

In terms of scheduling pharmacy services, considerably more time was needed for the first home visit after discharge from the hospital, mostly because of the preparation work required. After the first visit, a plateau occurred in terms of time usage. In particular, education continued to be required by a large proportion of the patients who received 2 or more pharmacist visits.

Medication-Related Issues and Pharmacist Recommendations

Over the 5 visits, a total of 98 medication-related issues were identified, an average of 3.6 (SD 2.0) per patient. More than half of these medication-related issues (52 or 53%) were identified at visit 1, a quarter (25 or 26%) were identified at visit 2, and 15 (15%) were identified at visit 3. The reduction from visit 1 to visit 2 was statistically significant (pairwise t_{24} = 2.22, p = 0.036), but the change from visit 2 to visit 3 was not (pairwise t_{21} = 1.25, p = 0.24). Although the number of patients declined to 7 for visit 4 and 3 for visit 5, a further 3 medication-related issues (3% of the total number) were identified at each of visits 4 and 5. The most common medication-related issues were linked to failure to receive a medication, untreated indications, and incorrect doses (subtherapeutic dose or overdose combined) (Table 3).
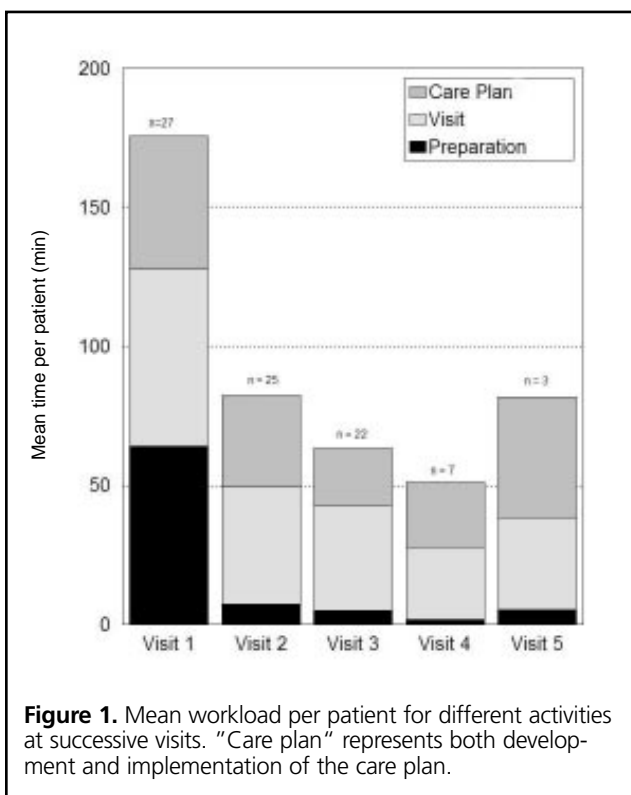
Table 3. Medication-Related Issues Identified across Visits

| | No. of Issues Identified | | | | | |
Category	Visit 1	Visit 2	Visit 3	Visit 4	Visit 5	Total
Failure to receive needed medication	15	6	2	0	1	24
Untreated indication	13	5	2	1	0	21
Adverse drug reaction	6	3	4	0	0	13
Subtherapeutic dose	4	1	3	2	0	10
Overdose	3	5	1	0	0	9
Drug interaction	4	1	3	0	1	9
Improper drug selection	3	3	0	0	0	6
Drug use without an indication	0	0	0	0	0	0
Other	4	1	0	0	1	6
Total	52	25	15	3	3	98

In response to these medication-related issues, a total of 116 recommendations were made by the pharmacist, an average of 4.3 (SD 2.6) per patient. There was a trend toward a decrease from visit 1 (mean 2.3 per patient, SD 2.0) to visit 2 (mean 1.3, SD 1.3) (pairwise t_{24} = 1.85, p = 0.08), as well as a trend toward a decrease from visit 2 to visit 3 (mean = 0.7, SD 1.0) (pairwise t_{21} = 1.95, p = 0.07). The number of recommendations and their significance across the entire study is shown in Figure 2. Of the 116 recommendations made, 53 (46%) were directed toward the physician, 52 (45%) were directed to the patient or caregiver, and 11 (9%) were directed to nurses. Table 4 shows the distribution of recommendations that were accepted over the course of the study.

Fifty-one (44%) of the 116 recommendations were related to altering specific medications (i.e., starting a medication, discontinuing a medication, changing a medication, or changing a medication dose or instructions). Recommendations related to laboratory or symptom monitoring accounted for 28 (24%) of the recommendations, 14 (12%) of the recommendations related to adherence, and 12 (10%) of the recommendations were educational in nature (to the patient and/or caregiver).

Significance of Pharmacist's Recommendations

Each recommendation was rated in terms of its clinical significance. The majority of recommendations (83 [71%] of the 116 recommendations) were rated as significant (level 4). Examples of such "significant" recommendations included starting a ß-blocker for a patient with a history of myocardial infarction or starting an angiotensin-converting enzyme inhibitor for a patient with heart failure. Twenty (17%) of the 116 recommendations were rated

as very significant (level 5) and 13 (11%) of recommendations were rated as somewhat significant (level 3). The average numeric rating of significance of the recommendations was 4.1 (SD 0.3). The distribution of recommendations at each level of significance over the course of the study is shown in Figure 2.

Even with the small number of patients included in this pilot project, a large number of medication-related issues was identified over a short period, and more than 100 recommendations were made by the pharmacist. More important, most of the recommendations were clinically significant, and most were accepted by those to whom they were directed, particularly other members of the health care team.
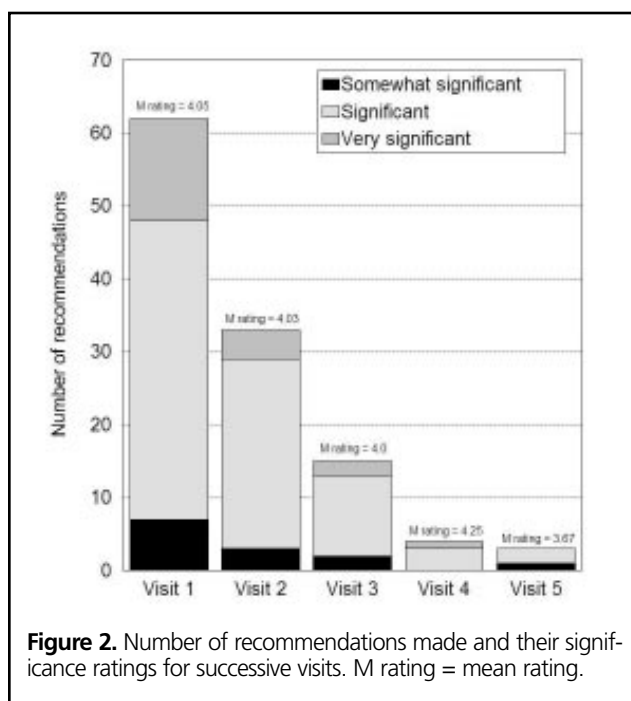

Figure 2. Number of recommendations made and their significance ratings for successive visits. M rating = mean rating.

Table 4. Recommendations and Acceptance Rate over Time

Recommendation	No. of Issues Identified					
	Visit 1	Visit 2	Visit 3	Visit 4	Visit 5	Total (%)*
To physician						
Accepted	20	12	3	3	1	39 (74)
Rejected or unknown	3	4	5	0	2	14†
Total	23	16	8	3	3	53
To nurse						
Accepted	8	1	2	0	0	11 (100)
Rejected or unknown	0	0	0	0	0	0
Total	8	1	2	0	0	11
To patient or caregiver						
Accepted	22	12	3	0	0	37 (71)
Rejected or unknown	8	4	2	1	0	15
Total	30	16	5	1	0	52

*Percentage in relation to total number of recommendations of each type.
†A total of 3 (6%) of recommendations to physicians were rejected, and the outcome of 11 (21%) was unknown.

Satisfaction Ratings

Once patients completed the pilot project, they (or their caregivers) were asked to rate their satisfaction with pharmacy services. Sixteen patients responded to the telephone survey. All of these patients were overwhelmingly positive about the inclusion of pharmacy services as part of their home care, and no rating on any of the questions was lower than 8 out of 10. Indeed, for overall satisfaction, the mean rating was 9.9 (SD = 0.5). Patients were also clear about the importance of the home visits (mean rating of importance 9.8, SD 0.5) and their usefulness (mean rating of usefulness 9.5, SD = 0.8).

Parallel surveys were also distributed in hard copy to the nurses and other allied health care professionals involved in the pilot project; 14 nurses and 4 other health care professionals responded to the survey (although some of the non-nurse respondents did not answer all questions). Again, the respondents reported very high satisfaction ratings: no rating was less than 7 on the 10-point scale, and the mean rating was 9.5 or higher for each question. Mean ratings for key variables were as follows: overall satisfaction with the pharmacist's services, mean 9.5, SD = 0.9 (n = 17); importance of the visits, mean 9.6, SD = 0.6 (n = 17); and usefulness of the visits, mean 9.9, SD = 0.3 (n = 16). Respondents were also given the opportunity to provide comments; most of these addressed the need to continue the provision of pharmacy services beyond this pilot project.

DISCUSSION

Overall, for the patients in this pilot project, who had complex medical conditions, were taking multiple medications, and had recently been discharged from hospital, many medication-related issues were identified, and many important interventions were carried out to optimize their medication regimens, particularly during the first visit by the pharmacist after discharge from hospital. In addition, both patients and the home care team were extremely positive about the involvement of the pharmacists in home care during this pilot project. The literature published to date has demonstrated that a variety of positive outcomes can be achieved through pharmacist involvement on the health care team. The results from this small pilot project suggest that home visits conducted by a pharmacist during the first month after hospital discharge can facilitate the identification of medication-related issues and the provision of recommendations to resolve these issues.

This group of predominantly elderly patients had a variety of medication-related issues, despite their recent stay in hospital. The most common type of medication-related issue was failure to receive a medication (e.g., nonadherence with prescribed therapy, inappropriate inhaler technique). This was not surprising, as previous literature and practice insights suggest that nonadherence can occur for various reasons.[32] The next most common types of medication-related issues were untreated indication (e.g., patient with pain who was not receiving an analgesic) and incorrect dose (i.e., subtherapeutic dose or overdose). Once medication-related issues had been identified, the pharmacist offered various recommendations to optimize patients' medication regimens. Over 40% of the recommendations were related to altering a specific medication, such as starting a medication (e.g., starting an antiplatelet agent for secondary prevention of

a stroke), stopping a medication (e.g., stopping a benzodiazepine that had been started to treat insomnia during the hospital stay for a patient without prior sleep difficulties), changing a medication (e.g., changing from glyburide to repaglinide for an elderly patient with diabetes, reduced renal function, and ongoing episodes of hypoglycemia), or changing a dose or instructions (e.g., decreasing ranitidine dose from twice to once daily for a patient with reduced renal function). One-quarter of the recommendations were related to laboratory or symptom monitoring, which represents a key component of pharmacists' involvement in ensuring both medication efficacy and tolerability. Examples include recommendations to repeat measurement of hemoglobin A_{1C} if changes were made to oral hypoglycemic or insulin therapy or recommendations to order testing for ferritin, iron, total iron-binding capacity, vitamin B_{12}, and folate for a patient receiving erythropoietin with apparent resistance to the effects of the drug after an initial response. The need for recommendations such as those made during this pilot project may be partially explained by the current constraints on the health care system. Shorter lengths of stay relative to what occurred in the past may contribute to the presence of unresolved medication-related issues at the time of hospital discharge (although this was not identified at the time of patient enrolment in the study). If short hospital stays lead to a focus on urgent medical needs, rendering it difficult to address all medication-related issues, then the need for active participation of pharmacists on the home care team is clear.

The importance of the interventions provided by the pharmacist to the patients in this study is highlighted in many ways. For example, 56% (15/27) of patients had more than one reason for referral, which perhaps signals the high number of medication-related needs among this group of patients immediately after hospital discharge. Also, the recommendations made by the pharmacist were rated as having high levels of clinical significance. Most (89%) of the recommendations were rated as significant or very significant, which (according to the scale used) signals that patients' therapies were brought into line with standards of practice and might have had an impact on major organ dysfunction. It is important to note that this scale was developed for use in an acute care setting and may therefore underestimate the significance of recommendations in the context of a less acute setting, such as home care.[31] For example, the recommendation to start a ß-blocker in a patient with heart failure was ranked as having level 4 significance (in line with standards of practice), rather than level 5 (potential or existing major organ dysfunction) or 6 (life-or-death situation), even

though, over the long term, the use of ß-blockers in this setting has been demonstrated to reduce the risk of death and hospital admission among patients with heart failure.[33] These findings suggest that having a pharmacist involved immediately after hospital discharge may represent a wise use of resources. By offering focused suggestions targeted at improving patient outcomes and optimizing patient safety pertaining to medications, pharmacists can work to decrease risks to patients and optimize efficacy outcomes.

An interesting component of the methods for this pilot project was the analysis of services over time and the determination of whether the pharmacist's role changed over time. The majority of recommendations were associated with visits 1 and 2. The lower number of recommendations in later weeks reflects the fact that the full medication history and assessment were done during the initial visit, at which time most of the medication-related issues were identified and recommendations made. The pharmacist's role tended to change during later visits, focusing more on monitoring of any medication changes that occurred on the basis of recommendations during previous visits. This information may be useful in optimizing pharmacists' involvement in home care.

Almost all visits were conducted in the home setting, rather than by telephone. This reflects to some degree the type or severity of the medication-related issues identified and the patient characteristics that led to the need for a home visit rather than a telephone consultation. For example, for nonadherence with therapy identified at visit 1, subsequent home visits were warranted to allow visual inspection of medication vials, blister packages, dosettes, and the home environment, to fully assess adherence or factors that might represent challenges to maximizing adherence. In addition, the pharmacist visiting the home might have noticed that patients were making food choices that were inconsistent with dietary recommendations made in the structured hospital environment, which might explain uncontrolled hyperglycemia at home for patients whose glucose control was acceptable while in the hospital. Clearly, observation in patients' homes is a key component of the pharmacist's assessment, as many clues can be gathered that reflect the patients' and caregivers' true abilities to function in the home setting. Finally, for patients with marked visual or hearing impairment, a home visit allowed more efficient communication and information-gathering.

An important aspect of evaluating the success of this type of project is the acceptability of the care, particularly when patients are being visited in the privacy of their own homes. The results of the satisfaction survey indicated high satisfaction among both patients and members of the

home care team. No formal survey was carried out with physicians, because the combination of a small number of patients and a large pool of physicians meant limited repeat interactions with physicians. However, indicators of support and/or satisfaction for pharmacist involvement with patients receiving home care surfaced during (and after) the pilot project, including referrals initiated by physicians and positive written comments from physicians following receipt of the pharmacist's recommendations and consultations.

One limitation of this pilot project was the small sample size and therefore the inability to evaluate the impact of the pharmacist's home visits on outcomes such as readmission, visits to the emergency department, and mortality. Moreover, the patients in this pilot project were elderly general medicine type patients receiving care in a home care setting; although the results obtained are probably generalizable to the general patient population, they may not be applicable to specialty populations such as palliative care patients or oncology patients, who may have different medication-related issues and may be receiving different types of post-hospital care (e.g., through specialty clinics). Further research is needed to explore the role that pharmacists can play across different types of home care situations.

This pilot project adds to the Canadian literature base exploring the role of pharmacists in home care. This project was conducted at a single site, and one pharmacist provided all of the services. The model chosen and the resource issues identified may not be similar to those in other jurisdictions with different home care or pharmacy practice models. Nonetheless, the patients who received care in this pilot project had numerous characteristics typical of those commonly seen within the hospital system in Canada (e.g., older age, multiple medications, cardiovascular disease and/or diabetes). The presence of medication-related issues upon hospital discharge within this group of patients emphasizes the key role that pharmacists can play in facilitating a seamless and safer transition from hospital to home.

As recognized by the ongoing national Safer Health-care Now! campaign, medication reconciliation has been associated with safer health care, lower rates of errors, and improved safety when patients are transferred from one point of care to another within the health care system.[34] In fact, one of the patient safety goals and required organizational practices of the Canadian Council on Health Services Accreditation (CCHSA) related to medication reconciliation is to reconcile medications upon admission to the organization and at referral or transfer within or outside the organization.[35] The CCHSA defines medication reconciliation as a process to ensure the collection and communication of accurate client/patient medication information.[35] The ultimate goal of medication reconciliation is to facilitate continuity of pharmaceutical care for patients or clients on admission, at the beginning of service, and/or at discharge, transition, or end of service (e.g., from hospital to home or to another level of care or service).[35] With this in mind, the incorporation of a pharmacist to assist with patient transition from hospital to home care (and vice versa) could be a key component of improving health care and medication safety across continuums of care in Canada.

CONCLUSIONS

Patients who have recently been discharged from hospital experience a variety of medication-related issues. In this pilot project, many clinically significant recommen-dations that were suggested by the pharmacist to optimize patients' medication regimens were accepted; the majority of interventions were implemented during the first and second visits. Both patients and other members of the health care team were very satisfied with the provision of clinical pharmacy services as part of home care.

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