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ORIGINAL RESEARCH

Interventions performed by community pharmacists in one Canadian province: a cross-sectional study

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Purpose: Interventions made by pharmacists to resolve issues when filling a prescription ensure the quality, safety, and efficacy of medication therapy for patients. The purpose of this study was to provide a current estimate of the number and types of interventions performed by community pharmacists during processing of prescriptions. This baseline data will provide insight into the factors influencing current practice and areas where pharmacists can redefine and expand their role.

Patients and methods: A cross-sectional study of community pharmacist interventions was completed. Participants included third-year pharmacy students and their pharmacist preceptor as a data collection team. The team identified all interventions on prescriptions during the hours worked together over a 7-day consecutive period. Full ethics approval was obtained.

Results: Nine student–pharmacist pairs submitted data from nine pharmacies in rural (n = 3) and urban (n = 6) centers. A total of 125 interventions were documented for 106 patients, with a mean intervention rate of 2.8%. The patients were 48% male, were mostly ≥18 years of age (94%), and 86% had either public or private insurance. Over three-quarters of the interventions (77%) were on new prescriptions. The top four types of problems requiring intervention were related to prescription insurance coverage (18%), drug product not available (16%), dosage too low (16%), and missing prescription information (15%). The prescriber was contacted for 69% of the interventions. Seventy-two percent of prescriptions were changed and by the end of the data collection period, 89% of the problems were resolved.

Conclusion: Community pharmacists are impacting the care of patients by identifying and resolving problems with prescriptions. Many of the issues identified in this study were related to correcting administrative or technical issues, potentially limiting the time pharmacists can spend on patient-focused activities.

Keywords: pharmaceutical care, pharmacy, medications, Canada, prescriptions, drug-related problems

Introduction

With the increasing number of new, more complex, and costly medications, pharmacists are the health care professionals with the skills and training to ensure the effective and safe use of medications.[1] Pharmacists are interested in taking on more significant roles to ensure their knowledge and skills are optimally utilized to improve patient outcomes and ensure judicious use of medications.[1–3] The landscape of community pharmacy is changing across Canada, with each province implementing various mechanisms to enable changes in scope of practice, such as pharmacist prescribing, medication management, regulation of pharmacy technicians, and electronic drug information systems.[1,4–6] Delivery and regulation of pharmacy practice falls under

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provincial jurisdiction and provinces currently vary in the stage of their regulatory changes. Within Newfoundland and Labrador (NL) progress has been made to implement some of the above policy changes.[7,8]

The scope of the pharmacist's responsibility starts with the patients presentation of the initial prescription to the community pharmacist and extends to any future point during the medication therapy.[9] At any step in the prescription-filling process, the pharmacist may identify problems such as incomplete information, incompatibility with the patient's current medications, or the occurrence of an adverse effect. Interventions made by pharmacists to resolve these issues ensure the quality, safety, and efficacy of the medications received. This function is often not recognized by patients or funders and may be a time consuming task.

Published evidence has demonstrated that pharmacists intervene on a regular basis, especially during the initial prescription-dispensing process.[10–21] The purpose of this study was to provide a current estimate of the number and types of interventions performed by community pharmacists in one Canadian province during processing of prescriptions. This baseline data will provide insight into the factors influencing current practice and areas where pharmacists can redefine and expand their role.

Materials and methods

A cross-sectional study of community pharmacist prescription interventions was completed over a one-week period between May and July 2010, utilizing pharmacy students as data collectors. Students were chosen as data collectors to provide exposure to research, as well as to minimize the increased workload of community pharmacists that would otherwise result from this research. Previous research in NL demonstrated that community pharmacists were challenged to find time to participate in data collection during their regular workday.[22] One week was chosen for data collection because students complete a 4-week placement and are expected to complete other activities during this time. For the purpose of this study, an intervention was defined as any action required by the pharmacist to resolve an identified issue related to a prescription from a licensed prescriber.

Participants for data collection

The interventions were documented by a data collection team consisting of a pharmacy student and pharmacist preceptor. The pharmacy students were initially invited to participate in the study. Students were eligible for inclusion if they were a third-year pharmacy student at Memorial University of Newfoundland (MUN) completing their summer student placement in NL, Canada. Students were excluded if they were completing their placement outside of NL, due to the interprovincial differences in pharmacy legislation. Additionally, if the students or preceptors did not consent to participate in the study, or the student had less than one week remaining in their placement, they were excluded.

The pharmacy students were responsible for completing the data-collection forms. Third-year pharmacy students were chosen due to their prior exposure in community pharmacy and their demonstration in coursework that they can accurately understand, identify, and document interventions in a pharmacy setting. During the data-collection time period they were also required to complete at least 4 weeks in a community pharmacy. The pharmacists were all preceptors for the MUN School of Pharmacy. All preceptors undergo preceptor training to ensure consistency with the expectations of the student's activities, including identifying and solving drug-related problems.

Once the students and their assigned preceptor each signed a consent form, the students were provided with a study package containing all required study materials and forms. The student–pharmacist pair then began data collection.

Data collection

The student-pharmacist pair was requested to identify all problems with prescriptions that required interventions, for all consecutive patients, during the hours worked together over a 7-consecutive-day period. Part of the pharmacist's daily responsibility is to identify problems when filling prescriptions. Students were not expected to identify additional problems, but to capture and document interventions that occurred in daily practice. As part of this process, the students recorded problems that required an intervention. Information recorded included patient demographics, a detailed description of the problem, actions taken to resolve the problem, the outcome of the intervention, and the time estimate for the problem resolution. A question was included that asked the team if additional patient information would have helped resolve the problem, and if answered yes, to explain how. When the data collection form was completed, the pharmacist was not expected to sign each form. However, it was the responsibility of the preceptor to oversee the work of the student and ensure that all students' work was accurately completed.

The student–pharmacist pair was not expected to categorize the drug-related problem when recording the intervention.

All documented interventions were coded (for the problem, action, and outcome sections) independently by two researchers, with a third researcher acting as tiebreaker when required. Coding for the type of problem was based on standard categories of drug-related problems, with additional categories added as required.[23] Coding for the action and outcomes logically complimented the type of problem and was consistent with how the literature reported the intervention coding process.[15,17,18]

The participating student-pharmacist pairs were also requested to record information about the pharmacy. They recorded the size of the town or city where the pharmacy was located, the type of pharmacy (eg, independent, banner, franchise, etc), hours during which the interventions were documented, and the number of prescriptions filled during the hours worked.

Outcomes

The outcome of interest for the pharmacy-level data included the percentage of prescriptions requiring intervention, calculated as the intervention rate. For the intervention-level data, the outcomes included a description of the number and type of interventions, the primary action taken to resolve the problem, the outcome of the pharmacist's intervention, and the average time required for resolution.

Analysis

Data were entered into and analyzed using Statistical Program for the Social Sciences (SPSS version 17; IBM, Armonk, NY). The characteristics of the sample were described with frequencies, means, and standard deviations. The intervention rate was calculated for each pharmacy as the number of interventions per pharmacy divided by the total number of prescriptions filled during the hours of data collection.

Ethics approval

The Interdisciplinary Committee on Ethics in Human Research (ICEHR) at Memorial University of Newfoundland, Canada approved the research protocol.

Results

Participants

Of the 40 third-year pharmacy students enrolled in the program, twelve were ineligible as they were completing their placements outside NL, 15 had already finished their work in a pharmacy prior to commencement of the study, and four expressed interest but subsequently declined. Of the 604 licensed pharmacists in the province 28 were eligible to participate as they were preceptors for third year students, nine agreed to participate in the study. A total of nine student–pharmacist pairs consented to participate in the study and provided data.

Data on interventions were provided from a variety of pharmacies with representation from rural and urban centers as well as different types of pharmacies (Table 1). The nine pharmacies involved in the data collection represented 4.6% of all pharmacies in NL (9/195).

Interventions

A total of 125 interventions were identified for 106 patients, with some patients requiring multiple interventions. The mean age of the patients was 54.6 years; 94.3% were 18 years of age or older (Table 2). The majority (85.8%) of the patients had at least one type of medication insurance while 15 (14.2%) did not have any insurance. Drugs involved in the interventions were categorized according to the American Hospital Formulary Service groupings.[24] The top five categories of medications where interventions occurred included central nervous system agents (26.4%), anti-infective agents (18.4%), cardiovascular drugs (12.8%), hormones (8.8%), and skin and mucous membrane agents (7.2%) (Table 3).

The total number of prescriptions filled during the hours worked over the study period was 5320. The mean intervention rate was 2.8%, with a range of 1.4% to 8.7%. Most (76.8%) of the interventions were for new prescriptions. Of the 125 interventions, 120 (96%) were for prescription products, and the remaining five (4%) were for over-the-counter products filled as a prescription.

The types of drug-related problems identified are noted in Table 4. The top four types of problems identified were issues related to prescription insurance coverage (n = 22, 17.6%), drug product not available (n = 20, 16%), dosage too low (n = 20, 16%), and missing information (n = 19, 15.2%).

Table 1 Pharmacy characteristics (self-reported, n = 9)

Characteristic	Result
Estimated population of town where pharmacy located, n (%)	
2000–10,000	3 (33)
>10,000–40,000	2 (22)
>40,000	4 (45)
Type of pharmacy, n (%)	
Banner pharmacy	2 (22)
Chain pharmacy	1 (11)
Franchise pharmacy	3 (33)
Independent pharmacy	1 (11)
Supermarket pharmacy	2 (22)

Table 2 Patient characteristics (n = 106)

Characteristic	Result
Age in years, expressed as mean ± SD (range)	54.6 ± 20.8 (2–97)
Age categories, n (%)	
<18 years	6 (5.7)
18–65 years	60 (56.6)
>65 years	40 (37.7)
Gender, n (%)	
Male	51 (48.1)
Female	55 (51.9)
Type of medication insurance, n (%)	
No prescription insurance	15 (14.2)
Public insurance	41 (38.7)
Private insurance	48 (45.3)
More than one	2 (1.9)

Abbreviation: SD, standard deviation.

These four categories made up about two-thirds (n = 81, 64.8%) of the total types of problems identified.

The most common action taken to resolve the problems identified was to call or contact the physician (n = 86, 68.8%), followed by, talking to the patient (n = 13, 10.4%), and completing required forms (eg, special authorization forms for third-party payers) (n = 11, 8.8%) (Table 5). Fourteen (11.2%) of the problems identified were not resolved by the end of the data-collection period. For those problems resolved by the end of the data-collection period, the average time required for each intervention was 9 minutes (±5 minutes), with a range of 5 to 30 minutes.

For the interventions resolved by the end of the data-collection period (n = 111), the most common outcome was that the prescription was dispensed as written (n = 31, 27.9%), followed by dispensing a different dose (n = 26, 23.4%), clarification of the prescription dispensed (n = 21, 18.9%), and dispensing a different drug (n = 20, 18%) (Table 6).

For 21 (16.8%) of the interventions, the data-collection team indicated that having more patient information would have helped resolve the problem. It was indicated that this additional information would have helped solve the problem more readily (eg, diagnosis or lab test result for dosage assessments).

Table 3 Categories of medications for interventions (n = 125)

Top medication categories for interventions, n (%)	Result
Central nervous system	33 (26.4)
Anti-infectives	23 (18.4)
Cardiovascular	16 (12.8)
Hormones	11 (8.8)
Skin and mucous membrane	9 (7.2)
Gastrointestinal	7 (5.6)
Eye, ear, nose, throat	5 (4.0)
Respiratory	4 (3.2)
Diuretics	4 (3.2)
Other	13 (10.4)

Table 4 Types of drug-related problems requiring intervention (n = 125)

Drug-related problem	n (%)
Noncompliance (drug product not available)	20 (16.0)
Dosage too low (incorrect dose or frequency written)	20 (16.0)
Dosage too high (incorrect dose written, drug interaction, or incorrect administration)	13 (10.4)
Needs additional drug therapy	4 (3.2)
Adverse drug reaction potential due to drug interaction	3 (2.4)
Adverse drug reaction potential due to allergy	3 (2.4)
Unnecessary drug therapy due to duplicate therapy or no indication	3 (2.4)
Noncompliance due to unable to administer or directions not understood	3 (2.4)
Adverse drug reaction potential due to unsafe drug for patient	2 (1.6)
Needs different drug product as dosage form inappropriate	1 (0.8)
Other	
Prescription insurance related problems	22 (17.6)
Information missing from prescription (eg, dose, strength, quantity)	19 (15.2)
Miscellaneous (not fit into another category)	9 (7.2)
No refills remaining on prescription	3 (2.4)

Discussion

This study demonstrated that pharmacists in a Canadian province are identifying and resolving problems with prescriptions. Nine student–pharmacist pairs documented 125 different interventions for problems identified in the prescription-filling process, with a mean intervention rate of 2.8%. Published studies have demonstrated that pharmacists intervene on a regular basis, especially during the initial prescription-dispensing process.[10–21] The rate of interventions in our study is consistent with published rates of interventions by pharmacists of 1%–6% of prescriptions.[10–15,17,19–21] This rate of intervention appears to be somewhat consistent over time.[15,17]

The top four types of problems identified in our study (prescription insurance issues, drug product unavailability, medication dosage too low for the patient, and missing

Table 5 Primary action taken to resolve identified problems (n = 125)

Action taken	n (%)
Call/contact the physician	86 (68.8)
Not resolved by end of data collection period	14 (11.2)
Talk to the patient	13 (10.4)
Special authorization or other insurance forms completed/called or insurance issue clarified	11 (8.8)
Consult references	1 (0.8)

Table 6 Outcome of interventions by pharmacist to resolve identified problem (n = 111)

Outcome	n (%)
Prescription dispensed as written	31 (27.9)
Different dose dispensed	26 (23.4)
Clarified prescription dispensed	21 (18.9)
Different drug dispensed	20 (18.0)
Different frequency of drug dispensed	4 (3.6)
Drug not dispensed	3 (2.7)
Additional drug recommended and dispensed	2 (1.8)
Additional monitoring recommended	1 (0.9)
Drug discontinued	1 (0.9)
Special authorization sent	1 (0.9)
Other	1 (0.9)

information on the prescription) made up almost two-thirds of the problems identified. Comparison of these results with other published literature is challenging due to varying methodology and definitions of interventions. However, the top categories in our study were often included in results of other published literature, whether from older Canadian studies, or more recent studies from outside Canada.[14–17,19–21]

The top two categories in our study (prescription insurance issues and drug product unavailability) would indicate that when an intervention on a prescription was necessary, it was based on more technical than clinical issues. Canada and its provinces are moving towards formal regulation of pharmacy technicians with defined roles and responsibilities, which will redistribute the workload to allow pharmacists to focus more on patient care activities.[4] National and provincial pharmacy regulatory bodies should continue this work to help move the profession forward. The issue of the drug products not being available appears to be more evident in recent literature, as it was not noted as a prominent issue in older Canadian studies.[15–17] A recent Canadian survey indicated this is a significant issue for Canadian pharmacists, requiring pharmacist time to resolve, inconveniencing patients, and potentially adversely affecting patients' health outcomes.[25] Some of this workload can be alleviated if pharmaceutical manufacturers work diligently to ensure an adequate supply of medications. As also noted in our study, prescription insurance issues were often related to filling out forms or following up with insurance companies. As such, insurance companies should work towards streamlining the process for third party billing.

The third most common category of problem identified was the "dose of the medication too low." Some of the burden of this type of problem may be alleviated once pharmacists are able to participate in the prescription-writing process. The pharmacy regulatory bodies in several Canadian provinces have moved towards prescriptive authority for approved pharmacists in specific settings, and NL is examining this practice.[26]

Missing information on the prescription was also a common problem identified in our study. An initiative that may aid in the resolution of this type of issue is the practice of "Medication Management," defined in NL as a set of specific professional activities undertaken by the registered pharmacist to optimize safe and effective drug therapy outcomes for patients.[7] Currently, Medication Management includes activities such as adapting a prescription (eg, completing missing information). In addition, an electronic drug information system (DIS) has been introduced in several provinces across Canada.[6] The DIS provides comprehensive medication profiles, which may help provide additional information that the pharmacist can use to identify problems. Both of these initiatives began after the data collection period for this study, and further study is needed to evaluate the impact of these practice changes on the types of interventions occurring.

Most of the interventions documented in our study were for new prescriptions (77%), consistent with other studies.[11,13,15,17] The incidence of chronic diseases, such as diabetes and hypertension, are increasing, and medication adherence rates for these conditions are often suboptimal.[27,28] Interventions on refill prescriptions that may optimize adherence are crucial to disease management, and initiatives that allow the pharmacist to spend more time on clinical versus technical functions should help improve this. In addition, monitoring chronic diseases and optimizing medication use should be a focus of the renewal process. Individual pharmacists and pharmacy regulatory bodies should work towards the goal of optimizing chronic disease–medication adherence and medication use.

Several limitations should be considered when interpreting the results of the study. The sample of pharmacies was not random, as pharmacies participating in the study had already agreed to precept a student during their summer placement. The pharmacists were serving as preceptors, so their screening and intervention activities may have been different from community pharmacists not supervising students. This study utilized pharmacy students as part of the data-collection team to expose students to research methodology and participation, as well as to minimize additional pharmacist workload. Previous research in this province indicated that many community pharmacists do not have time to dedicate to collecting data, so we chose this method as a way to minimize the workload on the pharmacist and still enable this research to be carried out. This resulted in a

shorter data-collection period and fewer interventions than other published studies.[10,16,20,21] Also, beyond the definition of an intervention and the structure of the forms, students and pharmacists were given no specific training in identifying interventions for the purpose of this study. However, students and pharmacists have received training, as part of their education, to enable them to accurately identify and document interventions. Although the pharmacies involved were from a range of rural/urban settings and types of pharmacy, the small number of participating pharmacies makes the results less generalizable to a broader setting. Future research in this area would need to take into account the limitations noted, as well as the potential change in practice with increased scope of practice for pharmacists.

Conclusion

This study showed that pharmacists are spending time intervening on prescriptions to ensure patients are receiving safe and effective therapy. Pharmacists are spending time intervening on technical or administrative issues, such as medication insurance coverage, missing information, and drug shortages, which may not be an effective use of their time and skills. While this study gives information about the current work environment, further research is needed to assess whether changes in scope of pharmacists' practice will allow more time for patient-centered care.

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Disclosure

The authors report no conflicts of interest in this work.

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