ARDEN R. BARRY

Developing a pharmacist referral program in a novel primary care practice is daunting. The purpose of this cross-sectional study was to characterize this process with the goals of identifying opportunities for improvement and informing the development of future programs.

L'élaboration d'un programme de recommandation à un pharmacien est une nouvelle pratique de soins primaires qui représente un défi colossal. Cette étude transversale visait à définir un tel processus dans le but de cerner les possibilités de l'améliorer et de documenter la mise au point des programmes futurs.

Development of a Pharmacist REferral Program in a primary cARE clinic (PREPARE): A prospective cross-sectional study

Arden R. Barry, BSc, BSc(Pharm), PharmD, ACPR

ABSTRACT

Background: Increasing demand for ambulatory health care services has led to the development of primary care multidisciplinary teams that include pharmacists. The objective of this study was to characterize referrals to a pharmacist in a primary care clinic (PCC) based in Chilliwack, British Columbia.

Methods: This prospective cross-sectional study included all patients referred to the PCC pharmacist over 12 months (May 2015 to April 2016). Data regarding the source/reason for referral, patient demographics, medical problems/medications and number/category of identified drug therapy concerns (DTCs) were collected.

Results: A total of 137 referrals were received. Mean age was 60 years and 59% were female. Twenty patients (15%) did not attend their appointment. Fifty-eight percent were new clinic patients identified using a Medication Risk Assessment Questionnaire (MRAQ), 30% were from PCC clinicians and 12% were from community family physicians. The most common reason for referral was for a medication review (82%). Median number of medical problems and medications per patient were 7 (interquartile range [IQR] 5) and 11 (IQR 7.5), respectively. A total of 460 DTCs were identified (median 4 per patient, IQR 3.5), of which 34% were medication without an indication and 28% an untreated indication.

Discussion and Conclusion: The most common source of referrals to a PCC pharmacist was for medication reviews of new patients using an MRAQ. Most referred patients had multiple medical problems and polypharmacy, and few were referred for disease-specific management. The number of DTCs per patient was variable and, despite polypharmacy being commonplace, almost one-third of patients had an untreated indication. *Can Pharm J (Ott)* 2017;150:206-215.

Background

Increasing demand for disease prevention and chronic disease state management has led to the development of novel ways of providing ambulatory health care using a multidisciplinary approach. Over the past several decades, the role of the pharmacist has expanded from a dispenser of medications to an integral member of the multidisciplinary health care team. As such,

pharmacists have developed nondispensing practices in primary care environments where they provide consultative pharmacy services to family physicians and nurse practitioners.^{1,2} This is not a new concept—the American Society of Health-System Pharmacists released a statement on the pharmacist's role in primary care over 17 years ago.³ Subsequently, studies have demonstrated that integration of pharmacists

into primary care practices improves the utilization of evidence-based therapies in diabetes, hypertension, cardiovascular risk reduction, heart failure, asthma, chronic kidney disease and appropriate prescribing in older adults.⁴⁻¹⁷

Recently, the *Canadian Pharmacists Journal* published guidelines for integrating pharmacists into primary care teams and how to apply these guidelines in practice.^{18,19}

Because pharmacists in primary care clinics do not have a consistent source of patients for whom to provide care (such as patients attending a community pharmacy or patients admitted to a hospital unit), they primarily rely on referrals from other providers to identify patients who may benefit from pharmacy services. However, there are a variety of ways by which a primary care pharmacist may generate referrals, including direct referrals from other clinicians (e.g., physicians, nurses, other pharmacists), questionnaires (e.g., Medication Risk Assessment Questionnaire [MRAQ]), chart reviews or patient self-referrals. Currently, there is a paucity of evidence regarding the most effective way of identifying appropriate patients who may benefit from a pharmacist consultation. Furthermore, it is not known if the health needs of the patients referred to a pharmacist differ based on the type of referral. The purpose of this study was to characterize and evaluate different referral methods to a clinical pharmacist in a new primary care practice.

Methods

Objectives

The objectives of this project were to identify (1) the total number of patient referrals to the pharmacist; (2) the source of each referral; (3) characteristics of the referred patients overall as well as based on referral source; and (4) total number and category of any drug therapy concerns (DTCs) identified.

Design/Setting

This prospective cross-sectional study was based at a primary care clinic (PCC) located in Chilliwack, British Columbia. The PCC acts as a single point of intake for all patients who are new to Chilliwack and the surrounding area or do not have a primary care provider. As well, the PCC provides longitudinal care for complex unattached patients. Patients can be referred to the

KNOWLEDGE INTO PRACTICE

- Increasing demand for disease prevention and chronic disease state management has led to the development of novel primary care pharmacist practices. There is currently a paucity of evidence regarding the most effective way of generating referrals for pharmacists in a primary care setting.
- The most common source of pharmacist referrals was offering medication reviews to new clinic patients based on the results of a Medication Risk Assessment Questionnaire. Patients who were referred directly to the pharmacist by another provider were more complex, with a higher number of medical problems and medications compared with new clinic patients.
- Over a 12-month period, a pharmacist in a novel primary care practice received an average of 3 referrals per week. Most patients had multiple medical problems and medications and/or natural health products.

PCC from various sources, including community-based practitioners (e.g., at walk-in clinics) and hospital practitioners, or patients can self-refer. Patients either are transitioned to the care of a family physician in the community or are followed indefinitely by the PCC. The PCC is staffed by 2 full-time nurse practitioners (NPs), 1 part-time NP and 6 part-time general practitioners. The number of active patients on the PCC roster fluctuates between approximately 950 and 1100.

The pharmacist (lead author) provides part-time consultative pharmacy services to PCC patients and other patients in the region. The pharmacist is jointly funded by Fraser Health and the University of British Columbia. Referrals were accepted in person or via fax from 3 sources: (1) direct referrals from primary care providers in the PCC; (2) direct referrals from family physicians from other clinics in Chilliwack or surrounding areas; and (3) select patients new to the clinic as part of the intake process. All new clinic patients were provided with a 10-question MRAQ, developed by Makowsky et al.,²⁰ which was sent via email or mail for patients to complete. All MRAQs were reviewed by a medical office assistant. Any patient who answered yes to 3 or more of the 10 MRAQ questions (as recommended by Makowsky et al.) was invited by the medical office assistant to have a consultative appointment with the pharmacist. To help facilitate the direct-from-provider referral process, a pharmacist-specific referral form was

MISE EN PRATIQUE DES CONNAISSANCES

- La croissance de la demande en matière de prévention des maladies et de prise en charge des maladies chroniques entraîne la mise au point de nouveaux soins primaires. Il existe nombre de données probantes sur le moyen le plus efficace de recommander un pharmacien dans un milieu de soins primaires.
- Parmi celles-ci, la source la plus courante de recommandation consistait à offrir des examens médicaux aux nouveaux patients en fonction des réponses à un questionnaire d'évaluation des risques liés aux médicaments. Les patients directement adressés à un pharmacien par un autre fournisseur de soins avaient un état de santé plus complexe, impliquant plus de problèmes médicaux et de médicaments que les nouveaux patients suivis en clinique.
- Sur une période de 12 mois, trois patients en moyenne ont été adressés au pharmacien en soins primaires. La plupart de ces patients souffraient de plusieurs problèmes médicaux et prenaient plusieurs médicaments ou produits de santé naturels.

created and disseminated to all providers in the PCC and family physicians within the Chilliwack Division of Family Practice. This study was submitted to the Fraser Health Research Ethics Board for approval and was deemed to be a quality improvement/evaluation project and thus exempt from review.

Procedures

The study population consisted of all patients referred to the pharmacist in the PCC over a 12-month period (May 2015 to April 2016). All patients underwent a comprehensive medication review by the pharmacist, which included past medical history, best possible medication history, allergy status and development of a patient-specific care plan. The best possible medication history included a medication history interview with the patient and/or family member and review of PharmaNet, a secure electronic database that provides real-time information on all prescription medications that are processed at community pharmacies within British Columbia. All initial appointments were scheduled for 60 minutes. Follow-up was determined based on need, as per the pharmacist's opinion and patient preference. All follow-up appointments were scheduled for 30 minutes. A detailed electronic health record note or referral letter was written and communicated to the referring clinician (as well as any other applicable health care providers) for all patients seen in clinic.

Data Collection

Data were collected from the clinic and/or health authority electronic health record (if the patient was recently admitted to hospital). Any referrals that were deemed inappropriate by the pharmacist (e.g., beyond scope of practice, need for acute care) were excluded. The following data were collected in a de-identified manner: source of referral; profession of referring clinician; practice location of referring clinician; date; patient demographics (age, sex, number and type of medical problems; number and type of medications, including prescription, nonprescription and natural health products); and whether follow-up was scheduled and/or performed. Only age and sex were collected for patients who did not attend their appointment. Natural health products (NHPs) were defined as any vitamins, minerals, supplements, herbal remedies, homeopathic remedies and/or traditional medicines. Drug therapy concerns were classified as 1 of 8 predefined categories based on criteria developed by Zed et al.²¹ Accordingly, each DTC was assigned a severity of mild (laboratory abnormality or symptom not requiring treatment), moderate (laboratory abnormality or symptom requiring treatment or admission to hospital or resulting in nonpermanent disability), severe (abnormality or symptom that was life-threatening or resulted in permanent disability) or fatal. The pharmacist provided recommendations to resolve any identified DTCs as part of their routine clinical practice.

Statistical Analysis

As this study was a cross-sectional descriptive analysis, no sample size was calculated. Patient characteristics were evaluated using descriptive statistics (IBM SPSS, version 21; IBM Corporation, Armonk, NY). Comparisons based on referral source (intake versus direct referrals) were performed with the Student *t* test for parametric continuous variables, Mann-Whitney *U* test for nonparametric continuous variables (e.g., medians) and chi-square test for categorical variables. A *p* value less than 0.05 was considered statistically significant.

Results

Over the 12-month follow-up period, 137 referrals were received by the pharmacist (mean of 2.6 referrals per week) (Figure 1). No referrals were excluded. The mean age was 59.7 years

TABLE 1 Source of referrals

	<i>n</i>	%
New PCC patients using the MRAQ	80	58.4
PCC nurse practitioner	27	19.7
External general practitioner	16	11.7
PCC general practitioner	14	10.2

MRAQ, medication risk assessment questionnaire; PCC, primary care clinic.

TABLE 2 Reason for referrals

	<i>n</i>	%
Medication review	112	81.8
Disease-specific reason	19	13.9
Drug interaction	3	2.2
Adverse drug reaction	2	1.5
Adherence	1	0.7

(standard deviation 15.5) and 81 (59.1%) were female. Twenty patients (14.6%) either did not show up for their appointment or cancelled without rescheduling—15 (15/80, 18.8%) were from the intake process and 5 (5/57, 8.8%) were direct referrals. Thus, any data beyond the patient's age and sex were not included. The source and reason for referrals are detailed in Tables 1 and 2, respectively. The majority of referrals (80/137, 58.4%) were from the intake process with the aid of the MRAQ, as opposed to direct referrals. However, this number represents a small percentage of the patients who completed the MRAQ and attended a meet-and-greet appointment with a clinician at the PCC (80/776, 10.3%). All patients identified via the intake process with the aid of the MRAQ were classified as a general medication review. Of the direct referrals, 19 (19/57, 33.3%) were for a disease-specific concern, most frequently hypertension ($n = 3$), hypotension ($n = 2$), depression ($n = 2$), chronic obstructive pulmonary disease ($n = 2$) and chronic pain ($n = 2$).

Table 3 includes a detailed description of the number of medical problems and medications overall and based on referral source (intake versus direct referrals). Patients had a median of 7 medical problems (interquartile range [IQR] 5), which was numerically higher for directly referred patients but not statistically significant.

FIGURE 1 Referral flow diagram

The most common medical problems overall were chronic pain, hypertension and depression/anxiety. Directly referred patients had a

TABLE 3 Detailed description of referred patients' medical problems and medications

Overall patients	Total (N = 137)	Intake (n = 80)	Direct referrals (n = 57)	p value*
Age, mean (SD)	59.7 (15.5)	59.9 (14.6)	59.5 (16.9)	0.89
Female sex, %	59.1	58.8	59.6	0.92
Patients who attended appointment with pharmacist	Total (N = 117)	Intake (n = 65)	Direct referrals (n = 52)	p value*
Medical problems, median (IQR)	7 (5)	6 (4)	8.5 (6)	0.06
Prescription medications, median (IQR)	6 (6)	5 (4.5)	9 (8)	0.03
Nonprescription medications, median (IQR)	1 (2)	1 (1)	1 (2)	0.31
Natural health products, median (IQR)	1 (3)	2 (3)	1 (2)	0.79
Total medications, median (IQR)	11 (7.5)	9 (7)	12 (10)	0.57
Medical problems, %				
Chronic pain/arthritis	61.5	67.7	53.8	0.13
Depression/anxiety	47.0	36.9	59.6	0.01
Insomnia	39.3	32.3	48.1	0.08
Other psychiatric disorders [†]	14.5	12.3	17.3	0.45
Neurological disorders [‡]	24.8	20.0	30.8	0.18
Thyroid disorders [§]	21.4	18.5	25.0	0.39
Asthma/COPD	28.2	23.1	34.6	0.17
Hypertension	51.3	47.7	55.8	0.39
Dyslipidemia	45.3	33.8	59.6	<0.01
CVD	32.5	20.0	48.1	<0.01
Heart failure	12.8	4.6	23.1	<0.01
Atrial fibrillation	8.5	3.1	15.4	0.02
GERD/dyspepsia	41.0	46.2	34.6	0.21
Gastrointestinal disorders ^{**}	24.8	21.5	28.8	0.36
CKD	8.5	6.2	11.5	0.30
Other urological disorders ^{††}	12.0	13.8	9.6	0.48
Diabetes mellitus	25.6	15.4	38.5	<0.01
Osteoporosis	12.0	9.2	15.4	0.31
Venous thromboembolism	5.1	1.5	9.6	0.049
Smoker	22.2	20.0	25.0	0.21
Ex-smoker	29.1	26.2	32.7	0.44
Prescription medications, %				
Hypnotic	47.9	38.5	59.6	0.02
Antidepressant	41.0	33.8	50.0	0.08
Antiepileptic	8.5	4.6	13.5	0.09
Gabapentin/pregabalin	18.8	16.9	21.2	0.56

(continued)

TABLE 3 (continued)

Overall patients	Total (N = 117)	Intake (n = 65)	Direct referrals (n = 52)	p value*
Antipsychotic	15.4	13.8	17.3	0.61
Opioid	33.3	24.6	44.2	0.03
NSAID ^{††}	42.7	53.8	28.8	<0.01
Antihypertensive	60.7	53.8	69.2	0.09
Anticoagulant	8.5	3.1	15.4	0.02
Antiplatelet ^{§§}	35.9	33.8	38.5	0.61
Statin	37.6	26.2	51.9	<0.01
Diuretic ^{***}	13.7	4.6	25.0	<0.01
Oral antidiabetic	18.8	12.3	26.9	0.04
Insulin	8.5	4.6	13.5	0.09
Gastric acid suppressant	45.3	47.7	42.3	0.56

CKD, chronic kidney disease; COPD, chronic obstructive pulmonary disease; CVD, cardiovascular disease; IQR, interquartile range; NSAID, nonsteroidal anti-inflammatory drug; SD, standard deviation.

*Comparison of intake versus direct referral patients.

[†]Other psychiatric disorders included attention deficit hyperactivity, bipolar, borderline personality, obsessive-compulsive, posttraumatic stress, schizoaffective and Tourette's syndrome.

[‡]Neurologic disorders included brain aneurysm, brain cancer, cerebral palsy, chronic fatigue syndrome, cognitive delay, dementia, essential tremor, glossopharyngeal neuralgia, Huntington's disease, migraines, Parkinson's disease, restless leg syndrome, seizure and transient global amnesia.

[§]Thyroid disorders included hyperthyroidism and hypothyroidism.

^{**}Gastrointestinal disorders included achalasia, celiac disease, chronic nausea, colitis/diverticulitis, constipation, dysmotility, hepatitis, irritable bowel syndrome and rectal cancer.

^{††}Other urologic disorders included bladder cancer, incontinence, nephrolithiasis, nocturnal enuresis and prostate cancer.

^{‡‡}NSAIDs included prescription and over-the-counter medications (ibuprofen, naproxen).

^{§§}Low-dose acetylsalicylic acid was counted as an antiplatelet agent, as opposed to an NSAID.

^{***}Chlorthalidone, hydrochlorothiazide and indapamide were counted as antihypertensives, as opposed to diuretics.

significantly higher rate of depression/anxiety, dyslipidemia, cardiovascular disease, heart failure, atrial fibrillation, diabetes mellitus and venous thromboembolism. Patients were taking a median of 11 medications and/or NHPs (IQR 7.5). Directly referred patients, as opposed to intake patients, had a significantly higher median number of prescription medications. The most common classes of prescription medications were antihypertensives, hypnotics and gastric acid suppressants. Less than 3% of patients were taking mood stabilizers, amiodarone, digoxin, methotrexate or prednisone. Directly referred patients were taking a significantly higher percentage of hypnotics, opioids, anticoagulants, statins, diuretics and antidiabetic agents, while significantly more intake patients were taking a

nonsteroidal anti-inflammatory drug. Overall, follow-up was scheduled for 34 patients (34/117, 29.1%), of whom 27 were direct referrals (27/52, 51.9%) and 7 were intake patients (7/65, 10.8%).

In total, 460 DTCs were identified for a median of 4 per patient (IQR 3.5). A detailed description of the DTCs based on category is included in Table 4. Eight patients (8/117, 6.8%) did not have any DTCs identified, of whom 6 (6/8, 75%) were intake patients. All DTCs were classified as mild, as no DTC resulted in acute treatment, hospitalization, disability or death. The majority of DTCs (283/460, 61.5%) were categorized as either a drug without a valid indication or an untreated indication. Patients who were directly referred had a higher number of median DTCs per patient compared with

TABLE 4 Drug therapy concerns

	Overall (<i>N</i> = 117)	Intake (<i>n</i> = 65)	Direct referrals (<i>n</i> = 52)
Drug therapy concerns, <i>n</i>	460	212	248
Number of drug therapy concerns per patient, median (IQR)	4 (3.5)	3 (3)	4 (4)
Drug without indication, <i>n</i> (%)	154 (33.5)	63 (29.7)	91 (36.7)
Untreated indication, <i>n</i> (%)	129 (28.0)	65 (30.7)	64 (25.8)
Supratherapeutic dose, <i>n</i> (%)	66 (14.3)	35 (16.5)	31 (12.5)
Subtherapeutic dose, <i>n</i> (%)	41 (8.9)	12 (5.7)	29 (11.7)
Improper drug selection, <i>n</i> (%)	33 (7.2)	20 (9.4)	13 (5.2)
Adverse drug reaction, <i>n</i> (%)	23 (5.0)	8 (3.8)	15 (6.0)
Drug interaction, <i>n</i> (%)	7 (1.5)	5 (2.4)	2 (0.8)
Nonadherence, <i>n</i> (%)	7 (1.5)	4 (1.9)	3 (1.2)

IQR, interquartile range.

intake patients (4 [IQR 4] versus 3 [IQR 3], respectively). The most common DTC among patients who were directly referred was a drug without an indication (36.7% of all DTCs), whereas the most common DTC for intake patients was an untreated indication (30.7% of all DTCs).

Discussion

This prospective cross-sectional study evaluated 137 referrals of patients seen by a PCC pharmacist over a 12-month period. The highest number of pharmacist referrals was for medication reviews of new clinic patients via the completion of an MRAQ and triaged by a medical office assistant. A minority of patients were direct referrals from clinic providers, which is not unexpected, as it can take time to develop rapport and trust between the pharmacist and other team members. The triage of new clinic patients using the MRAQ was advantageous, as it provided a source of patient referrals independent of the clinic physicians and nurses, who were initially unsure about which patients to refer to the pharmacist. However, this triaging of new patients using the MRAQ resulted in a small number of patients with few or no DTCs. Therefore, one could infer that patients who were directly referred to the pharmacist potentially benefited more from the consultation, although these data were not collected. Expectedly, most referred patients had

multiple medical problems and polypharmacy. Patients who were directly referred to the pharmacist were generally more complex, with a higher number of medical problems and prescription medications. Few patients were referred for disease-specific concerns; thus, referrals tended to be more patient-specific, as opposed to disease- or medication-specific. Of those referred for a disease-specific concern, 42.1% (8/19) were referred for cardiac disorders or cardiovascular disease. As well, directly referred patients had a higher percentage of cardiovascular disease, dyslipidemia, heart failure and atrial fibrillation. This is likely explained by the training of the clinical pharmacist, who completed a postdoctoral fellowship in cardiovascular pharmacotherapeutics; therefore, clinicians may have been more inclined to refer patients with cardiovascular disorders to the pharmacist. A limited number of patients were receiving high-alert medications, as per the Institute for Safe Medication Practices target drug list in community/ambulatory health care.²² The most commonly used high-alert medication among referred patients was opioids (33.3%). Other agents, such as oral hypoglycemic agents (18.8%), insulin (8.5%), oral anticoagulants (8.5%) and methotrexate (2.6%), were less common. Therefore, in practices similar to the PCC, the pharmacist should specifically target these patients to determine the need for a consultative review.

The number of DTCs per patient was variable and most related to either initiating or discontinuing a medication. The most common DTC was a drug without an indication, which is not unexpected given that patients were on a median of 11 medications; this was higher in directly referred versus intake patients, who were on a higher median number of medications. Surprisingly, despite polypharmacy being commonplace, almost one-third of patients had an untreated indication, which was more common among intake versus directly referred patients. Only 7% of patients did not have an identified DTC, which substantiates the processes by which patients were referred to the pharmacist. Thus, this aids in validating the MRAQ as an effective tool for identifying patients who may benefit from a pharmacist consultation. Only DTCs that were identified at the initial visit were captured. As well, not all DTCs may have been identified, as some were contingent on pending investigations, such as laboratory tests or diagnostic imaging. Recommendations to resolve each of the DTCs identified were provided to the patient's primary care provider. However, data regarding the number of recommendations accepted were not collected, as this metric is not necessarily reflective of effective patient care and is dependent on a number of clinician factors (e.g., training, experience, relationship with the pharmacist). For example, a clinician may implement the one most acute recommendation while deferring multiple other recommendations to another visit, which may result in a low overall rate of acceptance.

The PCC is a unique clinic that is not necessarily representative of a typical primary care practice. The clinic provides longitudinal care to unattached patients who do not access, or are generally not adherent to, medical care. Therefore, the clinic has a high proportion of patients with mental health problems, substance abuse disorders or both. As such, approximately 15% of patients cancelled their appointment without rescheduling or simply did not show up. As well, the clinic acts as a single point of intake for all new patients in the region. Therefore, the number of new patients entering the PCC through the intake process is much higher than other practices in the area. Thus, using the MRAQ via the intake process may generate far fewer referrals in a different clinic setting.

This study has several limitations that warrant discussion. First, it was limited to a single

primary care practice with one clinical pharmacist. To minimize variability, a single investigator performed data collection. However, this also introduces the risk of confirmation bias. Second, the past medical history for most intake patients was based entirely on patient self-report and thus was at risk of recall bias. In general, data collected relied on the accuracy of the clinic electronic health record. However, whenever possible, multiple sources of information were sought. For example, all patients were asked to bring all of their current medications to the appointment to cross-reference them against PharmaNet data. As well, if the patient was recently admitted to hospital, the primary investigator had access to the local health authority's electronic health record to access their discharge summary. Finally, no specific outcome measures were collected (e.g., hospitalizations, adverse drug reactions), as the study was designed to be observational.

This study implies that pharmacists setting up primary care practices should develop processes to receive both clinician- and patient-generated referrals. The importance of relationship building and therapeutic trust between the pharmacist and other primary care providers (i.e., physicians and nurse practitioners) should not be underestimated, and clinician-generated referrals will tend to increase over time. Further, patient self-referrals to the pharmacist should be approached cautiously, as they may be perceived negatively (at least initially) by their primary care provider. Thus, new clinic patients represent an ideal group to target for patient self-referral to the pharmacist. Future directions should include an evaluation of providing the MRAQ to clinicians as a way to identify target patients who may benefit from a pharmacist referral, as well as qualitative evaluation of both patients' and clinicians' perception of the clinical pharmacy services offered, as quantitative outcomes are difficult to measure.

Conclusion

Over a 12-month period, 137 patients were referred to a clinical pharmacist in a new primary care practice, which equates to an average of approximately 3 patients per week. Fifty-eight percent of referrals were generated through a medical office assistant-led process with the aid of an assessment tool (the MRAQ). Patient-generated referrals outnumbered clinician-generated referrals. The MRAQ developed by

Makowsky et al.²⁰ was an effective tool for generating pharmacist referrals, as 93% of the intake patients had 1 or more identified DTCs. Generally, patients referred to the pharmacist had multiple comorbidities and medications, although high variance was observed. Eighty-two percent of patients were referred for a general medication review. Thus, referrals appeared to be primarily based on patient medication complexity, as opposed to specific drugs or disease states.

Most patients had 1 or more DTCs (median 4 per patient), although high variance was observed. Unsurprisingly, given that half of the patients were taking 11 or more medications, the most common drug therapy concern identified was a drug without a clear indication. However, almost one-third of all DTCs identified were for untreated indications for drug therapy, which was more common among intake versus directly referred patients. ■

From the Lower Mainland Pharmacy Services, Chilliwack, and the Faculty of Pharmaceutical Sciences, University of British Columbia, Vancouver, British Columbia. Contact arden.barry@ubc.ca.

Acknowledgments: The author thanks Dr. Glen Pearson, Professor of Medicine, Division of Cardiology, Department of Medicine and Associate Chair, Health Research Ethics Board, Faculty of Medicine & Dentistry, University of Alberta, for his assistance with reviewing this manuscript prior to submission.

Author Contributions: A. R. Barry initiated the project, collected and analyzed the data, and wrote the manuscript.

Declaration of Conflicting Interests: The author has no financial or other conflicts of interest related to this work.

Funding: This study was unfunded.

References

- Pottie K, Farrell B, Haydt S, et al. Integrating pharmacists into family practice teams. *Can Fam Physician* 2008;54:1714-5.e1-5.
- Jorgenson D, Laubscher T, Lyons B, Palmer R. Integrating pharmacists into primary care teams: barriers and facilitators. *Int J Pharm Pract* 2014;22:292-9.
- American Society of Health-System Pharmacists. ASHP statement on the pharmacist's role in primary care. *Am J Health Syst Pharm* 1999;56:1665-7.
- Geber J, Parra D, Beckey NP, Korman L. Optimizing drug therapy in patients with cardiovascular disease: the impact of pharmacist-managed pharmacotherapy clinics in a primary care setting. *Pharmacotherapy* 2002;22:738-47.
- Till LT, Voris JC, Horst JB. Assessment of clinical pharmacist management of lipid-lowering therapy in a primary care setting. *J Manag Care Pharm* 2003;9:269-73.
- Sookaneknun P, Richards RM, Sanguansermisri J, Teerasut C. Pharmacist involvement in primary care improves hypertensive patient clinical outcomes. *Ann Pharmacother* 2004;38:2023-8.
- Simpson SH, Majumdar SR, Tsuyuki RT, Lewanczuk RZ, Spooner R, Johnson JA. Effect of adding pharmacists to primary care teams on blood pressure control in patients with type 2 diabetes: a randomized controlled trial. *Diabetes Care* 2011;34:20-6.
- Ladhani NN, Majumdar SR, Johnson JA, et al. Adding pharmacists to primary care teams reduces predicted long-term risk of cardiovascular events in type 2 diabetic patients without established cardiovascular disease: results from a randomized trial. *Diabet Med* 2012;29:1433-9.
- Lowrie R, Mair FS, Greenlaw N, et al. Pharmacist intervention in primary care to improve outcomes in patients with left ventricular systolic dysfunction. *Eur Heart J* 2012;33:314-24.
- Gilani F, Majumdar SR, Johnson JA, et al. Adding pharmacists to primary care teams increases guideline-concordant antiplatelet use in patients with type 2 diabetes: results from a randomized trial. *Ann Pharmacother* 2013;47:43-8.
- Yakiwchuk EM, Jorgenson D, Mansell K, Laubscher T, LeBras M, Blackburn DF. Collaborative cardiovascular risk reduction in primary care II (CCARP II): implementation of a systematic case-finding process for patients with uncontrolled risk factors. *Can Pharm J (Ott)* 2013;146:284-92.
- Ip EJ, Shah BM, Yu J, Chan J, Nguyen LT, Bhatt DC. Enhancing diabetes care by adding a pharmacist to the primary care team. *Am J Health Syst Pharm* 2013;70:877-86.
- Lowrie R, Lloyd SM, McConnachie A, Morrison J. A cluster randomised controlled trial of a pharmacist-led collaborative intervention to improve statin prescribing and attainment of cholesterol targets in primary care. *PLoS One* 2014;9:e113370.
- Barnes KD, Tayal NH, Lehman AM, Beatty SJ. Pharmacist-driven renal medication dosing intervention in a primary care patient-centered medical home. *Pharmacotherapy* 2014;34:1330-5.
- Gums TH, Carter BL, Milavetz G, et al. Physician-pharmacist collaborative management of asthma in primary care. *Pharmacotherapy* 2014;34:1033-42.

16. Riordan DO, Walsh KA, Galvin R, Sinnott C, Kearney PM, Byrne S. The effect of pharmacist-led interventions in optimising prescribing in older adults in primary care: a systematic review. *SAGE Open Med* 2016;4:2050312116652568.
17. Bajorek B, Lemay KS, Magin P, Roberts C, Krass I, Armour CL. Implementation and evaluation of a pharmacist-led hypertension management service in primary care: outcomes and methodological challenges. *Pharm Pract (Granada)* 2016;14:732.
18. Jorgenson D, Dalton D, Farrell B, Tsuyuki RT, Dolovich L. Guidelines for pharmacists integrating into primary care teams. *Can Pharm J (Ott)* 2013;146:342-51.
19. Barry AR, Pammett RT. Applying the guidelines for pharmacists integrating into primary care teams. *Can Pharm J (Ott)* 2016;149:219-225.
20. Makowsky MJ, Cave AJ, Simpson SH. Feasibility of a self-administered survey to identify primary care patients at risk of medication-related problems. *J Multidiscip Healthc* 2014;7:123-7.
21. Zed PJ, Abu-Laban RB, Balen RM, et al. Incidence, severity and preventability of medication-related visits to the emergency department: a prospective study. *CMAJ* 2008;178:1563-9.
22. Institute for Safe Medication Practices. *ISMP list of high-alert medications in community/ambulatory health care*. Available: <https://www.ismp.org/communityRx/tools/ambulatoryhighalert.asp> (accessed Jul. 18, 2016).