



Managing common ambulatory conditions: Exploring clinical decision making performance between pharmacists and family physicians

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ABSTRACT

Background: Prescribing is part of the expanded scope of practice for pharmacists in Alberta, Canada. Given these responsibilities, clinical decision making (the outcome from the diagnostic and therapeutic decision making process) is an essential skill for pharmacists. The current study compared diagnostic and therapeutic decision-making between Additional Prescribing Authority (APA) pharmacists and family physicians using a set of common ambulatory clinical cases that both practitioners could encounter in the community as part of their daily practice.

Objectives: To explore clinical decision making performance and behaviors between APA pharmacists and family physicians during the assessment and prescribing of common ambulatory conditions.

Methods: Eight written ambulatory clinical cases were developed by a panel of experts in both family medicine and pharmacy that were commonly encountered in both professions' daily practice. Participating APA pharmacists and family physicians reviewed the cases and responded with likely diagnoses, recommended treatments, and reported confidence in therapeutic choices. The responses of 18 APA pharmacists and 9 family physicians in community practices were analyzed.

Results: There were no significant differences in diagnostic accuracy, therapeutic accuracy, confidence in diagnostic choices, and confidence in therapeutic choices between APA pharmacists and family physicians to these common ambulatory presentations.

Conclusions: This study provides preliminary insights regarding the capabilities of pharmacists in the assessment of common ambulatory community conditions and suggests that APA pharmacists are making similar diagnostic and therapeutic decisions to family physicians. Future research could focus on examining the performance of pharmacists trained in different pharmacy education models, as well as their ability to provide clinical assessment in other specialties, or in more uncommon clinical scenarios.

Background

Pharmacists have expertise in the safe and effective use of medication therapy. Traditionally, pharmacists have occupied a more passive role in healthcare systems focusing largely on drug distribution and the dispensing process.¹ However, changes in healthcare environments such as increasing complexity in patients, and workforce shortages have required pharmacists to utilize their expertise as drug therapy experts and expand their scope of practice to diagnostic and therapeutic

decision-making.² As such, the global scope of practice for pharmacists has expanded beyond the role of assessing medication appropriateness while dispensing medication to take on more active clinical roles such as care planning, vaccination, and chronic disease management.²⁻⁴ The Canadian Pharmacists Association advocates for a consistent scope of pharmacy practice across Canada practice with four clinical authorities⁵: a) pharmacists can dispense medications, b) pharmacists can administer medications, c) pharmacists can manage medications by ordering and interpreting health tests, and d) pharmacists can prescribe

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medications.

Of the four clinical authorities, pharmacist prescribing represents a major change in pharmacy scope of practice. Pharmacist prescribing practices has been organized across a continuum ranging from supplementary prescribing to independent prescribing.⁶ Supplementary prescribing describes when pharmacists form explicit agreements with other prescribers, such as physicians, that defines the scope of the pharmacists' prescribing. Independent prescribing allows pharmacists to prescribe without having to enter a formal relationship with another prescriber (i.e., physicians). In all types of pharmacist prescribing, pharmacists are expected to act within their professional competencies and to connect with or refer to other healthcare professionals as appropriate. While all pharmacists in Alberta are allowed to independently prescribe for the purposes of extending or adapting an existing prescription, since 2007 Albertan pharmacists can also attain Additional Prescribing Authority (APA) upon approval by the Alberta College of Pharmacy.^{3,7} APA pharmacists can independently prescribe to initiate (i.e., start patients on new therapy) Schedule 1 medications (i.e., Canadian designation for medications requiring a prescription, excluding controlled substances). As of 2022, over 3500 pharmacists — nearly 60% of all active pharmacists in Alberta — held the APA designation.⁸

There is growing interest in the appropriateness of expanding scopes of practice such as APA. Stakeholders, including pharmacists, physicians, and patients, are generally cautious of pharmacist prescribing due to concerns regarding the differences in training between pharmacists and medical physicians.⁹ Despite these reservations, the evidence gathered thus far is supportive of pharmacist prescribing.¹⁰ For example, experimental studies have demonstrated that patients allocated into pharmacist-prescribed care have shown better patient outcomes in diseases states like hypertension or diabetes than usual care.^{11,12} Patient satisfaction and economic benefits have been reported.^{13–15} As such, pharmacist prescribing models continue to be implemented in North America. Ontario, for example, has recently asked for province-wide feedback on a pharmacist prescribing legislation.¹⁶

Several reviews have demonstrated that across multiple clinical disciplines pharmacist-prescribed therapies result in similar, if not better, patient outcomes when compared to physician-prescribed therapies.^{17–19} In addition, patients reported higher satisfaction rates with pharmacist-prescribing.^{20,21} The majority of studies of pharmacist prescribing behaviors analyzed the initiation or changing of medications given a prior diagnosis, often in a multidisciplinary setting.^{17–19,22} However, another factor that has been driving the implementation of pharmacist prescribing is the primary care provider shortage in North America.^{23,24} Prescribing pharmacists are gaining recognition as valued primary care providers, particularly around the management of ambulatory or “minor” illnesses in the outpatient setting.^{25,26} Currently in Canada, eight provinces enable pharmacists to prescribe for minor ailments with legislation pending in the two remaining provinces.³ The management of these ambulatory conditions often require the pharmacist to establish a diagnosis or at the least obtain diagnostic information. There are fewer studies that have examined how pharmacists would approach independent prescribing for ambulatory conditions. Studies conducted primarily in the United Kingdom have qualitatively assessed pharmacist management of certain conditions.^{27–32} The evidence from these studies showed pharmacists largely demonstrated risk-averse behaviors and engaged in rigid protocols to gather clinical information, resulting in substandard diagnostic responses. There appears to be a gap in the literature where a broad assessment of the capabilities of pharmacists such as their confidence and accuracy in diagnostic and therapeutic decision making towards the diverse presentations in ambulatory settings is warranted.

The objective of this study was to explore the performance of pharmacists when presented with a range of common ambulatory conditions requiring drug therapy or advice to establish a baseline understanding of the confidence and accuracy of the clinical decision making skills of Albertan pharmacists with APA. As many of these ambulatory

conditions are also presentations commonly seen in the discipline of family medicine or primary care, both pharmacist and family physician responses to a variety of clinical vignettes were compared in a survey-based approach. The hypothesis driving this study was that given previously identified differences in training, knowledge, and experience, pharmacists would demonstrate lower performance diagnostic and therapeutic decision-making and lower confidence than family physicians.^{27–30,32–35}

Methods

Setting and participants

The study took place in the province of Alberta, Canada. Participants included in the study were pharmacists with Additional Prescribing Authority (APA) and family physicians practicing in community settings (non-hospital) in Alberta.^{36,37} To practice in Canada, graduates of Canadian BScPharm or PharmD programs must pass the Pharmacy Examining Board of Canada exam and complete structured internship hours prior to independent practice. In Alberta, pharmacists are regulated by the Alberta College of Pharmacy which also grants the APA status to eligible pharmacists. Pharmacists can attain APA status after being licensed for independent practice for at least 1 year or by graduating from an accredited Canadian Doctor of Pharmacy program starting in 2018; must demonstrate strong collaborative relationships with other regulated healthcare professionals; must demonstrate and maintain the necessary knowledge, skills, abilities, and clinical judgement to enhance patient care; and must demonstrate the required supports to enable safe and effective management of drug therapy.³⁷ These factors are assessed in an application which includes a professional narrative describing the applicant's competencies and limitation as well as 3 clinical cases describing the applicant's care process.

Family physicians in Alberta are regulated by the College of Physicians and Surgeons of Alberta. Graduates of Canadian Doctor of Medicine (MD) programs must first complete a family medicine residency program and pass the Certifying Examination in Family Medicine by the College of Family Physicians of Canada, prior to independent practice as a family medicine physician.^{38,39}

Study design

The survey was delivered in an online format using the Qualtrics program and included demographic questions to organize participants into 2 major groups — pharmacists and family physicians. The following demographic data were collected: gender identity, time in practice, relevant degree status. Participants were informed to respond to the clinical cases as they would in their respective practice settings and there were no time limits for individual cases, however, participants were given a guide that the survey could be completed in approximately 30 min.

Following the demographic information, participants were presented with the 8 clinical cases in a randomized order. For each clinical case, the participants were asked to provide a free text, written (constructed) response with their assessment of likely diagnosis (Dx) and a likely drug therapy to be prescribed (Rx). Participants were asked to rate their confidence regarding their diagnostic and therapeutic decisions (designated as Dx and Rx confidence, respectively) on a 5-point rating scale. Participants were given the option to detail any other actions of care they may wish to take.

Case development

A panel consisting of 5 personnel, recruited via invitation, with expertise in family medicine, pharmacy education, survey design, pharmacy practice, and educational assessment, including authors VC, KH, LG, and DT. The panel built a blueprint of potential ambulatory

conditions that were frequently discussed in the pharmacy literature. From the blueprint, 8 cases were developed and piloted. Case development focused on ambulatory de novo clinical presentations (i.e., the first time a patient has sought help for a condition). The criteria used during the blueprinting process focused on cases that were non-emergency conditions, which could reasonably be managed in an out-patient setting, would not require extensive clinical or laboratory investigations, and had the potential to be treated using prescription medication therapy. The cases also covered a variety of organ-systems (e.g., respiratory, dermatologic, urogenital, etc.) and a variety of causes (e.g., bacterial infection, viral infection, injury, etc.). The clinical case vignettes were standardized to approximately 90–100 words, containing relevant clinical information such as allergy and medication history, clinical signs or symptoms experienced by the patient, duration and intensity of symptoms, and additional relevant information. The cases were piloted with a group of 5 family medicine residents and 2 pharmacists to ensure content validity. Based on feedback, minor adjustments to the clinical case details were made to reduce ambiguous wording. The 8 finalized cases were as follows: uncomplicated cystitis, bilateral bacterial conjunctivitis, atopic dermatitis, bacterial pharyngitis, allergic rhinitis, gout, herpes zoster, and, acute musculoskeletal pain (Example case provided in Fig. 1).

Recruitment

Participants were recruited via convenience sampling to complete the online survey through distribution lists and newsletters through the University of Alberta, University of Calgary, and the Alberta Medical Association. The recruitment information detailed the aim of the survey and was part of the informed consent process. Participants were included if they were pharmacists or family physicians practicing primarily in outpatient community settings in Alberta. For the study, no restriction was placed on age, length of practice or type of training for either participant group. All participants provided informed consent at

the beginning and were allowed to leave at any stage of the survey. The protocol was approved the University of Calgary Conjoint Health Research Ethics Board under study ID: REB20–1770. Participants were recruited over 7 months from Feb 2021- Sep 2021. Due to the concurrent COVID-19 pandemic, significant difficulties were experienced in recruitment which accounts for the long duration of recruitment.

Scoring of participant responses

A 3-point scoring key was used for each clinical case to determine accuracy of the diagnosis responses (Dx score) and pharmacotherapeutic responses (Rx score) (0 = unacceptable response; 1 = disputable response; 2 = acceptable response). The key was developed alongside the cases using an expert panel of non-participating family physicians and pharmacists (including DT), scored by VC and adjudicated by VC and DT. The scores were then summed across all cases to achieve a total possible Dx and Rx score of 16 per participant. Self-reported confidence in diagnostic responses (Dx confidence) and self-reported confidence in pharmacotherapeutic responses (Rx confidence) were scored on a 5-point scale (1 = Not confident; 2 = Slightly confident; 3 = Somewhat confident; 4 = Fairly confident; 5 = Very confident). Confidence scores were averaged across all cases to a total possible Dx and Rx confidence score of 5 per participant.

Statistical analyses

Between professional group differences were analyzed using the non-parametric Mann-Whitney *U* test with effect sizes computed using the formula $r_U = |Z|/\sqrt{N}$ where *Z* is the standard test statistic and *N* is the number of pair observations.⁴⁰ Within group comparisons were computed using Pearson product-moment correlation coefficient (*r*). An α of 0.05 was set for significance. Data were collected in Qualtrics (Qualtrics, Provo, UT) and analyzed using Microsoft Excel (Microsoft Company, Redmond, WA) and SPSS version 26 (IBM, Armonk, NY).

Please read the following information. While reading, highlight up to three (3) pieces of information that you found most relevant to this case. To highlight, click/ drag on the word(s) you wish to highlight and click “Relevant” above it to confirm your selection.

A 20-year-old woman presents to you with increasing urinary frequency, along with increased urgency and dysuria for the past 2 days. She reports her urine is brownish, but does not have any unusual odor, neither does she reports any genital lesions or vaginal discharge. The patient has no previous history of similar complaints. However, she has recently become sexually active and has been using a diaphragm with spermicide as contraceptive. She does not take any other medications and has only tried cranberry juice to combat the symptoms. She reports that she has no known allergies or other conditions.

Based on your assessment, what do you believe is the most likely diagnosis at this time?

Based on your assessment, what drug therapy do you believe is the most appropriate at this time. Please indicated your selection including drug, dose, direction, and duration. If NO drug therapy is appropriate, please indicate so.

If other actions are needed to manage this case, please indicate so.

How confident are you in your responses?	Not confident	Slightly confident	Somewhat confident	Fairly confident	Very confident
Diagnosis	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Treatment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Fig. 1. Clinical Case Example for uncomplicated cystitis.

Results

A convenience sample of 19 pharmacists and 10 family physicians in Alberta were recruited. One pharmacist response and one family physician response were identified as outliers due to the responses appearing consistently and intentionally erroneous. The resulting data left a total of 27 responses (18 pharmacists and 9 family physicians) for analysis.

Demographic characteristics

The majority of pharmacists identified as female ($n = 13/18$), practiced for <10 years ($n = 11/18$) and obtained APA in the last 5 years ($n = 13/18$). The most common training reported by pharmacists was a Bachelor of Science in Pharmacy or equivalent, with 2 respondents having Doctor of Pharmacy degrees. The respondents were commonly practicing full-time ($n = 14/18$) and in large urban settings ($n = 11/18$). (Table 1) The majority of family physicians identified as female ($n = 6/10$), and as being in active practice for >10 years ($n = 6/10$). Only one family physician reported having another professional degree beyond a Doctor of Medicine degree, which was BSc Pharm, indicating previous pharmacy experience. The respondent family physicians were commonly practicing full-time ($n = 5= /10$) and in large urban settings ($n = 6/10$). (Table 1).

Score analysis

Out of a total possible score of 16.00, the median Dx score for pharmacists was 15.00, ranging from 12.00 to 16.00; and median Rx score for pharmacists was 14.50, ranging from 10.00 to 16.00. The median family physician Dx score was 15.00, ranging from 14.00 to 16.00; and median family physician Rx score was 15.00, ranging from 10.00 to 16.00. Median scores by case are provided in Table 2 and total scores are provided in Table 3.

On a 5-point scale, the median Dx confidence and Rx confidence reported by pharmacists across all cases was 3.60, ranging from 2.88 to 4.63; and 3.94, ranging 2.88–5.00, respectively. Whereas the median Dx confidence and Rx confidence reported by family physicians was 3.88, ranging from 1.75 to 5.00; and 4.38, ranging from 3 to 5; respectively (Table 3). There were no significant differences as well as small to medium effect sizes between groups on all the above measures (Table 3).

There was a medium, significant, positive correlation between therapeutic accuracy and confidence in diagnostic choices ($r = 0.39, p < 0.05$) and a large, significant, positive correlation between confidence in diagnostic choice and confidence in therapeutic choice ($r = 0.86, p < 0.001$) All other correlations were non-significant with small to medium

Table 1
Demographic information of participants.

Demographic		Pharmacist ($n = 18$)	Physician ($n = 9$)
Gender	Male	4	3
	Female	13	6
	Prefer not to say	1	0
Length of practice	< 5 years	6	1
	6–10 years	5	2
	11–25 years	5	1
	>25 years	2	5
Training	BSc Pharm or equivalent	15	1
	PharmD	3	0
	MD or equivalent	0	9
Practice status	Full-time	14	5
	Part-time	4	2
	Not currently working	0	2

effect sizes.

Discussion

The purpose of this research was to assess the performance of pharmacists in the diagnosis and management of common outpatient conditions when compared to family physicians. The overall main findings were that there were no significant differences in the diagnostic and therapeutic scores between pharmacists and family physicians when evaluating clinical vignettes of common ambulatory cases as well as no significant differences in confidence in diagnostic and therapeutic choices between groups. This finding indicates that pharmacists in Alberta, Canada provided similar responses to their family physician colleagues. The median score for diagnostic and therapeutic responses of both pharmacist and family physicians was 15/16 and both groups reported high confidence in both responses. This study provides preliminary evidence supporting that pharmacist can appropriately diagnosis and manage a potentially wide variety of ambulatory conditions in the outpatient setting.

Previous studies have shown that pharmacists tend to demonstrate mixed results when tasked with diagnostic assessments.^{27–30,32–34} The majority of these studies were conducted in the United Kingdom and focused on one single prototypical scenario usually requiring urgent or emergency care. Whereas the current study demonstrated a sample of pharmacists in Alberta that provided diagnostic and therapeutic assessments to a breadth of clinical presentations were similar to the decision-making demonstrated by family physicians' counterparts. No significant differences were observed. The current study provides evidence that pharmacists and physicians in Alberta make similar diagnostic and treatment decisions in a multitude of ambulatory outpatient conditions.

Low confidence has been reported in pharmacists during previous research and has been identified as a perceived barrier to pharmacist prescribing.^{41,42} However, both pharmacists and family physicians demonstrated similar average median self-reported confidence scores in both Dx and Rx confidence. The moderate confidence in both professional groups potentially stems from the limited information of the clinical vignette design. Health care professionals often require more information to make highly confident decisions. Risk aversion has been reported as a general trait of pharmacists who reported a duty and role to act as “safety nets” in the healthcare team during the provision of care.^{43–45} Further education may be necessary to support pharmacists in practice and in training when taking on new roles as prescribers, particularly education in diagnostic and therapeutic selection.

Future research should aim to evaluate and expand the clinical acumen of pharmacists as the Doctor of Pharmacy (PharmD) designation has become the new educational standard for pharmacists in Canada. PharmD curricula have been implemented across North America with the intent on increasing the clinical training of pharmacy students to match the expanding role of pharmacists.^{46,47} In this study, only 3 out of 18 pharmacists held a PharmD which was insufficient to determine any significant differences. Continuing education or additional training following entry into practice such as residencies and certifications have been highlighted as a potential avenue to help ensure prescribing pharmacists are competent.^{9,48,49} Therefore, further studies that examine the impact that the PharmD curriculum or other clinical training has on pharmacists as well as on patient outcomes.

While this study provides evidence that pharmacists in Alberta demonstrate similar responses towards independent assessment of ambulatory outpatient conditions as family physicians, pharmacist prescribing exists on a spectrum from independent to supplementary.^{3,22,50} During supplementary prescribing, pharmacists share the responsibility of prescribing with other healthcare providers often in formal relationships. As such, another area of future research would be to characterize and understand the clinical decision-making and underlying clinical reasoning processes that contribute to the partnerships

Table 2
Performance and reported confidence between pharmacists and physicians by case.

Median Score by Case								
	Uncomplicated Cystitis	Bilateral Bacterial Conjunctivitis	Atopic Dermatitis	Bacterial Pharyngitis	Allergic Rhinitis	Gout	Herpes Zoster	Acute Musculoskeletal Pain
Pharmacists								
Dx Score	2.00	2.00	2.00	2.00	2.00	2.00	2.00	1.00
Rx Score	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Dx Confidence	4.00	4.00	4.00	4.00	4.00	4.00	4.00	3.50
Rx Confidence	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
Physicians								
Dx Score	2.00	2.00	2.00	2.00	2.00	2.00	2.00	1.00
Rx Score	2.00	2.00	1.00	2.00	2.00	2.00	2.00	2.00
Dx Confidence	5.00	4.00	4.00	4.00	4.00	4.00	5.00	4.00
Rx Confidence	5.00	4.00	4.00	4.00	5.00	4.00	5.00	4.00

Dx – diagnosis; Rx- treatment.

Table 3
Performance and reported confidence between pharmacists and physicians.

Group	Median Total Dx Score \pm IQR	Median Total Rx Score \pm IQR	Median Dx Confidence per case \pm IQR	Median Rx Confidence per case \pm IQR
Pharmacist	15.00 \pm 1.00	14.44 \pm 3.00	3.63 \pm 0.62	3.94 \pm 0.75
Physician	15.00 \pm 1.50	15.00 \pm 3.00	3.88 \pm 1.12	4.38 \pm 1.00
<i>U</i>	51.50	73.30	45.00	55.00
<i>p</i>	0.099	0.674	0.063	0.179
<i>r_U</i>	0.52	0.06	0.67	0.44

Dx – diagnosis; Rx- treatment.

of pharmacists and physicians. Supplementary prescribing for pharmacists is a more common model of pharmacist prescribing globally than independent prescribing yet supplementary prescribing still remains understudied.

A limitation of the study is the small sample size. An a priori power calculation indicated that approximately 25 participants per group would be needed to see significant differences based on previously established studies comparing pharmacists and physicians with respect to pharmacotherapy examinations.³⁴ A *post-hoc* power analysis of this study determined that for the power to detect differences in means for Dx score and Rx score were 48.4% and 4% respectively. As a small sample size is impacted more by skewed data and outliers as well as less likely to follow a normal distribution, we employed non-parametric analysis in order determine significance differences in the distribution of the data. Unfortunately, the study was performed during the peak of the COVID-19 pandemic of which many pharmacists and family physicians were beleaguered and overworked. As such, the participation in extraneous research studies, especially those involved in active patient care, may not have been a priority for many potential participants. This may also have skewed the sample as our sampling of convenience may have biased participation to pharmacists and family physicians with a high degree of interest in ambulatory care and prescribing practices. As such, there is a potential that our data may not be fully generalizable to the population.

Another limitation is the survey-based study design which reflects idealized approaches that the participants would take rather than what would happen in real-life practice. Attempts were made to create a workplace-like mind-frame by detailing the recommended time limit and perspective into the study preamble. Workplace based assessments such as the use of standardized patients/shoppers have been used to assess pharmacist performance before,^{32,51} but little has been done to assess pharmacists' performance towards ambulatory conditions or to understand the patient assessment skills and behaviors of pharmacists in

terms of their new roles as prescribers. Robust studies employing multiple or mixed methods are needed to understand the complex topic of pharmacist prescribing. In addition, convenience sampling was employed as the primary recruitment method, therefore there is the potential that this study captured responses from highly confident participants with a high degree of experience in ambulatory care management. Self-selection bias could be reduced in future research by using randomization or other experimental methods.⁵²

In conclusion, the above study describes a sample of pharmacists in Alberta being assessed using a survey of variety of common clinical vignettes. Diagnostic and therapeutic choices regarding common ambulatory conditions as well as confidence in those choices were measured using a sample of family physicians as a standard for comparison. Pharmacists did not perform significantly different to the family physicians in diagnostic or therapeutic accuracy. Pharmacists also did not report significantly different confidence in diagnostic or therapeutic choices than family physicians. Prescribing pharmacists may be underutilized due to the specialized training of pharmacy and this study provides baseline quantitative evidence that pharmacists in Alberta perform similarly to family physicians when managing common ambulatory outpatient conditions, providing a preliminary demonstration of the capabilities and behaviors of pharmacists as primary care providers. Future research should focus on determining the patient's assessment capabilities of pharmacists in other clinical disciplines as well as the characterizing the underlying clinical decision making process that pharmacists utilized in their patient assessments. In addition, future research can examine the effects of current pharmacy education initiatives such as PharmD curriculum and pharmacy residencies on patient assessment performance and clinical decision making.

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Declaration of Competing Interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests:

Dr. Kent Hecker is also the Chief Assessment Officer for the International Council for Veterinary Assessment.

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