A scoping review of research on the prescribing practice of Canadian pharmacists

Chowdhury Farhana Faruquee, BPharm, MPharm, MBA;

Lisa M. Guirguis, BScPharm, MSc, PhD

CHOWDHURY
FARHANA FARUQUEE

ABSTRACT

Background: Pharmacists in Canada have been prescribing since 2007. This review aims to explore the volume, array and nature of research activity on Canadian pharmacist prescribing and to identify gaps in the existing literature.

Methods: We conducted a scoping review to examine the literature on prescribing by pharmacists in Canada according to methodological trends, research areas and key findings. We searched for peer-reviewed research articles and abstracts in the Ovid MEDLINE, Ovid EMBASE and International Pharmaceutical Abstracts databases without any date limitations. A standardized form was used to extract information.

Results: We identified 156 articles; of these, 26 articles and 12 abstracts met inclusion criteria. One-half of the research studies (20) used quantitative methods, including surveys, trials and experimental designs; 11 studies used qualitative methods and 7 used other methods. Research on pharmacist prescribing demonstrated an improvement in patient outcomes (13 studies), varied stakeholder perceptions (10 studies) and factors that influence this practice change (11 studies). Pharmacist prescribing was adopted when pharmacists practised patient-centred care. Stakeholders held contrasting perceptions of pharmacist prescribing.

Discussion: Canadian research has demonstrated the benefit of pharmacist prescribing on patient outcomes, which is not present in the international literature. Future research may consider a meta-analysis addressing the impact on patient health. Gaps in research include comparisons between provinces, effects on physicians' services, overall patient safety and access to health care systems and economic implications for society.

Conclusion: A growing body of research on pharmacist prescribing has captured the early impact of prescribing on patient outcomes, perceptions of practice and practice change. Opportunities exist for pan-Canadian research that examines the system impact. *Can Pharm J (Ott)* 2015;148:325-348.

Although Canadian pharmacists have been prescribing for less than a decade, we were aware of a growing and diverse body of research in this area. We wished to explore the research and its findings, in order to understand pharmacist prescribing in Canada and to make informed decisions on future research.

Bien que les Canadiens aient la capacité de prescrire depuis moins de 10 ans, nous savions qu'il existait un corpus de recherche croissant et diversifié dans ce domaine. Nous souhaitons explorer la recherche et les résultats obtenus de manière à mieux comprendre les pharmaciens prescripteurs au Canada et à prendre des décisions éclairées dans les futures études.

Introduction

Pharmacists have training and expertise in medication therapy and the patient care capabilities to assess and respond to the health care and drug-related needs of patients. Although pharmacists are often perceived as medication dispensers, their professional role goes well beyond this simplistic characterization. Pharmacists

are important members of the health care team who have the skill and knowledge to initiate, monitor and adjust drug therapy,¹ and they are well recognized by the general public as being knowledgeable about medications.² Although medical and dental care providers dominate prescribing activity, other health care professionals such as optometrists, podiatrists, midwives and

KNOWLEDGE INTO PRACTICE

- Early research on pharmacist prescribing showed improved medication use, economic benefit and patient outcomes in heart disease, diabetes and minor ailments (i.e., ambulatory conditions).
- The pharmacy profession needs to effectively communicate the benefits of pharmacist prescribing in both individual interactions and promotional communication while remaining sensitive to the differing views of stakeholders.
- Researchers can focus on developing strategies to improve medication adherence, cost savings and interprofessional collaboration through appropriate application of pharmacist prescribing.
- Researchers and pharmacists could work together to evaluate prescribing models between provinces to allow for identification of best policies and practices.

nurse practitioners have been granted prescribing rights.³ Similarly, pharmacists' expanded professional role includes prescribing. Pharmacist prescribing is different from prescribing by other health care professionals. Depending on the jurisdiction, pharmacists may alter or adapt a prescription, renew a prescription for continuity, provide an emergency supply or initiate a new medication therapy (i.e., prescription and non-prescription therapies).⁴

The jurisdictional power of prescribing by pharmacists varies between countries. Internationally, there are different models of pharmacist prescribing.^{1,5} In the United Kingdom, supplementary prescribing (i.e., prescribing authorities through different protocols or formularies) by pharmacists was approved in 2003. In 2006, pharmacists obtained independent prescribing rights (i.e., prescribing personnel are solely responsible for patient assessment, initiation of therapy and clinical management).^{1,6,7} In the United States, there are 2 models of pharmacist prescribing. Over 41 US states allow dependent prescribing as a part of collaborative drug therapy management and 5 states allow collaborative prescribing of controlled substances.⁸⁻¹⁰ The independent prescribing model was first introduced in a US Department of Veterans Affairs outpatient clinic in Florida.⁹

In contrast with the United Kingdom and the United States, prescribing in Canada varies by jurisdiction. In the last 7 years, provinces in Canada have introduced a number of differing

policies regarding the extended scope of pharmacy practice, especially with regard to prescribing activities.⁵ Pharmacists can independently prescribe in 7 of 10 provinces. In Canada, independent prescribing includes extending existing prescriptions (10 provinces), adapting existing prescriptions (i.e., change of drug dosage and formulation in 9 provinces and therapeutic substitution in 7 provinces) and initiating new prescriptions (7 provinces).¹¹ In some provinces (Saskatchewan, Nova Scotia and Prince Edward Island), initiating new prescriptions refers to pharmacist prescribing only as part of assessment and prescribing for minor ailments (otherwise referred to as ambulatory conditions).¹¹ In Alberta, pharmacists with additional prescribing authority can prescribe prescription-only drugs, excluding narcotics and controlled substances based on their initial assessment or in collaboration with either another authorized prescriber or regulated health professional with nonprescriptive authority.⁴ There is variability in provincial- and employer-sponsored reimbursement for patients for prescriptions written by a pharmacist.¹⁰

The objective of prescribing by pharmacists is to make use of pharmacists' expertise and knowledge to improve the health of Canadians. Legislation and practice models are changing depending on the effects on patient care and patient outcomes of prescribing by pharmacists.⁵ There has been noteworthy discussion in the literature about the benefits and problems of the expanded scope of pharmacists' practice in Canada.⁵ For 7 years, pharmacists have performed many types of prescribing within the country. Therefore, we aimed to review the empirical literature on pharmacist prescribing in Canada.

The objective of this scoping review was to characterize the literature on prescribing by pharmacists in Canada according to methodological trends, research areas and key findings.

Methods

Scoping review

We conducted a scoping review of the research on the prescriptive authority of Canadian pharmacists. The purpose of a scoping review is to provide an overview of the volume, array and nature of research activity by mapping the available literature for a particular field of study.¹² Scoping reviews identify the gaps in existing literature but do not assess research quality.¹²

Search strategy

The following 3 electronic databases were searched without any limitations on the date of publication: Ovid MEDLINE, Ovid EMBASE and International Pharmaceutical Abstracts. Key search terms included “pharmacist prescribing,” “prescribing by protocol or protocol-based prescribing,” “collaborative prescribing,” “independent or supplementary prescribing,” “adaptation of prescription” and “minor ailment prescribing.” These were combined with search terms related to Canadian or different provinces and territories of Canada. We used different terms because the context of pharmacist prescribing varies across Canada. For example, prescribing is called “expanded role” or “additional prescribing authority” in Alberta, “adaptation service” in British Columbia and “minor ailment prescribing” in Saskatchewan, Manitoba and Nova Scotia.

MISE EN PRATIQUE DES CONNAISSANCES

- Les premières études sur la prescription par les pharmaciens ont montré une amélioration des résultats des patients pour les maladies cardiaques, le diabète et les troubles mineurs (états ambulatoires), l'utilisation des médicaments et les avantages économiques.
- La profession pharmaceutique doit communiquer efficacement les avantages de la prescription par les pharmaciens dans le cadre des interactions en personne et de communications promotionnelles, tout en continuant de respecter les opinions divergentes des intervenants.
- Les chercheurs peuvent se concentrer sur l'élaboration de stratégies visant à améliorer l'observance thérapeutique, les économies de coûts et la collaboration interprofessionnelle grâce à la bonne application de la prescription par les pharmaciens.
- Les chercheurs et les pharmaciens pourraient unir leurs efforts afin d'évaluer des modèles de prescription entre les provinces afin de déterminer les politiques et pratiques les plus efficaces.

FIGURE 1 PRISMA flow diagram

IPA, International Pharmaceutical Abstracts; PRISMA, Preferred Reporting Items for Systematic Reviews and Meta-Analyses.

A detailed search strategy is presented in Appendix 1 (available online at cph.sagepub.com/supplemental). All search results were then exported to RefWorks reference manager software and duplicates were removed. The search results are shown in Figure 1.

Study selection

Studies were eligible for inclusion if they were related to prescribing activities of pharmacists in Canada and were published in English as peer-reviewed research articles or abstracts. Both authors screened each article in 2 stages independently. In the first stage, we reviewed titles and abstracts for potential relevance. In the second stage, we obtained full-text articles for further evaluation and examined them to determine eligibility. We resolved any discrepancies regarding inclusion by discussion.

Data synthesis

We used a standardized form to extract data from the selected studies and verified the data for accuracy and inclusiveness. The following study characteristics were recorded: lead author, year of publication, location, participants, methods, analysis, results or key findings and research design. We categorized the literature according to methodological trends, research areas and key findings.¹³ The guiding questions were as follows: “What data analysis techniques are most commonly used in research?” and “What is the range and frequency of topics being explored in research?” Initially, we organized the research by research methods, using inferential statistics, descriptive statistics and qualitative or combined data analysis methodologies. We were open to adding categories as required. We extracted and categorized all research questions to understand the breadth of ideas and themes. We then compared the study topics to find similarities and clustered them into broader categories. We identified the gaps after analyzing the data and themes extracted from the existing literature.

Results

We identified 167 articles, excluding 127 articles after initial screening and 2 articles after full-text assessment for eligibility, resulting in 26 articles and 12 abstracts that met the inclusion criteria (Figure 1). These publications represent 35 data sets. Findings are summarized in tables organized by research areas (Tables 1-5).

We found 20 quantitative studies, 11 qualitative studies, 3 mixed-method studies, 1 case study, 1 observation and 2 document analyses. Quantitative articles used surveys (8 studies),^{2,14-20} experiments (3 studies),²¹⁻²³ randomized controlled trials (5 studies)²⁴⁻²⁸ and others (4 studies).²⁹⁻³² Qualitative studies explored perceptions of pharmacists³³ or pharmacy students³⁴ (2 studies), stakeholders (3 studies),³⁵⁻³⁷ media (1 study)³⁸ and different factors influencing the practice change (5 studies).³⁹⁻⁴³ Two methodology articles described the mixed method (semistructured interview and survey) to explore pharmacists' perception about prescribing in Alberta, British Columbia and Ontario.^{44,45} Another mixed-method study used an online survey with both open-ended and 5-point scale questions to explore the public attitude toward the expanded role of pharmacists in Nova Scotia.⁴⁶ Two rich descriptions of regulatory changes summarized independent prescribing rights across Canada.^{10,47} Finally, there was a case study⁴⁸ and a description of higher education training of independent pharmacists.⁴⁹ Two studies among 11 qualitative studies were conducted in collaboration with Australia³⁴ and Scotland.⁴⁹

By analyzing the topics for similarities and grouping them into broader categories, we found 5 research areas: outcomes (13 studies), perceptions of prescribing (10 studies), practice changes (11 studies), regulatory changes (2 studies) and training (2 studies). Below we outline key findings by research area.

Thirteen studies measured the outcome or impact of pharmacist prescribing, including clinical, medication use and humanistic and economic outcomes (Table 1).^{18,22-32,48} Three articles evaluating the outcomes of pharmacist prescribing on the use of antihypertensives,²⁴ cardiovascular risk reduction²⁸ and health care use²³ were on study design and did not report any results. All remaining studies reported benefits of pharmacist prescribing. Seven studies showed benefit in clinical patient outcomes. These studies found improved risk factor control in patients with prior stroke,²⁵ reduced systolic blood pressure^{26,31} and low-density lipoprotein cholesterol,²⁷ improved glycemic control in patients with poorly controlled type 2 diabetes²² and improved quality of life in patients with uncontrolled type 2 diabetes in a cost-effective manner.³² Better chronic disease management as well as significant symptomatic improvement was reported by 81% of patients when pharmacists prescribed

TABLE 1 Research on outcomes of pharmacist prescribing

Author and year	Research objective	Location and participants	Methods	Analysis	Results/key findings	Research design
Mansell et al., 2015 ¹⁸	To evaluate self-reported symptomatic improvement after pharmacist prescribing for minor ailments	Saskatchewan: patients who were prescribed by pharmacists for minor ailments	After pharmacist prescribing for minor ailments (i.e., ambulatory conditions), patients were asked to complete an online survey to report symptomatic improvement	Mean feedback was measured based on scores of 1 (strongly disagree), 2 (disagree), 3 (agree) and 4 (strongly agree)	80.8% of participants reported that symptoms improved significantly	Quantitative
Al Hamarneh et al., 2013 ²²	To determine the effect of community pharmacist prescribing on glycemic control in patients with poorly controlled T2DM	Alberta: patients with T2DM receiving oral hypoglycemic medications and with glyated HbA1c of 7.5% to 11%	An experimental study in which pharmacists prescribed glargine insulin as per protocol	Paired <i>t</i> test: to compare HbA1c between baseline and 26 weeks; <i>t</i> test and basic frequencies: proportion of patients achieving target HbA1c, changes in oral hypoglycemic agents, quality of life and patient satisfaction, persistence on insulin glargine, number of insulin dosage adjustments per patient and number of hypoglycemic episodes	HbA1c was reduced from 9.1% at baseline to 7.3%, and fasting plasma glucose was reduced from 11 to 6.9 mmol/L. 51% of the patients achieved the target HbA1c of $\leq 7\%$	Quantitative
Law et al., 2010 ²³	To evaluate how pharmacist adaptation and renewal of prescriptions affected medication and health care use	British Columbia: general patients	Three population-based, administrative data sources: BC PharmaNet, health services data from Population Data BC and income data and administrative billings from physicians and hospital discharges	Characterized the adaptations. Conducted an interrupted time series analysis on changes in drug utilization and costs, medication adherence and ambulatory care visits and hospitalizations	N/A	Quantitative

(continued)

TABLE 1 (continued)

Author and year	Research objective	Location and participants	Methods	Analysis	Results/key findings	Research design
Charrois et al., 2011 ²⁴	To evaluate outcomes in patients who are prescribed antihypertensive therapy by pharmacists	Alberta: patients in rural areas with undiagnosed or uncontrolled BP	Randomized controlled trial of enhanced pharmacist care. Patients were randomized to either enhanced pharmacist care or usual care	Compared baseline characteristics using 2-sample, 2-sided <i>t</i> tests or nonparametric Wilcoxon tests for continuous variables and chi-squared tests for categorical variables	N/A	Quantitative
McAlister et al., 2014 ²⁵	To compare 2 modes of hypertension management: pharmacist-led management by active prescribing vs nurse-led management by screening and delegating to the primary care physician	Alberta: patients with history of prior stroke and high systolic BP and high cholesterol (LDL) levels	6-month prospective randomized controlled open-label trial with blinded ascertainment of outcomes. Patients were screened and allocated 1:1 to an intervention group (pharmacist-led management) or an active control group (nurse-led management)	Prespecified BP and LDL-C and HDL-C levels were the primary outcome after 6 months. The 2-sample independent <i>t</i> test was used to compare changes in outcomes. Multiple logistic regressions were used to adjust study site and clinically important or statistically significant baseline differences	Substantially improved risk factor control was found in the pharmacist-led management group at 6 months compared with the nurse-led management group	Quantitative
Tsuyuki et al., 2014 (abstract) ²⁶	To evaluate the effect of pharmacist care (including prescribing) on SBP in patients with uncontrolled hypertension	Alberta: adult patients with BP above recommended targets	Randomized controlled trial. Intervention group: pharmacist assessment, education, pharmacist prescribing of antihypertensive drugs and laboratory monitoring plus monthly follow-up visits. Control group: patient education and no specific follow-up	Differences in reduction of SBP between the intervention and control groups were observed at 6 months	Pharmacist prescribing resulted in a significant reduction in SBP of 18.0 mmHg compared with 11 mmHg in the control group	Quantitative

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TABLE 1 (continued)

Author and year	Research objective	Location and participants	Methods	Analysis	Results/key findings	Research design
Rosenthal and Tsuyuki, 2014 (abstract) ²⁷	To determine the impact of pharmacist prescribing and follow-up in patients with dyslipidemia not at recommended treatment targets	Alberta: adult patients with uncontrolled dyslipidemia (treated or untreated)	Randomized trial of pharmacist prescribing vs usual care. Intervention: pharmacists reviewed cardiovascular risk, assessed LDL-C levels and prescribed lipid-lowering medications. Control group: patients received usual pharmacist and physician care, LDL-C levels were assessed and educational materials were provided	The independent <i>t</i> test was used to compare the change in LDL levels between groups	Pharmacist prescribing and follow-up resulted in a >2-fold reduction in LDL	Quantitative
Al Hamarneh et al., 2014 (study protocol; abstract) ²⁸	To determine the impact of a community pharmacy-based case finding and intervention program on reduction in cardiovascular risk	Alberta: adults at high risk for cardiovascular events identified by the pharmacist	Randomized controlled trial. Intervention: the pharmacist conducts a structured medication review and prescribes, adapts or recommends medications as necessary. Follow-up for 3 months. Control group: usual care by the pharmacist and physician. Patients are crossed-over to receive intervention for the next 3 months	The independent <i>t</i> test will be used to determine the difference in change in cardiovascular risk between groups	N/A	Quantitative

(continued)

TABLE 1 (continued)

Author and year	Research objective	Location and participants	Methods	Analysis	Results/key findings	Research design
McKinnon and Jorgenson, 2009 ²⁹	To determine whether there is improvement in medication management when pharmacists and family physicians collaborate to prescribe medication renewals requested by fax	Saskatchewan: patients whose pharmacies faxed the health centre requesting prescription renewals	Prospective, nonrandomized controlled trial. Intervention group: pharmacists assessed drug therapy issues and made a collaborative prescribing decision with physicians. Control group: physicians managed the renewal requests independently	Chi-square and independent <i>t</i> tests were used to compare outcomes between the control and intervention groups. Outcomes: renewals, recommendations, new tests and appointments	The control group had significantly more requests authorized with no recommendations. The intervention group had significantly more medication-related problems identified; medication changes were made and appointments were scheduled with their family physicians	Quantitative
Soon et al., 2011 (abstract) ³⁰	To evaluate how pharmacist prescribing affected EC use	British Columbia: women aged 15-24 years	Quantitative analysis of a provincial drug claims database	Correlation analysis: association between the rate of EC prescriptions and sociodemographic variables over time	EC use doubled across all geographic regions after pharmacist prescribing	Quantitative
Houle et al., 2014 (Abstract) ³¹	To determine the impact of paying prescribing pharmacists by FFS or P4P on patient BP	Alberta: patients with elevated BP	Observational study. The effects of paying pharmacists by FFS and P4P for providing enhanced care to patients with elevated BP were examined	The independent <i>t</i> test was used to compare the difference in changes in systolic BP between groups	Both groups showed substantial reductions in SBP but no appreciable difference in the magnitude of BP reduction was achieved	Quantitative

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TABLE 1 (continued)

Author and year	Research objective	Location and participants	Methods	Analysis	Results/key findings	Research design
Al Hamarneh et al., 2014 (abstract) ³²	To evaluate pharmacists' early intervention in prescribing insulin to people with T2DM in terms of cost-effectiveness and patient quality of life	Alberta: documents and data from the RxING study ²⁰	Assessed complications and disability using the IMS CORE Diabetes Model, a Markov structure and a Monte Carlo simulation model. Efficacy of insulin obtained from RxING study	Quality-adjusted life-year and economic analyses were conducted	Pharmacist initiation of insulin sooner in uncontrolled T2DM resulted in improved quality of life and survival rates with an increment in cost savings	Quantitative
Lyster and Houle, 2013 ⁴⁸	To describe a case in which a patient experienced unexplained vaginal bleeding with complex endometrial hyperplasia due to metformin prescribed by a pharmacist	Alberta: a woman with metabolic disorder detected by pharmacist and confirmed by physician	Case study: the pharmacist prescribed 500 mg of metformin twice a day to treat metabolic disorder. The patient had vaginal bleeding (dose dependent) and was diagnosed with hyperplasia	The Naranjo probability scale was used to understand the probable association of drug therapy with the symptoms observed	In collaboration with other health care professionals, pharmacist prescribing detected endometrial hyperplasia	Case study

BP, blood pressure; EC, emergency contraceptive; FFS, fee-for-service; HbA1c, hemoglobin; HDL-C, high-density lipoprotein cholesterol; LDL, low-density lipoprotein; LDL-C, low-density lipoprotein cholesterol; N/A, not available; P4P, pay-for-performance; SBP, systolic blood pressure; T2DM, type 2 diabetes mellitus.

TABLE 2 Research on perception of pharmacist prescribing

Author and year	Research objective	Location and participants	Method	Analysis	Results/key findings	Research design
Perepelkin, 2011 ²	To understand public perceptions of pharmacists and the acceptance of possible expanded roles for pharmacists, including prescribing	Saskatchewan: general people	A telephone survey of 43 items was conducted in February and March 2010 to assess public perceptions of pharmacists and their scope of practice	Basic descriptive statistics, one-way ANOVA and statistical analysis (Scheffe) when statistically significant differences were $\alpha < 0.05$	Limited support for an expanded role for pharmacists. Public perceived that pharmacists provide knowledge about medications to patients. Public supported pharmacist prescribing in emergency situations but not altering prescriptions, diagnoses or new prescriptions	Quantitative
Hughes et al., 2014 ³³	To understand how pharmacists describe prescribing and its application in pharmacy practice	Alberta: pharmacists working in community, hospital, primary care networks or other settings	Semistructured telephone interviews	Interpretive description approach to identify themes; grounded in diffusion of innovation theory	Three themes: physical task of writing a prescription, integral part of patient care and legislated definition of prescribing	Qualitative
Charrois et al., 2013 ³⁴	To understand pharmacy students' perceptions or views on pharmacist prescribing in 2 different countries (Canada and Australia)	Alberta and Australia: fourth-year pharmacy students of the University of Alberta and Curtin University	Focused group interview	Qualitative approach using content analysis	Four main themes were revealed: benefits, fears, needs and pharmacist roles. Canadian students supported independent prescribing, whereas Australian students were accepting of supplementary prescribing	Qualitative

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TABLE 2 (continued)

Author and year	Research objective	Location and participants	Method	Analysis	Results/key findings	Research design
Grindrod et al., 2011 ³⁵	To illustrate pharmacy managers' and owners' perception about pharmacist adaptation services in British Columbia	British Columbia: pharmacy owners, managers from "high-adapter" pharmacies and managers from "low-adapter" pharmacies	Semistructured interview on 4 main subject areas: pharmacist uptake, capital costs, revenue and perceptions	Content analysis by 2 researchers	Perceived motivating factors: perceived benefit of stakeholders. Perceived barriers: additional time, additional human resources, training time, lack of collaboration with physicians and insufficient remuneration	Qualitative
Henrich et al., 2011 ³⁶	To reveal the perceptions and attitudes of family physicians about pharmacy adaptation services	British Columbia: physicians of 5 regional health authorities of British Columbia	Focus group and individual interviews	A descriptive approach was used for thematic coding and analysis	Physicians had limited experience but a negative outlook, especially regarding the consequences to their patients' health; they acknowledged conveniences for patient when access to physicians is difficult	Qualitative
Pojksic et al., 2014 ³⁷	To report initial perceptions of the Ontario government and pharmacy and medical professional groups about pharmacists' expanded role as prescribers	Ontario: policy documents and key informants of the Ontario Government and health professional stakeholder groups	Obtained policy document related to Ontario pharmacists' expanded scope of practice and semistructured interviews	Content analysis of both the document and interview transcripts by the investigator and 2 coinvestigators until data saturation was reached	Government and pharmacy professional groups agreed with increased patient convenience and benefit to the health care system as a result of pharmacist prescribing. On the other hand, physicians showed concern about patient safety and delegation of authority	Qualitative

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TABLE 2 (continued)

Author and year	Research objective	Location and participants	Method	Analysis	Results/key findings	Research design
Schindel and Given, 2013 ³⁸	To analyze newspaper media coverage of pharmacist prescribing 1 year before and 2 years after prescribing was implemented in Alberta	Alberta: pharmacist prescribing–related news	Qualitative analysis of pharmacist prescribing–related news published in national and local newspapers over a 3-year period after the pharmacist prescribing declaration	Discourse analysis of news articles, editorials and letters by using the lens of social positioning theory	Five themes were elicited: qualifications, diagnosis, patient safety, physician support and conflict of interest. Binary positioning was found in the discussion about pharmacist prescribing rights	Qualitative
Guirguis et al., 2011 ⁴⁴	To investigate pharmacists' perceptions of prescribing, the extent to which prescribing has been incorporated into pharmacists' practices and the factors that have influenced its uptake	Alberta and Ontario: currently practising pharmacists	Mixed methods. Stage 1: semistructured interviews of pharmacists in Alberta and Ontario. Stage 2: survey development guided by the responses from stage 1. Stage 3: a mixed-methods survey of a large sample	Stage 1: interpretive description for qualitative method. Stage 2: descriptive statistics. Exploratory factor analysis for validity and Cronbach's alpha for reliability. Stage 3: Descriptive statistics. Statistical comparison using the chi-square test, t test, ANOVA and multiple regressions to identify predictors of pharmacist prescribing such as motivating factors and barriers	N/A	Mixed methods

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TABLE 2 (continued)

Author and year	Research objective	Location and participants	Method	Analysis	Results/key findings	Research design
Norman et al., 2013 (abstract) ⁴⁵	To explore the acceptability and feasibility for independent provision of contraception by pharmacists in rural British Columbia	British Columbia: rural pharmacists	Mixed methods: mailed survey to rural pharmacies in British Columbia and participants were invited to have a structured telephone interview in which the questions followed Rogers's diffusion of innovation theory	N/A	85% of the participants showed interest in prescribing hormonal contraceptives. Pharmacists required clarification about related assessment protocol and liability issues	Mixed methods
Boyle et al., 2014 (abstract) ⁴⁶	To understand the public attitude toward pharmacists' ESOP	Nova Scotia: general population	Mixed methods: in-pharmacy intercept survey and an online survey consisting of open-ended and 5-point scale. ESOP included prescribing for minor ailments (i.e., ambulatory conditions), medication reviews, prescription renewals and injections and vaccinations	Thematic analyses, descriptive statistics and comparisons based on practice awareness using MANOVA	Pharmacist knowledge and medication history on file influenced the public's decision to use ESOP. Members of the public were comfortable with prescription renewals, but had varying level of awareness	Mixed methods

ANOVA, analysis of variance; ESOP, expanded scope of practice; MANOVA, multivariate analysis of variance; N/A, not available.

TABLE 3 Research on practice change with pharmacy prescribing

Author and year	Research objective	Location and participants	Method	Analysis	Results/key findings	Research design
Hutchison et al., 2012 ¹⁴	To determine reasons for the slow adoption of APA by hospital pharmacists	Alberta: hospital and institutional pharmacists	A cross-sectional survey on factors influencing the adoption of APA	Descriptive statistics. Responses were compared between pharmacists who had and those who had not applied for APA	Factors motivating pharmacists to apply for APA: perceived relevancy and value, increased efficiency. Factors preventing APA application: lengthy application process, increased liability risk, challenges with patient follow-up and documentation	Quantitative
Hall et al., 2013 ¹⁵	To characterize the personality traits of hospital pharmacists for understanding the potential obstacles to practice change	Alberta: hospital pharmacists	A cross-sectional survey based on the Big Five Inventory, which uses a 5-point Likert scale to measure the traits of extroversion, agreeableness, conscientiousness, neuroticism and openness	Univariate ANOVA to assess any differences in responses related to age, duration of practice, role, full-time equivalence, location of hospital and whether pharmacists had APA	Pharmacists showed stronger expression of extroversion, agreeableness, conscientiousness and openness and low levels of neuroticism. This characterization explained their regular practice of seeking consent from other health care professionals and anxiety regarding adoption of APA prescribing	Quantitative
Rosenthal and Tsuyuki, 2012 ¹⁶	To determine the relationship between pharmacists' personality traits and performance in a research study on pharmacist prescribing	Alberta: 24 pharmacists from a large chain pharmacy who agreed to obtain APA	Baseline pharmacists completed the validated Big Five Inventory and researchers tracked dropouts and APA status	N/A	Pharmacists who dropped out had lower levels of extroversion, agreeableness, conscientiousness and openness compared with those who made progress on their applications or submitted them	Quantitative

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TABLE 3 (continued)

Author and year	Research objective	Location and participants	Method	Analysis	Results/key findings	Research design
Marra et al., 2012 ¹⁷	To evaluate the labour costs related to pharmacy adaptation service	British Columbia: high-adapting pharmacies	Cross-sectional study by observing both nonadapted and adapted prescriptions from the workflow of purposefully selected pharmacies	Average total time to complete 10 stages of adaptation service was calculated and incremental labour cost was assessed from the difference of average cost of adapted and nonadapted prescriptions	Average time for adaptation service was 6:43 minutes longer than nonadaptation service. Increased labour cost for adapting a prescription was \$6.10	Quantitative
Guirguis et al., 2014 (abstract) ¹⁹	To characterize pharmacists' prescribing practices in Alberta	Alberta: pharmacists	A cross-sectional web-based survey was conducted in a random sample	Analysis was descriptive. Prescribing behaviour and beliefs were compared between practices using ANOVA and chi-square	93.4% of pharmacists prescribing. Most frequent: continuity of therapy (92.3%), adapting (73.4%) and medication substitution (80.5%). Pharmacists with APA mostly prescribe to adjust ongoing medications than initiating a new prescription	Quantitative
Jain et al., 2014 (study protocol; abstract) ²⁰	To determine the impact of PA services on the traditional professional practices and workload of community pharmacists	Saskatchewan: registered community pharmacists	Cross-sectional study using a mail-in questionnaire with an online option	N/A	N/A	Quantitative

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TABLE 3 (continued)

Author and year	Research objective	Location and participants	Method	Analysis	Results/key findings	Research design
Guirguis et al., 2014 ³⁹	To characterize pharmacist prescribing in different practice settings in Alberta since the legislation was approved and implemented	Alberta: pharmacists working in community, hospital, primary care networks or other settings	Semistructured telephone interviews	Interpretive description approach to identify themes; grounded in diffusion of innovation theory	Prescribing practice was characterized as product focused, disease focused and patient focused. Many community pharmacists adopted product-focused prescribing. Hospital and primary care pharmacists focused on disease and patient-focused prescribing	Qualitative
Makowsky et al., 2013 ⁴⁰	To explore how pharmacists have adopted prescribing in practice 3 years after this legislation was implemented	Alberta: pharmacists working in community, hospital, primary care networks or other settings	Semistructured telephone interviews	Interpretive description approach to identify themes; grounded in diffusion of innovation theory	Prescribing behaviours: nonadoption, product, disease and patient focused. Adoption depends on innovation itself, adopter, system readiness, communication and influence. Patient-focused pharmacists were more likely to adopt advanced prescribing than product-focused pharmacists	Qualitative
Charrois et al., 2012 ⁴¹	To examine the experiences of pharmacists regarding the decision to apply for APA and the application itself	Alberta: pharmacists who had received their APA	E-mail response to written responses to open-ended questions regarding their experiences regarding application for APA	Content analysis by 2 independent reviewers	Three main themes were revealed: motivation, hurdles and outcomes	Qualitative

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TABLE 3 (continued)

Author and year	Research objective	Location and participants	Method	Analysis	Results/key findings	Research design
Guirguis et al., 2014 (abstract) ⁴²	To understand pharmacists' perceptions about prescribing between those who were currently prescribing (in Alberta) and those preparing to prescribe (in Ontario)	Alberta and Ontario: pharmacists working in community, hospital, primary care networks or other settings	Semistructured, qualitative interviews (individual and group)	Thematic analyses were done for similarity and differences in 2 jurisdictions	Similar views were found in both groups regarding liability and importance of physician relationship, continuing education and environmental support. Pharmacists in Ontario were more concerned about the liabilities, whereas pharmacists in Alberta stated the importance of physician relationships	Qualitative
Schindel et al., 2014 ⁴³	To explore collaboration associated with research on pharmacist prescribing	Alberta: analysis of documents (2001-2014) from the Alberta Pharmacists' Association and the Canadian Pharmacists Association	Qualitative analysis of documents representative of pharmacist prescribing and communications from pharmacy organizations in Canada	Discourse analytic approach was used to construct pharmacists' identity as prescribers. Analysis focused specifically on the theme of collaboration	Collaboration differs by location of the pharmacist and physician and influence by tension between independent and collaborative prescribing	Qualitative

ANOVA, analysis of variance; APA, additional prescribing authority; N/A, not available; PA, prescriptive authority.

TABLE 4 Research on regulatory changes accompanying practice change

Author and year	Research objective	Location and participants	Method	Analysis	Results/key findings	Research design
Law et al., 2012 ¹⁰	To summarize independent prescribing rights across Canada	Canada: legislation or regulations regarding expanded pharmacists' scope of practice	Qualitative: identified documents and regulations and interviewed officials from the relevant government and professional bodies	Province-wide analysis of pharmacist requirements, continuing education requirements and rules and reimbursement	Pharmacists independently prescribe in 7 of 10 provinces: continuing existing prescriptions (7), adapting existing prescriptions (4) and initiating new prescriptions (3). Significant heterogeneity exists between provincial regulations	Document analysis
MacLeod-Glover, 2011 ⁴⁷	To analyze the policy and legislative changes permitting pharmacist prescribing in Alberta	Alberta: government and regulatory body documents related to health care systems and pharmacist prescribing	Qualitative: systematic search of documents plus correspondence with authors and regulators to clarify or obtain current data	Explanatory analysis of problem definition, policy development process and consequences of implementation	Requirements: legislative opportunity supported by communication between stakeholders, research evidence and early identification of stakeholder barriers	Policy analysis

TABLE 5 Research evaluating education on pharmacist prescribing

Author and year	Research objective	Location and participants	Method	Analysis	Results/key findings	Research design
Neubauer et al., 2004 ²¹	To determine the impact of the training program on pharmacists' knowledge about the ECP	Saskatchewan: pharmacists who intended to participate in the ECP training program	Pretest and posttest scores were compared to determine whether the training addressed the pharmacists' knowledge gaps	Single-group paired <i>t</i> test to compare pretraining and posttraining knowledge scores	Pretraining score = 14.4 (57.6%); posttraining score = 22.1 (85%). There was a significant increase in knowledge of pharmacists on ECP after the training program ($p < 0.05$)	Quantitative
Addison et al., 2014 (abstract) ⁴⁹	To carry out a pilot study allowing a group of Canadian pharmacists to participate in higher education training of independent pharmacist prescribing in Scotland	Scotland: 5 pharmacists from Nova Scotia	Description of a collaborative project between the Robert Gordon University, Aberdeen; and Dalhousie University College of Pharmacy, Halifax, Nova Scotia	N/A	1-week program with an established independent pharmacist prescriber and online materials	Training program analysis

ECP, emergency contraceptive pill; N/A, not available.

medications for minor ailments (i.e., ambulatory conditions) in Saskatchewan.¹⁸ A case study showed that pharmacist prescribing in collaboration with other health care professionals facilitated the detection of an underlying disease.⁴⁸ Two studies showed that pharmacist prescribing improved medication use, with increased drug-related problem identification²⁹ and increased use of emergency contraceptive pills.³⁰ Finally, one study showed benefit in humanistic and economic outcomes in terms of improved quality of life and cost-effectiveness when pharmacists initiated insulin therapy in patients with uncontrolled type 2 diabetes. All of the studies used quantitative methods, except the case study.^{18,22-32,48} Among 12 quantitative studies, 5 were randomized controlled trials.²⁴⁻²⁸

Perception or insight about pharmacist prescribing was evident in 10 studies (Table 2). Researchers used different perspectives, such as the general public, students, government agencies, physicians and pharmacists themselves, to understand the insight.^{2,33-38,44-46} The general public in Saskatchewan and Nova Scotia agreed with pharmacist prescribing for managing minor ailments (i.e., ambulatory conditions),^{2,46} emergencies² and prescription renewal⁴⁶ but showed less support in diagnosing new diseases and prescribing a treatment plan.² Pharmacy students and health care stakeholders perceived that independent prescribing was shaping the profession in the right direction,³⁴ increasing convenience for patients and benefiting health care delivery.^{36,37} On the other hand, physicians expressed concerns about patient safety and delegation of authority.³⁶ Pharmacy owners and managers reported a benefit to prescribing, in addition to multiple workplace barriers.³⁵ Similarly, newspaper analysis revealed contradictory views, a lack of clarity and a lack of consistency in pharmacist prescribing.³⁸ Pharmacists in British Columbia were in favour of potentially prescribing oral contraceptive pills but had concerns about liability.⁴⁵ Pharmacists in Alberta with experience in prescribing defined it in 1 of 3 ways: the physical task of writing a prescription, an integral part of patient care and a legislated definition of prescribing.³³ Results were not included in 1 article on study design.⁴⁴ Nine of 10 studies used qualitative methods that were either qualitative only³³⁻³⁸ or were combined with quantitative surveys.⁴⁴⁻⁴⁶ Face-to-face, telephone and interview surveys were used in these 9 studies. A documented analysis was added to 1 group of

interviews³⁷ and was the sole method in another group.³⁸

We found 11 studies on practice change that focused on 3 areas: the extent of pharmacist prescribing, factors that influence pharmacists' uptake of prescribing and the impact of prescribing on workload and collaboration (Table 3).^{14-17,19,20,39-43} The level and extent of prescribing adoption in different settings was analyzed in 2 studies. These studies found greater adoption of advanced prescribing activity in patient-focused pharmacists than in product-focused pharmacists,⁴⁰ and there was a greater practice of adjusting ongoing medications than initiating a new prescription by pharmacists with additional prescribing authority.¹⁹ Six studies summarized factors influencing pharmacist prescribing. Three of these studies reported the value of additional prescribing authority and increased efficiency as motivating factors and the increased risk, liability and lengthy application process as drawbacks.^{14,41,42} Practice setting was found to be an impelling factor, because there was more patient-focused prescribing in primary care networks than in community settings.³⁹ Again, 2 pharmacist surveys showed personality traits as a driving factor of adoption of prescribing, and these studies reported that pharmacists with more extroversion and openness made greater progress on their applications for additional prescribing authority.^{15,16} Pharmacist prescribing also affected their workload and collaboration.^{17,20,43} Increased service time and labour cost was found in British Columbia due to adaptation services provided by pharmacists.¹⁷ In Saskatchewan, researchers will examine pharmacist workload after the introduction of prescribing.²⁰ Pharmacist prescribing also influenced collaboration and interprofessional communication.⁴³ In community settings, collaboration is encouraged by the process of sharing prescribing decisions with other prescribers, especially physicians. On collaborative teams, pharmacists are empowered with the ability to assess patients and implement care plans.⁴³ Mostly quantitative survey methods were used in this research area.^{14-17,19,20} One abstract was on study design and did not report any results.²⁰ In qualitative studies, researchers analyzed semistructured telephone interviews^{39,40} and written responses to open-ended questions on an e-mail survey.⁴¹

Regulatory changes were the focus in 2 studies (Table 4).^{10,47} In the first study, researchers

summarized prescribing rights across Canada and identified significant diversity among provincial regulations.¹⁰ In the second study, a policy analysis of legislation in Alberta showed that pharmacist prescribing resulted from a legislative opportunity that was supported by strong communication among stakeholders, research evidence and early identification and resolution of stakeholder barriers.⁴⁷

Two studies concentrated on evaluating training programs to improve knowledge of prescribing pharmacists (Table 5).^{21,49} One study showed that training significantly increased pharmacists' knowledge on prescribing the emergency contraceptive pill.²¹ A qualitative abstract described a collaborative project in which 5 pharmacists from Nova Scotia participated in a 1-week training program on independent pharmacist prescribing in Scotland.⁴⁹

Discussion

We analyzed the pharmacy practice literature on pharmacist prescribing in Canada from 3 perspectives: design trends, research areas and key findings. We found that most evaluations were quantitative, focused on patient outcomes and reported positive health care impacts of pharmacist prescribing. Qualitative research mostly explored perceptions regarding pharmacist prescribing and found contradictory views of different stakeholders and different aspects of practice change.

In terms of study design, we found predominantly quantitative methods, including surveys, trials and experimental designs, and fewer qualitative or mixed-methods studies. By contrast, researchers in the United Kingdom used mostly qualitative methods to understand the prescribing activity by pharmacists.⁵⁰ Because prescribing by pharmacists is a new paradigm in Canada, the use of qualitative research methods may help to acquire in-depth understanding of how and why pharmacists are behaving in a particular way.⁵¹ We found 3 mixed-methods studies, which may generate in-depth and multifaceted information to understand pharmacist prescribing.

In the spectrum of research areas, we found a major emphasis on outcome in the literature and equivalent importance was placed on perception and practice change. By contrast, most of the literature based on UK practice explored perceptions of different stakeholders, with limited focus on clinical and economical outcomes and practice change.⁵² The unique prescribing models in

Canada and the United Kingdom may account for this. In the United Kingdom, pharmacists first were authorized for dependent prescribing, and the more recent independent model requires training with a short period of supervision by a medication practitioner. By contrast, Canadian pharmacists were authorized to prescribe with the intent of physician collaboration but without requirements for specific agreement or supervised training, resulting in less focus on stakeholder perceptions. A substantial application of quantitative research methodology was found in this area to identify outcomes^{17,18,22-32} and practice change,^{14-16,19,20} whereas most of the qualitative and mixed-methods approaches were used to explore perceptions or insights about pharmacist prescribing^{34-38,44,45} and practice change.³⁹⁻⁴³ The growing quantitative research may indicate the need for a meta-analysis that addresses the impact of pharmacist prescribing on patient health.

Research on stakeholder perceptions of pharmacist prescribing in Canada suggest the coexistence of multiple and contradictory views.³⁸ On one hand, government agencies and pharmacists exhibited immense support of prescribing to improve patient access to medications.³⁷ On the other hand, physicians expressed concerns regarding patient safety and pharmacists' lack of diagnostic skill.³⁶ Physicians in the United Kingdom believe that supplementary prescribing (i.e., physicians have direct oversight) by pharmacists improved overall patient care, but concerns were expressed regarding independent prescribing and pharmacists' role in diagnosis.^{36,53} Negative outcomes of pharmacist prescribing have not been documented in the literature. In fact, the burden of medication misuse has resulted in calls to review the competence of all prescribers.^{54,55} By contrast, Canadian research shows that pharmacist prescribing improved patient outcomes.^{18,22,29,48} In Canada, the general public tentatively supported an expanded role for pharmacists in tasks familiar to patients, such as continuing ongoing medication therapy.² Conversely, patients in the United Kingdom perceived pharmacists as an alternative to doctor prescribing in primary care, and there is general acceptance of pharmacist prescribing.^{52,56} In Australia, patients supported pharmacists' prescribing roles but preferred that physicians play the main role in diagnosis.⁵⁷ However, the literature suggests that the general public and physicians have a low level of

understanding and speculative beliefs about an expanded role for pharmacists, and this may be due to a lack of clear communication.^{2,36} Accordingly, there is further opportunity to evaluate the experience of patients and other health care professionals with different types of pharmacist prescribing. Pharmacist prescribing may impact interdisciplinary collaboration, especially with physicians, and the extent of collaboration may depend on the complexity of the situation. Physicians may warrant collaboration when the pharmacist is prescribing in a multifaceted situation, whereas pharmacists will be confident enough to prescribe independently in less complex situations. Future research is needed to explore the impact of pharmacist prescribing on interdisciplinary collaboration. With increased experience in prescribing, researchers may identify how pharmacist prescribing, especially by renewal or in emergency situations, changes patient behaviours around obtaining and taking medications as well as adhering to drug therapy.

We identified several additional gaps in the literature. Geographically, prescribing research has focused on individual provinces and not the country as a whole. Prescribing was implemented at different times and in different ways in Canada, making national projects challenging. However, comparisons between provinces may identify best practices for pharmacist prescribing. Researchers could identify the impact of different prescribing models on health care costs, physicians' services and medication budgets. Empirical data could establish whether pharmacist prescribing does indeed increase patient access to medications and reduce physicians' workload as promised. Investment in research is required to address these questions.

In Canada, pharmacists with more patient-centred practice were more likely to prescribe,

because they saw increased efficiency and value in the practice. Overall, many pharmacists reported training needs and physicians' response as barriers to their practice change.^{14,27,41} This is similar to the findings of UK-based research.^{58,59} There was 1 study regarding the impact of training on the knowledge to prescribe, but it only concerned the emergency contraceptive pill.²¹ However, it is necessary to find ways of addressing training requirements and educating pharmacists as well as physicians and other health care professionals regarding the scope of pharmacy practice.

Our conclusions have a few limitations. We narrowed our search to research articles and did not include the grey literature, theses or dissertations. We did not assess the quality of the research, as per scoping review methodology.

Conclusion

A developing body of research used mostly quantitative, qualitative and a few mixed methods to understand the effect and adoption of prescribing by pharmacists, related regulatory changes and insights about this new paradigm of health care practice in Canada. Pharmacist prescribing resulted in improvement in some chronic disease management (type 2 diabetes mellitus, hypertension, etc.) and use of emergency contraceptive pills. Stakeholders had diverse and at times contradictory understanding of pharmacist prescribing. Gaps in the literature include the impact of pharmacist prescribing on patient behaviours, medication adherence, cost savings and health systems. Future research directions may explore pharmacist prescribing in the context of an interprofessional health care system and may identify strategies to improve the collaborative relationship between pharmacists and physicians and other health care professionals. ■

From the Faculty of Pharmacy and Pharmaceutical Sciences, Edmonton Clinic Health Academy, University of Alberta, Edmonton, Alberta. Contact lguirgui@ualberta.ca.

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