

Review

Medication reviews in community pharmacy: a scoping review of policy, practice and research in Canada

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Abstract

Objectives This scoping review aims to systematically map the empirical evidence on publicly funded medication reviews provided by community pharmacists in Canada and identify gaps that could inform future research directions.

Methods We used a scoping review framework and PRISMA guidelines for Scoping Reviews to conduct the study. Three electronic databases were searched for papers published between January 2000 until August 2020. Data was charted on study characteristics, and a thematic synthesis was performed.

Key findings Of 41 original studies included, most were conducted in Ontario ($n = 21$). Majority of the studies employed quantitative designs (70%). Five major themes identified were program uptake, patient health outcomes, stakeholder beliefs and attitudes, processes and collaboration and pharmacy workplace culture, which varied considerably. At the individual, organizational and policy levels, many factors were interrelated and influenced the implementation of reimbursed medication reviews by community pharmacists. Gaps in eligibility policy highlighted some patients who may have complex needs are excluded. Variation in clinical outcomes may relate to different types of medication review and pharmacist practice across Canada. Few researchers evaluated eligibility criteria, the impact of policy changes, strategies to engage patients and healthcare professionals, patient–pharmacist communication or compared practice models of medication reviews. About 12% of the research applied a theoretical framework.

Summary Publicly funded medication reviews in Canadian community pharmacies reduce medication-related problems and potentially improve patient health outcomes. Future research and policies could consider addressing barriers and exploring models for sustainable delivery of high-quality medication reviews internationally.

Keywords: medication reviews; health policy; community pharmacy services; drug-related side effects and adverse reactions; pharmacists; patient-centred care

Introduction

Poor medication management has been directly linked to negative health outcomes such as preventable adverse drug events, emergency visits and hospital admissions.^[1] These medication-related problems are not only burdensome to patients and families but are costly to health systems. As such, tackling poor medication management through community-based medication reviews is of policy interest for health systems globally.^[2] Medication review services have become an important component of pharmacists' patient care services to address drug therapy problems, monitor and optimize medication use and potentially improve patient health outcomes, particularly for patients using long-term medications for chronic conditions.^[3, 4] Many countries have developed models of pharmacists-provided medication reviews including Australia, New Zealand, the USA, the UK and other European countries.^[5–9] Typically, medication reviews are funded by government programs and delivered across a range of settings including hospitals, long-term care, outpatient clinics, community pharmacies and patients' homes.^[10]

Different types of medication reviews exist depending on the comprehensiveness involved.^[11] These include prescription review, medication reconciliation and adherence review and comprehensive clinical medication assessments. Within a patient-centred model, medication reviews provide the opportunity for pharmacists to actively engage patients to understand their perspectives and concerns regarding medications, prevent or resolve problems with medications, agree on goals of medication therapy and develop and implement an appropriate care plan to monitor chronic conditions and medications.^[12] Internationally, medication reviews have become one of the commonly remunerated patient-focused services provided by community pharmacists though there are wide variations in patient eligibility criteria, type of medication review, reimbursement models and activities performed.^[13, 14]

Canadian context for medication reviews

Canada has a publicly funded healthcare system that comprises ten provincial and three territorial health systems based on national principles of medically necessary health care.^[15] In Canada, seniors are the highest users of medications compared with any other age group.^[16] About 65.7% of seniors aged 65 and over were prescribed

five or more different drug classes and more than one-quarter had 10 or more prescribed medications to manage multiple chronic conditions.^[16] With the increased risk of adverse consequences from using multiple long-term medications costing an estimated \$419 million per year,^[16] regular medication reviews by pharmacists represent a key area for Canadian health systems to ensure safe and appropriate medication use.^[16, 17]

Similar to other countries, community pharmacists in Canada provide medication reviews for eligible patients through publicly funded (provincial) health programs. Ontario was the first province to roll out formal community pharmacist medication review 'MedsCheck' in 2007. Currently, eight out of ten provinces, except for Quebec and Manitoba, fund medication review programs for patients meeting prespecified criteria. Pharmacists are not mandated to undergo additional training or certification to provide the service.^[14] Since pharmacists are regulated on the provincial or territorial level, the scope of practice shapes the delivery of medication reviews in each Canadian jurisdiction.^[14] Eligibility policies, reimbursement and type of medication review also differ across provinces. Table 1 broadly outlines the characteristics of medication review programs offered in eight provinces – British Columbia, Alberta, Saskatchewan, Ontario, New Brunswick, Nova Scotia, Prince Edward Island and Newfoundland and Labrador. Basic medication reviews are available in all eight provinces that entail reconciling a medication list and assessing patient adherence to medications. Some provinces remunerate pharmacists to comprehensively assess drug therapy on an annual basis and follow up while other programs remunerate targeted reviews for specific conditions (e.g. diabetes). A more comprehensive approach is available in Alberta, where pharmacists assess patients and develop care plans. Medication reviews are reimbursed to varying extents by provincial governments. Comprehensive care plans, enhanced medication reviews and home reviews for homebound patients are reimbursed at higher rates (\$100–150) than basic programs (\$50–60) and follow-up assessments (\$15–50).^[18, 19] In response to the COVID-19 pandemic, policy changes were made to encourage the uptake of virtual pharmacy services in Canada. These changes temporarily removed the requirement to have in-person consultations and written patient consent in order to bill for medication reviews in some provinces. As a result, pharmacists in Alberta, Saskatchewan

Table 1 Community pharmacist medication reviews in Canada

Characteristics		Provinces									
		BC	AB	SK	MB	ON	QC	NS	NB	PEI	NL
Publicly funded medication reviews	Annual medication reviews	Yes	Yes	Yes	N/A	Yes	N/A	Yes	Yes	Yes	Yes
	Follow-ups per year	4	12	2	N/A	1	N/A	2	No	4	No
Year introduced		2011	2012	2013	N/A	2007	N/A	2008	2012	2013	2012
Type of medication review	Basic	Yes	Yes	Yes	N/A	Yes	N/A	Yes	Yes	Yes	Yes
	Diabetes-specific	No	Yes	No	N/A	Yes	N/A	No	No	Yes	Yes
	Enhanced/comprehensive	Yes	Yes	No	N/A	Yes	N/A	Yes	No	No	No
Criteria for eligibility	Age	No	No	Yes	N/A	No	N/A	Yes	Yes	No	Yes
	Income	No	No	No	N/A	No	N/A	No	Yes	No	No
	Specific chronic condition	No	Yes	No	N/A	No	N/A	No	No	No	Yes
	Chronic medications	No	No	Yes	N/A	Yes	N/A	Yes	No	Yes	No
	Specific medications	Yes	No	Yes	N/A	No	N/A	No	No	No	No

AB, Alberta; BC, British Columbia; MB, Manitoba; NB, New Brunswick; NL, Newfoundland and Labrador; NS, Nova Scotia; ON, Ontario; PEI, Prince Edward Island; QC, Quebec; SK, Saskatchewan.

NB: Terminology for medication review programs varies by Canadian jurisdiction. Examples are PharmaCheck (Newfoundland), MedsCheck (Ontario), Standard Medication Assessment Program – SMAP (Saskatchewan) and the Comprehensive annual care plan (CACP) and Standard Medication Management Assessment (SMMA) programs in Alberta.

and Ontario can bill for government-funded medication reviews conducted virtually.

Since 2007, when publicly funded medication reviews began in Canada, the literature on the implementation and evaluation of these programs has grown considerably. However, this body of research has not been synthesized. A summary of evidence could provide an understanding of the uptake and benefits of publicly funded medication reviews within the diverse pharmacist scope of practice and remuneration models existing in Canada.^[13] Therefore, the current study was undertaken to systematically gather, review and synthesize research on publicly funded medication reviews provided by community pharmacists in Canada. Specific objectives of this review were to:

- 1) map the literature according to study designs and research areas,
- 2) synthesize the study findings based on research areas and
- 3) determine gaps in the existing literature

Method

Our research question of synthesizing the diverse Canadian literature on community pharmacist medication reviews lends itself to a scoping review approach over a systematic review based on the purpose of the study.^[20] Scoping reviews are intended for summarising the breadth and depth of evidence on a broad research topic by systematically mapping the key concepts, sources of evidence and identifying knowledge gaps.^[20–22] In contrast, systematic reviews often address a specific question on the appropriateness or effectiveness of a defined practice or treatment.^[20]

This scoping review was conducted according to the framework proposed by Levac and colleagues^[22] which extended the original framework developed by Arksey and O'Malley.^[21] The enhanced framework provides more clarity and specific details on the six stages of the review process. We used the first five stages as the sixth stage (stakeholders consultation) did not have articulated benefits for our study. We followed the PRISMA-ScR guidelines (i.e. Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews) to ensure quality and transparent reporting of our scoping review.^[23, 24] The completed PRISMA-ScR checklist can be found in [Supplementary File 1](#).

Stage 1: identifying the research question

The research question guiding the review was: What are the research methods and key findings described in the peer-reviewed literature

on publicly funded community pharmacist medication reviews in Canada?

Stage 2: identifying relevant studies

The medical librarian conducted searches in three electronic databases Ovid MEDLINE, Ovid Embase and CINAHL for literature published between January 2000 and August 2020. The date limit was set to the 2000s since Ontario's MedsCheck program was launched in 2007. No language limits were applied. Our goal was to identify peer-reviewed studies, thus we excluded grey literature. The final search results were exported into Refworks, a reference manager and duplicates were removed. The unique records were exported to Covidence software, a web tool designed to track and manage the steps within the review process.^[25] The full search strategy for databases is presented in [Supplementary File 2](#).

Stage 3: study selection

Two reviewers (D.O. and L.G.) met to discuss inclusion and exclusion criteria and continued to refine the criteria through an iterative process as they gained familiarity with the literature. Inclusion and exclusion criteria were defined by country, setting, provider, study focus, design and type of publication ([Table 2](#)). Studies were independently screened in two stages. In the initial stage, both researchers independently screened titles and abstracts for potentially relevant papers. Discrepancies were resolved through discussion. In the second stage, we obtained and assessed the full text of relevant papers for eligibility using the specified criteria. We resolved disagreements on full-text papers by discussion.

Stage 4: charting the data

Data charting spreadsheets were developed by one researcher (D.O.) to extract data from included full-text studies consistent with the research objectives. Data were extracted on the following study characteristics: first author, year of publication, province, participants studied, research design, method of data collection, data analysis techniques and main findings.

Stage 5: collating, summarizing and reporting the results

Research objectives, methods and findings for each study were analysed to identify the particular focus or topic of research. Similar topics were synthesized together. After analysing the results, gaps in the literature were identified.

Table 2 Inclusion and exclusion criteria

Criteria	Inclusion criteria (study meets all criteria)	Exclusion criteria (study meets any criteria)
Country	Canada	Outside Canada
Setting	Community pharmacy	Ambulatory, outpatient clinics, hospital, long-term care unless an element of community pharmacy was studied and reported
Provider	Pharmacists, pharmacy technician, students, assistants, interns	Multidisciplinary teams
Program type	Publicly funded medication reviews	Program does not qualify for public funding
Study focus	Addressed medication review services alone or a distinct element of medication reviews within the range of pharmacist services	Only addressed pharmacy services broadly; Specific medication review services were not distinct from other pharmacy services
Study design	All research designs with empirical data	No empirical data, review articles, method/concept papers, commentary, editorials
Publication	Full-text peer-reviewed journal articles	Non-peer reviewed articles, grey literature, reports, abstracts

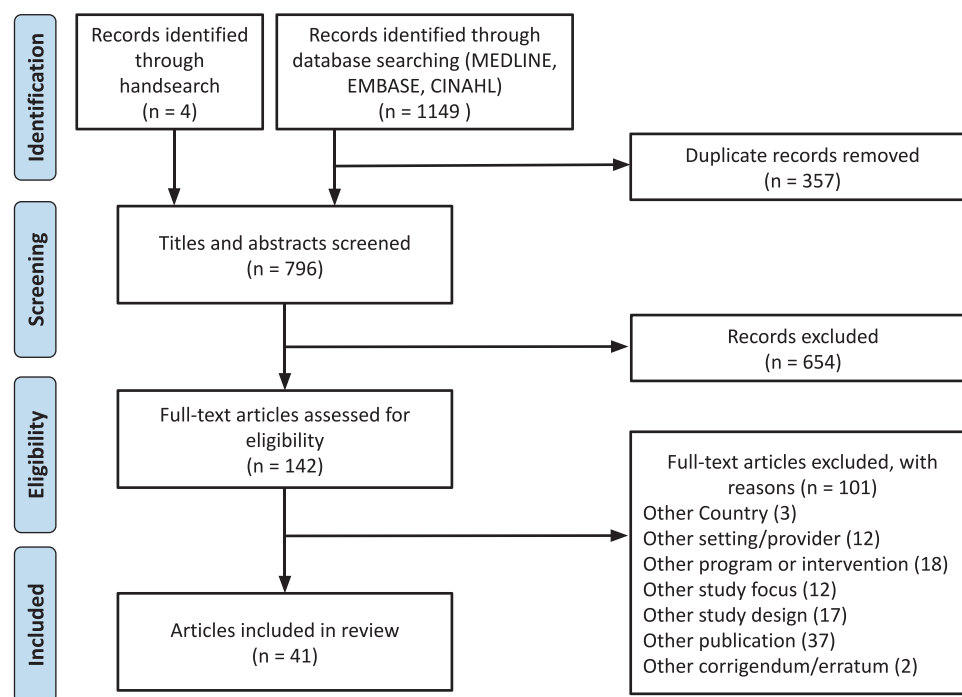


Figure 1 PRISMA flow diagram of the literature search.

Results

We identified 1149 articles through searching electronic databases, and additional four papers through hand searches. To avoid double-counting, we excluded two records (erratum and corrigendum) from the number of included papers as they corrected data in previously published papers and were not new studies. In total, 41 articles were included in the review. Figure 1 shows the details of the number of papers identified throughout the review. Data on the study characteristics are reported in detail in Table 3.

Province

Majority of research on community pharmacist medication reviews was conducted in the Canadian province of Ontario ($n = 21$).^[26–46] Major funders were the Ontario government and Ontario Pharmacy Evidence Network (OPEN). Eight studies were from Alberta,^[47–54] and the remaining studies were from British Columbia ($n = 5$),^[55–59] Saskatchewan ($n = 3$)^[60–62] and Nova Scotia ($n = 1$).^[63] Two pan-Canadian studies^[64, 65] were included and one collaborative study between Alberta and Ontario.^[66] No studies were found in the other three provinces providing publicly funded medication review programs, namely New Brunswick, Prince Edward Island and Newfoundland and Labrador.

Research design

Based on the data sources (types of evidence) and analytical approach, three major types of study designs were identified. These include (1) 29 quantitative studies based on population-based claims data, surveys, controlled trials or quasi-experimental designs,^[27, 30–37, 39, 40, 42, 43, 45–49, 52, 54, 56–59, 61–63, 65, 66] (2) Ten qualitative studies using data from interviews, focus groups, observation, document analysis or written reflections,^[28, 29, 38, 41, 44, 51, 53, 55, 60, 64] (3) Two mixed-method studies adopting both quantitative and qualitative designs.^[26, 50]

The selection of methodological design was closely related to the research objectives. The type of research questions addressed by quantitative methods focused on measuring program uptake, stakeholder perceptions and outcomes of medication reviews. Cohort studies and other population-based studies assessed program utilization rates and the impact of policies on program uptake. Controlled trials, cohort and quasi-experimental designs were used to evaluate the impact of medication reviews on patient outcomes. Surveys were mainly used to gather experiences and perceptions of stakeholders on their attitudes towards medication reviews, perceived value, benefits and factors associated with uptake.

On the other hand, the qualitative approaches used include qualitative description, grounded theory, ethnography and case study. Qualitative methods relied heavily on interviews and focus groups as data collection techniques with less adoption of direct observation methods and document analysis. Interviews and focus groups were used to gather stakeholder experiences in addition to implementation factors and strategies for delivering medication review services across multiple levels – patient, pharmacist, pharmacy and broader contexts of community and health systems. Stakeholders included patients, physicians, pharmacy technicians or assistants, pharmacy students, pharmacists (community, hospital, specialist), pharmacy managers and corporate executives. One study was based on written reflections of pharmacy student experiences providing medication reviews. The other two qualitative techniques (observations and document analysis) investigated pharmacy workflow to learn how medication reviews were operationalized in everyday practice. One policy brief analysed documents to review patient eligibility policies across Canada.

In terms of explicit use of theory, models or theoretical frameworks, only five studies reported using any of these tools to guide decisions at different stages of the research process.^[37, 38, 43, 50, 53] Three of the frameworks were implementation frameworks.^[37, 38, 50] Three studies consistently applied a theoretical framework or theory throughout the research,^[37, 50, 53] including a survey using

Table 3 Characteristics of studies on community pharmacist medication reviews in Canada

Author/year	Research objective	Province/participants	Study design	Data collection technique	Data analysis technique	Key findings
Ahmed <i>et al.</i> ^[60]	To examine perceptions of healthcare providers about the medication review program for complex renal patients	Saskatchewan: Renal pharmacists, nephrologists and community pharmacists	Qualitative description	Semi-structured interviews	Qualitative content analysis	Community pharmacists had varying levels of comfort delivering medication reviews for renal patients. Renal pharmacists and nephrologists doubted community pharmacists clinical knowledge and skills to manage the complex needs of renal patients. Collaboration and removal of age restrictions for patient eligibility could improve the program
Al Hamameh <i>et al.</i> ^[47]	To evaluate the effect of pharmacist medication review and interventions (including prescribing and ordering laboratory tests) on cardiovascular risk in a subgroup of patients with diabetes (Rx EACH-DM trial)	Alberta Adults with diabetes and at least 1 uncontrolled cardiovascular risk factor	Quantitative	Prespecified subgroup analysis. Multicentre, randomized controlled trial in a 1 : 1 ratio to intervention or usual care groups.	Analysis of covariance; Chi-square tests	Intervention reduced the risk of major cardiovascular events by 21% and improved HbA1c, blood pressure and LDL-cholesterol levels, tobacco cessation and exercise frequency
Al Hamameh <i>et al.</i> ^[48]	To evaluate the effect of pharmacist medication review and interventions (including prescribing and ordering laboratory tests) on cardiovascular risk in a subgroup of patients with chronic kidney disease (Rx EACH-CKD trial)	Alberta Adults with chronic kidney disease and at least 1 uncontrolled cardiovascular risk factor	Quantitative	Prespecified subgroup analysis. Multicentre, randomized controlled trial in a 1 : 1 ratio to intervention or usual care groups.	Analysis of covariance; Chi-square tests	Intervention reduced the risk of major cardiovascular events by 20% and improved control of BP, LDL cholesterol, tobacco cessation (self-reported) and HbA1c in those who also had diabetes. Larger effects for rural versus urban dwelling
Bharadia <i>et al.</i> ^[49]	To examine the effect of financial remuneration on pharmacists provision of diabetes management activity	Alberta: Community Pharmacists	Quantitative	Online survey	Chi-square for categorical variables and one-way analysis of variance (ANOVA) for continuous variables.	Diabetes management activity was significantly associated with billing for medication reviews
Currie <i>et al.</i> ^[61]	To explore the experiences of pharmacists with the medication review program	Saskatchewan: Community Pharmacists	Quantitative	Online survey	Descriptive statistics; Qualitative content analysis for nine free-text survey data	Perceived barriers: lack of time, difficulty having patients come to the pharmacy, excludes high-risk or federally insured patients, managing complex patients. Perceived facilitators: teamwork, support from employer, personal commitment, confidence, motivation, belief that program goals were met.
Deal <i>et al.</i> ^[63]	To describe the utilization of medication reviews during the first year	Nova Scotia: seniors enrolled in Nova Scotia Seniors Pharmacare program (NSSPP)	Quantitative	Population-based administrative databases	Descriptive statistics; Chi-square; <i>t</i> -tests and ANOVA	Low uptake of medication reviews in seniors and pharmacies; Less than 1% reviews were conducted compared with total Medicare program beneficiaries. Majority of pharmacies were in urban areas

Table 3 Continued

Author/year	Research objective	Province/participants	Study design	Data collection technique	Data analysis technique	Key findings
Dolovich <i>et al.</i> ^[26]	To describe pharmacist initial experiences with a new medication review service	Ontario Pharmacists	Mixed method	Mailed survey and semi-structured telephone interviews	Descriptive statistics for survey data. Qualitative content analysis of interview transcripts by 2 researchers	Perceived facilitators: overlap of pharmacist coverage, scheduling service during slower times, maximizing the role of pharmacy tech or interns, inviting and communicating with patients, reducing paperwork. Perceived barriers: lack of time, impact on workload cost of hiring an overlap pharmacist and lack of a private counselling room.
Dolovich <i>et al.</i> ^[27]	To describe utilization of community pharmacy medication reviews during the first 6 years	Ontario residents who received a medication review	Quantitative	Population-based administrative databases	Prevalence counts and frequencies	Service utilization was rapid and increased overtime for eligible patients who were less complex. Low follow-up rates. Pharmacy uptake was 95%.
Graham <i>et al.</i> ^[28]	To describe the utilization rates and experiences of patients, hospital pharmacy staff with community pharmacy medication reviews after provincial policy changes	Ontario; patients, hospital pharmacists, pharmacy technicians	Qualitative	Focus groups for pharmacy staff; Interviews with patients	Descriptive statistics; Qualitative content analysis of interview and focus group data	The characteristics of patients receiving medication reviews did not change after the program was enhanced. Benefits and barriers related to quality, access and collaboration in the medication review process
Grindrod <i>et al.</i> ^[29]	To share the stories of graduating pharmacy students learning to deliver medication reviews to patients	Ontario pharmacy students	Qualitative	Weekly reflection; Blogging; Group discussion	Written reflections	Students experienced successes and challenges in defining medication reviews, recruiting and engaging patients. Peer mentoring was useful in developing innovative ways to overcome barriers.
Grootendorst <i>et al.</i> ^[30]	To determine the uptake of pharmacy technicians and their impact on medication reviews provided in pharmacies	Ontario Pharmacy technicians and Pharmacies	Quantitative	Database of licensed pharmacy technicians and pharmacists, Pharmacy claims data	Proportions and Regression models	Chain pharmacies and pharmacies with a higher volume of prescriptions are more likely to use technicians. Pharmacies employing 3 or more pharmacy technicians were less likely to provide all types of medication reviews except in long-term care settings compared with pharmacies with fewer than 3 technicians.
Hanna ^[31]	To assess the feasibility and impact of implementing medication reviews to reduce cardiovascular risks	Ontario Adults	Quantitative	Controlled trial with random assignment of pharmacies to intervention or usual care groups.	Descriptive statistics; Random effects models	Intervention did not have a significant impact on cardiovascular outcomes. Patients had a positive impression and valued pharmacists' involvement in their health.

Table 3 Continued

Author/year	Research objective	Province/participants	Study design	Data collection technique	Data analysis technique	Key findings
Henrich <i>et al.</i> ^[5]	To understand the experiences of pharmacists, patients and physicians about the BC medication management program (BCMMP).	British Columbia Patients, Pharmacists and Physicians	Qualitative	Focus groups and interviews	Qualitative content analysis	Patients felt less confused and more informed about medication use. Pharmacists perceived professional satisfaction, a holistic review of medications and a stronger relationship with patients as benefits. Physicians had negative attitudes and concerns about uncompensated time and pharmacists' pay being too high. Blood pressure kiosks at the pharmacy were useful to identify patients with elevated readings who may benefit from publicly funded medication reviews and pharmaceutical opinions, leading to more revenue for the pharmacy
Houle <i>et al.</i> ^[32]	To estimate revenues generated by using blood pressure kiosks to identify patients who are eligible for reimbursable medication reviews and pharmaceutical opinions.	Ontario: All eligible patients identified from among those using blood pressure kiosks	Quantitative	Usage data from blood pressure kiosk database (Pharmasmart PS-2000)	Sensitivity analysis and Monte Carlo simulations	Barriers: workflow disruptions due to time constraints and staffing issues, cumbersome documentation, tension between quantity versus quality of services and uncertainty about integration into practice. After pharmacists were supported to perform medication reviews more efficiently, the number of medication reviews actually decreased due to overlap with influenza vaccination season
Houle <i>et al.</i> ^[30]	To assess what pharmacies need to provide more medication reviews and how task-focused facilitation impacts service provision	Alberta Pharmacists, Pharmacy technicians and assistants	Mixed method	Semi-structured interviews; Observations; Alberta Context Tool (survey); Pharmacy dispensing data	Descriptive statistics; Mann-Whitney U tests; Unpaired <i>t</i> -tests; Qualitative content analysis for interview data	Delivery of medication reviews was influenced by the level of support in the work environment, patient engagement, professional commitment to learning and development, collaborative relationships. One-quarter of eligible patients received at least one professional pharmacy service and of those patients, two-thirds had a medication review. Use of all services was positively associated with the number of medications. No effect on medication costs, utilization, persistence, deprescribing of potentially inappropriate prescriptions or pharmacy loyalty (utilization patterns).
Hughes <i>et al.</i> ^[51]	To explore experiences with the implementation of comprehensive medication reviews or care plans in community pharmacy	Alberta; Pharmacy staff, patients, healthcare providers	Qualitative	Observation; semi-structured interviews with pharmacy staff, patients, healthcare providers; Document review	Constructivist grounded theory	
Ignacy <i>et al.</i> ^[33]	To examine the relationship between prescription medication use and receipt of professional pharmacy services including medication reviews	Ontario patients who received prescriptions under the Ontario Public drug (ODB) program	Quantitative	Population-based administrative databases	Descriptive statistics; Cochran-Armitage trend	
Kolhatkar <i>et al.</i> ^[56]	To evaluate the effect of medication reviews on medication costs, utilization and persistence	British Columbia: All patients	Quantitative	Population-based administrative database	Interrupted time series analysis (ITS)	

Table 3 Continued

Author/year	Research objective	Province/participants	Study design	Data collection technique	Data analysis technique	Key findings
Kosar <i>et al.</i> ^[62]	To describe the utilization of medication reviews during the first year	Saskatchewan	Quantitative	Population-based administrative databases	Descriptive statistics; Chi-square and <i>t</i> -tests	7.4% of eligible patients received medication reviews. The number of medications was the most sensitive criteria for eligibility.
Lancaster <i>et al.</i> ^[66]	To investigate which reimbursed community pharmacy services (including medication reviews) are used after screening for chronic disease risk factors	Ontario and Alberta Seniors	Quantitative	Pharmacy administrative billing data, Case report forms	Descriptive statistics	Annual medication reviews were the most frequently provided service within 3 months post-screening followed by influenza vaccinations.
Lapointe Shaw <i>et al.</i> ^[34]	To study the effect of medication review after hospital discharge on the rates of readmission or death	Ontario: patients discharged from hospital	Quantitative – retrospective propensity score matched cohort study	Population-based administrative databases	Descriptive statistics; Kaplan–Meier survival curves	Medication review was associated with a small and reduced risk of short-term hospital readmission and death
Leung <i>et al.</i> ^[35]	To evaluate the feasibility and impact of integrating community-based medication review into the perioperative medication reconciliation process at a hospital	Ontario: Community pharmacists and patients	Quantitative	MedsCheck document; Best Possible Medication History; Baseline data; Inpatient medication orders; Satisfaction surveys	Descriptive statistics of patient characteristics and medication audit Medication discrepancy	MedsCheck was feasible to identify and reduce medication discrepancies as part of the hospital reconciliation process. Patients and pharmacists were satisfied. Barriers were time constraints, low patient familiarity with the service, patient ineligible or unable to visit pharmacy, insufficient quality of MedsCheck documents. Facilitators were pharmacists ease of scheduling appointments
MacCallum <i>et al.</i> ^[36]	To describe the uptake of medication reviews for diabetes patients	Ontario Diabetes patients	Quantitative	Population-based administrative databases	Prevalence counts and frequencies	Half of Ontario diabetes patients received an initial medication review; follow-up was 17.5%. Majority of recipients were male, over 66 years, received an average of 11 prescription medications, urban dwelling and Canadian. More than one-third had previous diabetes-related hospitalizations or emergency department visits
MacCallum <i>et al.</i> ^[37]	To identify the barriers and facilitators to routine monitoring and follow-up for diabetes patients by community pharmacists.	Ontario; pharmacists	Quantitative	Survey with 39-items plus two open-ended questions	Descriptive statistics – mean and standard deviation; Thematic analysis	Perceived barriers: Lack of personal financial reimbursement, recognition and practice environment Perceived facilitators: pharmacist's knowledge, skills and beliefs about their role and responsibility, social influences and optimism

Table 3 Continued

Author/year	Research objective	Province/participants	Study design	Data collection technique	Data analysis technique	Key findings
Mackeigan <i>et al.</i> ^[38]	To describe strategies used by pharmacy decision makers to implement medication review programs	Ontario Pharmacy owners, managers and corporate executives	Qualitative	Semi-structured interviews on strategies generated at corporate level and pharmacy level	Thematic analysis and mapping of themes to CFIR and ERIC implementation science models	Decision makers perceived the reimbursed medication review services as an opportunity to regain lost revenues after reduced generic drug reimbursements and rebates. Strategies were driven by efficiency and volume rather than quality.
Necyk <i>et al.</i> ^[32]	To evaluate the impact of comprehensive medication reviews or care plans on healthcare utilization	Alberta; patients	Quantitative	Population-based administrative databases	Controlled Interrupted time series analysis (ITS)	Small but significant reductions in total healthcare use in those patients who received a pharmacist CACP
Pammett <i>et al.</i> ^[64]	To review patient eligibility criteria for community pharmacy medication review programs across Canada.	All provincially funded medication review programs	Qualitative	Published provincial and professional documents with email/phone follow up	Document analysis	Patient consent and face-to-face contact was required for all programs. Criteria for deciding patients eligible were explicit but heterogeneous across provinces.
Pammett <i>et al.</i> ^[65]	To assess if each provinces' eligibility criteria is appropriate for identifying patients who have more serious and higher drug-related problems	All provincially funded medication review programs	Quantitative	Completed medication review documents	T-tests	Eligibility criteria identified those who had a higher number and severity of drug-related problems but excluded some patients with fewer medication issues who might benefit.
Papastergiou <i>et al.</i> ^[39]	To report on drug therapy problems identified in home medication reviews delivered by community pharmacists	Ontario; homebound patients	Quantitative – cross-sectional	Medication review documentation	Descriptive statistics (frequency and percentages)	Non-adherence, adverse drug reactions and additional therapy were the top 3 drug-related problems identified. Majority (58%) of patients had expired, duplicate and unnecessary medication removed from their homes
Papastergiou <i>et al.</i> ^[40]	To identify drug therapy problems in high-risk non-homebound patients (ineligible) and demonstrate potential benefits of expanding funding eligibility policy to meet patient's needs	Ontario ambulatory patients	Quantitative cross sectional design	Medication review documentation	Descriptive statistics (frequency and percentages)	Additional therapy, non-adherence, adverse drug reactions were the top 3 drug-related problems identified. Majority (67%) of patients had expired or unnecessary medication removed from their homes
Patton <i>et al.</i> ^[41]	To analyse the experiences of pharmacists and patients in the context of medication review practices	Ontario Pharmacists, patients	Qualitative	Non-participant observation, semi-structured interviews with pharmacy staff, brief unstructured discussions with patients and pharmacy staff.	Constructivist grounded theory	Patients were more satisfied with in-depth medication reviews that covered health concerns rather than brief interactions at the pharmacy counter without explanation of the purpose or opportunity to consent to the service.

Table 3 Continued

Author/year	Research objective	Province/participants	Study design	Data collection technique	Data analysis technique	Key findings
Pechlivanoglou <i>et al.</i> ^[42]	To identify patient, pharmacy and community factors associated with utilization of medication reviews in seniors	Ontario Seniors	Quantitative	Population-based administrative databases	Chi-square and independent <i>t</i> -test; Generalized Estimating Equations (GEE) model	Older patients and seniors were less likely to receive medication reviews if they used multiple and potentially inappropriate medications, had more comorbidities, visited pharmacies with high prescription volume or lived in rural areas.
Riley <i>et al.</i> ^[43]	To evaluate the economic, clinical and humanistic benefits of having a designated pharmacist provide medication reviews and other patient care services	Ontario: Pharmacist, Patients	Quantitative	Business plan; Patient profiles; Documents for medication review; Patient satisfaction survey	Descriptive statistics	Program benefits include generation of designated pharmacists pay, increased revenue, resolution of drug-related problems, discarding expired/discontinued drugs, patient satisfaction
Rosenberg-Yunger <i>et al.</i> ^[44]	To explore pharmacists' perceptions of shared decision making in medication reviews for diabetes patients	Ontario Pharmacists	Qualitative	Telephone semi-structured interviews	Thematic analysis; Constant comparative approach	Pharmacists perceived potential benefits but were not framing patient education through a shared decision making lens. They lacked a complete understanding of the concept and how to apply it in patient interactions.
Schindel <i>et al.</i> ^[53]	To understand the value of pharmacist care planning services to patients, pharmacists and healthcare providers	Alberta: Patients, Physicians, Nurse, Pharmacists, Pharmacy students, Pharmacy staff	Qualitative	Interviews, site-specific documents and observation	Constant comparative approach and Sociomaterial theory	Patients valued shorter wait times and jointly creating care plans. Physicians benefited from collaboration, information sharing and different perspectives on patient care while pharmacists increased interactions and responsibility for patients and received compensation.
Shakeri <i>et al.</i> ^[45]	To examine the impact of additional documentation, and reporting requirements on the delivery of medication review programs	Ontario; patients	Quantitative	Population-based administrative database	Interrupted time series analysis (ITS)	Policy changes resulted in an immediate and sustained decline in the number of community pharmacy and home medication reviews. Impact on reviews in long-term care settings
Tomas <i>et al.</i> ^[46]	To evaluate the feasibility and impact of incorporating community-based medication review into ambulatory clinic workflow	Ontario; Patients newly referred to an ambulatory internal medicine clinic for complex patients	Quantitative	Program documents; Surveys for patients and medical residents; Medical chart review.	Descriptive statistics	Feasible integration of up-to-date medication list into patient charts. Perceived benefits: shortened time to gather medication history, identified drug-related problems. Perceived barriers: low patient familiarity with medication review and its benefits, higher clerical workload and low response from community pharmacies

Table 3 Continued

Author/year	Research objective	Province/participants	Study design	Data collection technique	Data analysis technique	Key findings
Tsao <i>et al.</i> ^[58]	To determine the public's opinions, preferences and willingness to pay for pharmacist medication management services including medication reviews	British Columbia; General adult population	Quantitative	Cross-sectional survey including Best–Worst scaling items	Descriptive statistics. Multinomial logistic regression	Majority of the public were aware and supportive of medication management services. Ranked medication reviews as most important. Preferred same day/walk-in, 15 mins interactions and were willing to pay varying amounts. Previous experience was tied to willingness to pay more.
Tsao <i>et al.</i> ^[57]	To investigate pharmacist working conditions and their impact on quality and safety of patient care	British Columbia; registered pharmacists	Quantitative	Cross-sectional survey	Descriptive statistics. Logistic regression models	Negative perceptions of work conditions un conducive for safe patient care. Perceived work-related stress due to inadequate staffing support, time for tasks, lunch breaks Worse in chain pharmacies with higher prescription volume, pressure of imposed quotas for medication reviews and immunizations compared with independents or hospitals/long-term care settings.
Tsao <i>et al.</i> ^[59]	To describe and compare the opinions and preferences of pharmacists and physicians about pharmacy medication management services including medication reviews	British Columbia; Pharmacists and Family physicians	Quantitative	Cross-sectional survey including Best–Worst scaling items	Descriptive statistics. Logistic regression models	Pharmacists and physicians shared a similar goal of medication reviews in improving health and medication use, reducing healthcare costs and utilization. However, both parties thought their own profession should provide the services.
Tsuyuki <i>et al.</i> ^[54]	To evaluate the impact of pharmacist medication review and interventions (including prescribing and ordering laboratory tests) in patients at high risk of CVD (RxEach trial)	Alberta: Adults with high risk of CVD	Quantitative	Multicentre, randomized controlled trial in a 1 : 1 ratio to intervention or usual care groups	Analysis of covariance; Chi-square tests	21% Significant reduction in estimated cardiovascular risk factors and achievement of recommended targets for cholesterol, BP, glycemic control and smoking.

Theoretical Domain Framework v2,^[37] a qualitative case study using Sociomaterial and Document theories^[53] and a mixed-method study based on the Promoting Action on Research Implementation in Health Services (PARiHS) framework.^[50] The S.W.O.T. analysis (Strength, Weakness, Opportunities and Threat – SWOT) model informed aspects of planning a new delivery model for medication reviews^[43] while the Consolidated Framework for Implementation Research (CFIR) was applied to analyse and contextualize findings from qualitative interviews.^[38]

Research area

The main findings from each study were analysed and synthesized into research areas based on key data presented (Table 3). Some included papers contained unique data and fit into distinct categories while findings from many of the studies were diverse and were placed across multiple research categories. Specifically, five research categories were identified including:

- 1) program uptake,
- 2) health outcomes,
- 3) stakeholder beliefs and attitudes,
- 4) processes and collaboration and
- 5) pharmacy workplace culture.

Uptake of medication review programs

Seventeen studies reported on the uptake of medication reviews, focusing on one or more aspects of the program: (1) extent of utilization in eligible patients,^[27, 33, 36, 42, 52, 62–64] (2) categories of patients missed by policy criteria,^[40, 60, 61, 65] (3) factors that influenced uptake of medication reviews within the policy or regulatory context.^[27, 30, 38, 45, 49]

Patient eligibility requirements varied widely across provinces but commonly focused on known risk factors associated with drug therapy problems (DTPs) such as chronic conditions, medications and age 65 years and over.^[64] Many high-risk patients qualified to receive publicly funded medication reviews, but a small proportion of eligible patients actually received them within the first year of the program. Low uptake was reported as 1% in Nova Scotia,^[63] 7.5% in Saskatchewan^[62] and 11% in Ontario.^[27] As more programs were rolled out in Ontario such as MedsCheck Diabetes, uptake increased rapidly to almost 50% for diabetes patients,^[36] but repeat annual and follow-up assessments were underutilized.^[27, 36] The majority of patients who received medication reviews had hypertension^[27, 52] or were seniors taking multiple medications.^[33] However, the longitudinal analysis showed recipients tended to be younger and less complex patients over time.^[27] Older patients and seniors with more comorbidities,^[42, 52] taking multiple and potentially inappropriate medications, visiting a high prescription volume pharmacy or living in rural areas were less likely to receive medication reviews.^[42]

Further analysis of eligibility policies showed that although criteria generally identified patients with more severe DTPs who may benefit more from a medication review,^[65] they could also miss some categories of patients who may benefit.^[40, 60, 61, 65] These excluded groups include complex patients under 65 years^[60, 61] homebound patients or individuals insured under federal programs (e.g. First Nations, Inuit),^[60, 61] patients with moderate risk but serious drug therapy problems,^[64] and ambulatory patients who do not qualify for home medication reviews but have drug therapy problems arising from poor medication practices at home.^[40]

Pharmacy location and policy changes had a significant impact on the uptake of pharmacist medication reviews. Most pharmacies (95%) provided medication reviews,^[27] though the majority of them were located in urban areas.^[63] Studies showed the number of medication reviews increased with reduced revenue from dispensing generic drugs,^[27, 38] introduction of financial compensation or billing policies^[49] and additional start-up payments were made to pharmacies.^[27] By contrast, service uptake in Ontario dropped after increasing MedsCheck documentation requirements.^[45] Another study in Ontario showed that dispensing-focused pharmacies hiring three or more regulated pharmacy technicians were less likely to provide medication reviews.^[30]

Health outcomes

The ECHO (Economic, Clinical and Humanistic Outcomes) model serves as a useful framework to characterise the impact of medication reviews on health outcomes along multiple dimensions.^[67] The outcomes and impact of medication reviews have been studied in three provinces – British Columbia, Alberta and Ontario. In Alberta, community pharmacists provided comprehensive care plans combined with initial access prescribing while pharmacists in the other two provinces provided medication reconciliation and adherence-focused reviews.

Economic outcomes

Three studies analysed the impact of medication reviews on economic outcomes measured in terms of pharmacy revenue in Ontario,^[32, 43] and medication costs in British Columbia.^[56] There was an increase in pharmacy revenue of an average of \$12 270^[32] and \$35 755^[43] but no decrease in medication costs.^[56] In these programs, pharmacists provided an adherence type of review.

Clinical outcomes

Ten studies measured patient outcomes from the clinical perspective in Alberta,^[47, 48, 52, 54] Ontario^[31, 34, 39, 40, 43] and British Columbia.^[56] Measures that signify the control of disease conditions, risk factors, hospitalizations, physician visits, emergency department visits, death were considered as core clinical outcomes. Drug-related problems, potentially inappropriate medications and medication persistence were assessed as medication-related process variables.

Six studies reported on clinical parameters, of which four studies utilized randomised controlled designs,^[31, 47, 48, 54] one quasi-experimental design^[52] and one cohort study.^[34] In three Rx EACH trials in Alberta,^[47, 48, 54] community pharmacists provided comprehensive care plans combined with patient assessment and prescribing in 56 Alberta pharmacies. These patients had reduced cardiovascular risk, improved control of blood pressure, low-density lipoprotein cholesterol, tobacco cessation and exercise frequency compared with usual care. Unlike the Alberta study, the trial in Ontario did not show a significant impact on cardiovascular outcomes.^[31] Analysis of population-based administrative databases revealed mixed effects of medication reviews on healthcare services utilization in two provinces – Ontario^[34] and Alberta.^[52] Medication reviews slightly reduced emergency department (ED) visits and all-cause hospitalizations, ED visits related to ambulatory care sensitive conditions and physician visits^[52] and also slightly reduced short-term hospital readmission and death.^[34] On the other hand, medication reviews increased physician visits,^[34] hospitalizations related to ambulatory care sensitive conditions and all-cause ED visits.^[52]

Four studies reported on medication-related processes with mixed results.^[39, 40, 43, 56] Drug-related problems were identified during

medication reviews including non-adherence, adverse drug reactions and additional therapy and were resolved by the pharmacist alone or with the patients' physician.^[39, 40, 43] Patients receiving medication reviews at home had expired, duplicate and unnecessary medication removed from their homes.^[39, 40] There was no evidence that medication reviews were associated with persistence to common classes of medications or deprescribing of unnecessary or potentially inappropriate medications in British Columbia.^[56]

Humanistic outcomes

Humanistic outcomes evaluated in seven studies included measures related to medication knowledge, patient satisfaction and patient experiences of care.^[28, 41, 43, 51, 53, 55, 58] Perceptions of patients regarding medication reviews were influenced to varying degrees by the type of medication review as well as interpersonal and contextual factors such as access, wait times, duration of consultation, location, privacy of setting and information sharing practices. Patients receiving comprehensive care plans in Alberta valued shorter wait times and convenient access compared with physician visits.^[53] Patients perceived they had a better understanding of their conditions, medications, felt comfortable asking questions, discussing their health goals, action plans and self-management practices to improve their health.^[51, 53] They also perceived their care was better coordinated through pharmacist–physician collaboration.^[53] The frequent and continuous nature of interactions was an important factor in enhancing familiarity and building patient–pharmacist relationships.^[53] Patients gained more awareness of pharmacists' role in monitoring medications and supporting them to get more benefits from their medications, beyond dispensing activity.^[51, 53] Although patients were not asked to choose their preferred location during pharmacy visits, longer medication reviews that occurred in a private consultation room had a positive impression on patients,^[41, 53] who were usually uncomfortable discussing health concerns at the pharmacy counter or non-private areas.^[41] However, some patients in British Columbia preferred short visits.^[58] Many patients receiving adherence-focused reviews in British Columbia and Ontario were satisfied with the quality of pharmacists' advice and interaction time, clarity of information on medication use and felt less confused about their medications.^[43, 55] Despite positive findings, medication reviews did not improve patient experiences across the types of medication reviews. Barriers included inappropriate patient selection, lack of preparation and insufficient time for patient–pharmacist interaction.^[28] Some patients did not receive an updated medication list,^[41] and other patients did not develop an understanding of their medications,^[28] treatment goals and action plans.^[53]

Stakeholder beliefs and attitudes about engaging in medication reviews

Twelve studies provided diverse perspectives from pharmacists, physicians and patients about their beliefs and attitudes towards medication reviews.^[26, 29, 37, 41, 44, 51, 53, 55, 58–61] Pharmacists held different views about engaging in medication reviews. Pharmacists and pharmacy students perceived medication review services as part of their role and responsibility in providing patient care^[26, 29, 37, 41, 51, 59, 60] though they understood this role in different ways. Some pharmacists defined the goal of medication reviews as creating an up-to-date patient medication list^[26, 29, 41] while others described higher expectations of optimising patient's therapy and outcomes^[26, 29, 37, 41, 51, 59, 60] that required pharmacists to adopt a new understanding of their expanded role in patient care.^[51] There were pharmacists who reported meaningful partnerships with patients and increased professional

satisfaction as motivating factors to engage in medication reviews.^[26, 51, 53, 55, 61] Despite perceived benefits and individual readiness (knowledge, beliefs and confidence) to provide medication reviews and follow up,^[37, 61] some pharmacists reported individual barriers including limited understanding of patient-centred care concepts such as shared decision-making,^[44] lack of confidence in managing complex patients^[60, 61] and interpersonal factors such as critical attitudes of physicians.^[55, 60]

Other stakeholders had mixed perceptions. In British Columbia, the majority of the public^[58] and physicians^[59] ranked medication reviews as the most important component of medication management services to improve patients' health when compared with other pharmacist services such as prescribing, non-prescription product counselling or administering injections. Despite positive views, many patients and healthcare providers were perceived to have a low level of understanding about the value of medication reviews.^[26, 29, 41, 55, 61] Renal pharmacists and nephrologists perceived the program may be duplicating services they already provide but supported its continuity.^[60] These specialists also doubted community pharmacists' clinical knowledge and skills to manage the complex needs of renal patients.^[60] Many physicians in British Columbia reported feeling dissatisfied with higher reimbursement for pharmacist medication reviews than physician visits and lack of compensation for reviewing recommendations.^[55] Furthermore, some physicians perceived they were the ideal healthcare professionals to provide medication reviews^[59] based on clinical knowledge and skills.^[55] In British Columbia, Alberta and Ontario, patients and physicians showed more interest in engaging in medication reviews in certain situations such as where they had strong relationships with pharmacists,^[29, 41, 53, 55, 59] or physicians were responsible for referring patients,^[55, 59] or the invitation to participate was framed in terms of perceived patient needs.^[29]

Processes and collaboration

We found 13 studies^[28, 29, 35, 37, 38, 40, 41, 43, 46, 50, 51, 53, 54, 60, 61, 66] that examined the processes involved, perceptions of stakeholders about the process and influence of medication reviews on collaboration. The components of medication reviews included the following processes: identify and recruit patients, prepare for patient consultation (for scheduled appointments), conduct patient interview and assessments (including physical assessment and laboratory data in comprehensive reviews or care plans), resolve drug therapy problems (or refer to patient's physician to make recommended changes to medications), document medication list or care plans, follow-up and monitoring of therapy goals.^[43, 51]

Medication review processes varied among pharmacies. Typically, pharmacy staff recruited patients^[38, 50, 51] while referrals from other care providers occurred in specific feasibility trials.^[35, 46] Pharmacies predominantly used an ad-hoc approach to identify, recruit and conduct immediate medication reviews for eligible patients who visit the pharmacy for prescriptions,^[38, 51, 66] while only a few pharmacies used a proactive strategy to target high-risk patients likely to benefit most from the service based on clinical needs.^[29, 38, 54] Walk-in or ad-hoc reviews were used for logistic reasons – convenience, reduced rates of 'no shows' and avoiding unplanned patient visits to the pharmacy, ultimately allowing higher uptake.^[38, 50] On the other hand, pharmacy staff scheduled appointments during overlap pharmacist coverage because it caused fewer workflow disruptions and allowed pharmacists sufficient time to prepare for and better engage patients in medication reviews.^[50, 51] One study in Ontario found patients appreciated the convenient timing and ease of booking appointments.^[46]

Good patient–pharmacist relationships were associated with higher recruitment success and service uptake.^[29, 41] To facilitate the medication review process, patient laboratory results and prescription information were frequently accessed from provincial electronic health records, in provinces where available^[51, 54, 61] whereas lack of access was a barrier to service delivery in other provinces.^[37] An average of 30 min was needed to interview the patient^[50] and an additional 15–60 min^[50] to up to 4 h^[51] for documentation under the care plan model in Alberta. In Ontario, complex cases^[29] and reviews done in the patient's home^[40] took longer than the estimated 30 min to complete. Longer reviews and regular follow-up assessments were perceived as more comprehensive and beneficial to patients^[29, 41] than brief interactions (2–5 min) at the pharmacy counter.^[41] Most medication reviews were performed by pharmacists^[41, 51] or supervised pharmacy students.^[29] In some practices, pharmacy technicians or assistants delivered aspects of the program such as identifying and recruiting eligible patients, booking appointments and billing.^[38, 43, 51]

Pharmacist medication reviews influenced collaboration and relationships with patients and other healthcare providers such as physicians, and hospital or ambulatory care pharmacists. Collaboration was increased through timely sharing of information and documents (e.g. medication lists, patient care plans from medication reviews) with patients and other healthcare providers.^[35, 41, 43, 46, 53] On the other hand, lack of timely communication, lack of access and poor quality of medication review documents hindered collaboration and also contributed to negative perceptions of other providers regarding medication reviews performed by community pharmacists.^[28, 53, 60, 61]

Pharmacy workplace culture

The community pharmacy environment has featured prominently in the Canadian research on medication reviews as evident in 12 studies^[26, 30, 37, 38, 43, 45, 50, 51, 53, 55, 57, 61] Two areas were studied: workplace factors that affected the delivery of medication reviews and strategies to address workplace barriers.

Workplace barriers were reported as the primary challenge to implementing medication reviews in community pharmacy practice across Canadian jurisdictions. Pharmacists cited barriers related to heavy workload, insufficient staffing, inadequate time to complete job tasks and difficulty in integrating medication reviews into workflow.^[26, 37, 50, 55, 61] Services such as dispensing, influenza vaccinations and patient self-care requests often took priority over medication reviews in busy pharmacies.^[50, 61] Workload was further increased by lengthy documentation^[45, 50, 51] and follow-up requirements^[37] stipulated in reimbursement policies. Contrary to the dominant view of workload barriers, there were positive perceptions about the value of spending time with patients among high-performing pharmacists in Alberta.^[53]

Pharmacy type, ownership and reimbursement models were important workplace factors affecting uptake by pharmacists. Dispensing-focused pharmacies had a lower uptake of medication reviews than pharmacies with lower prescription volumes and fewer technicians.^[30] Compared with independent pharmacies, chain pharmacists in Saskatchewan, British Columbia and Ontario commonly used service quotas or targets to increase the number of medication reviews.^[38, 57, 61] Pharmacists' reactions to quotas varied. While some pharmacy managers and pharmacists favoured the use of targets and financial incentives, respectively, as motivational strategies to increase service uptake, others expressed concerns about the potential impact on patient safety and quality of care.^[38, 57] Insufficient reimbursement for individual pharmacists was a major barrier to delivering medication reviews as reimbursement

was provided to pharmacies, not pharmacists who are salaried employees.^[37]

A range of strategies that may facilitate a supportive work environment and contribute to pharmacist increasing the uptake of medication reviews were identified, including human resource strategies – staffing and expanding pharmacist and technician roles^[26, 38, 51, 53] designating pharmacists to provide medication reviews^[43, 53] staff training, formal professional development and learning from experience^[38, 51] adapting software to support recruitment and documentation process,^[38, 43, 51] financial incentives or other staff rewards^[38, 43, 51] and timely access to patient health records where practice regulations allow.^[38, 51, 61]

Discussion

Discussion and implications for policy, practice and research

This scoping review characterised the Canadian literature on pharmacist medication reviews published over the last 13 years. The uptake of annual medication reviews was variable, follow-up was low, perceptions of stakeholders varied and the impact on patient outcomes was mixed. Multiple sources of evidence and study designs (quantitative, qualitative and mixed methods) corroborated most of the key findings. However, the review identified variation in results within the same province which may have been due to study design. For example, a cross-sectional study in Ontario^[33] suggested that complex patients (defined as patients taking multiple medications) received more medication reviews, while a longitudinal cohort study^[42] reported less utilization in complex patients over time in Ontario.

Publicly funded medication review programs have been rolled out in all but two Canadian provinces but system-level barriers still challenged their uptake. Our review showed that provincial eligibility policies were inconsistent and may be creating barriers to patient uptake because policies excluded some patients with medication needs who may benefit. For example, Indigenous people who are insured under the federal program – NIHB (Non-Insured Health Benefits) do not have coverage for provincially funded medication reviews.^[68, 69] Chronic health conditions are a stronger predictor of a patient's health needs than age,^[70] yet age restrictions were used in half of the provinces to select who can benefit from a medication review. Apart from chronic conditions, difficulty using medical devices and lack of caregiver support at home were identified as factors that may be correlated with a higher risk for drug therapy problems^[40] and may need to be considered in policy decisions to expand programs and patient eligibility criteria. Future studies could determine the most appropriate eligibility policy for selecting patients for medication reviews.

International literature has highlighted the mixed evidence of medication reviews on patient outcomes, revealing positive or negative impact and sometimes inconclusive results.^[3, 4, 71] Few studies have focused on accounting for these differences by analysing variations in delivery models^[72] or investigating the effect of the intervention according to the type of medication review.^[3] Our current review showed a similar trend of variable outcomes in two provinces – Alberta and Ontario. For example, four studies looked at the impact of pharmacists' medication reviews on cardiovascular outcomes, with three in Alberta reporting improved clinical outcomes^[47, 48, 54] while one study in Ontario found no impact.^[31] To explain the discrepancies in clinical outcomes, we considered the difference in the type of medication reviews and the scope of pharmacist practice

in Alberta and Ontario. Alberta has the most in-depth medication reviews [known as comprehensive annual care plans (CACP)] and a reimbursement model for up to 12 follow-ups per year. As of March 2020, Alberta pharmacists completed an average of 4.3 follow-ups for each CACP.^[18] Pharmacists in Alberta can also access, order and interpret laboratory tests and independently initiate medications, as part of the scope of practice,^[73, 74] whereas pharmacists in Ontario lack both access to laboratory values and independent prescribing authority to initiate a new prescription drug.^[73, 74] We hypothesize that differences in cardiovascular outcomes may be because pharmacists in Alberta can act on findings from a medication review while pharmacists in Ontario could only make recommendations to another prescriber. Future investigations are required to unpack the impact of pharmacist scope of practice in addition to the model of medication reviews.

Another crucial point for facilitating patient-centred practice in medication review services is the opportunity to consider the individual patient context that may be contributing to adverse health outcomes.^[12, 75, 76] A patient's medication experience, beliefs, feelings and preferences, shape if and how patients take medications.^[12, 75-77] These patient-related experiences are valuable in identifying the reasons for drug therapy problems such as non-adherence, adverse drug reactions and poor control of chronic disease conditions.^[75-77] Surprisingly, none of the studies in our review explored this research area. It is possible that pharmacists may be missing opportunities to actively engage patients and explore their perspectives about medications, as noted in other studies.^[78, 79] There is a need to understand factors that affect communication processes and develop strategies that can better engage patients and tailor the service to patient needs.^[80]

Patients' experiences are not only crucial in conducting a medication review, they may also be key in determining priorities and conducting research on medication reviews, considering the growing evidence supporting the involvement of patients and the public in health research.^[81] Patients were the subject of the study in research examining program uptake using population-based administrative databases in Canada's jurisdictions. Other studies in our scoping review gathered patients' perceptions using surveys, or qualitative approaches. However, it does not appear that patients were engaged in the research process either by informing research, getting involved with the research team or collaborating as a research partner. Engaging patients in a meaningful way in various stages of the research has the potential to align research priorities with issues that matter to patients, enhance transparency, credibility and translation of research findings aimed at improving the delivery of care.^[82, 83]

The ability to collaborate with physicians influenced medication review uptake.^[41, 53, 55, 59, 60] Previous studies have demonstrated that interprofessional relationships and collaboration play a key role in facilitating decision making about drug therapy changes and coordinating patient care.^[3, 5, 8, 9, 84] Still, researchers primarily studied pharmacists' beliefs, behaviours and actions regarding medication reviews. Only four studies focused on physicians' perceptions of the program with a qualitative approach^[53, 55, 60] or survey.^[59] There were no comparisons between medication reviews between pharmacists and other healthcare providers. It may be relevant to explore the perspectives of other healthcare providers to understand how to increase awareness and work together to integrate medication reviews in other healthcare practices.

Research on medication reviews in Canada described variable uptake of the service in relation to workplace culture. While most pharmacies leveraged technology, modified their staffing arrangements and used financial incentives to achieve widespread uptake

of medication reviews, these strategies appear to have focused on workflow efficiency and productivity with less emphasis on using a patient-centred approach to engaging patients who would benefit the most and addressing patient needs. On the other hand, low uptake was commonly attributed to workplace barriers and insufficient reimbursement models. Previous research has documented numerous barriers and challenges to implementing medication reviews in community pharmacy.^[85-87] To successfully address barriers and enhance the quality of medication reviews, future research efforts need to move beyond the discourse on workflow and consider exploring ways to better meet patient needs and improve experiences of care.

The continuity of medication reviews, like other publicly funded services, is significantly impacted by regulatory and government policies. For example, one study in our review found the uptake of medication reviews declined in Ontario community pharmacies after new documentation standards were introduced by provincial authorities.^[43] Evaluating the impact of various policy contexts on program delivery would be an important priority for future research. Previous work has also recognised that community pharmacy medication reviews are complex, dynamic and influenced by multiple factors across individual, interpersonal, organisational and health system levels.^[84, 88, 89] Theoretical frameworks can be useful tools to understand the relationship between multiple interrelated factors and the implementation of patient care services in community pharmacy practice.^[84, 88, 89] Yet, only five studies in our review applied any form of theory, model or framework, consistent with other findings.^[90] Pharmacy health services researchers may benefit from exploring how to incorporate implementation science literature and researchers into their evaluation of medication reviews. Future policies should consider the mutual interdependence of relevant factors across all levels – individual, interpersonal, community pharmacy and healthcare system, when developing and implementing changes.

Several gaps were identified in the Canadian research on pharmacist medication reviews. Further attention to the following areas could be a priority in medication review research: evaluating patient eligibility policy, medication review coverage for Indigenous people, influence of pharmacist reimbursement and practice models on outcomes, patient-pharmacist communication, developing and evaluating strategies to identify and address patient needs. The COVID-19 pandemic has led pharmacists to adopt virtual means to provide services. As studies in our review were conducted before the pandemic, it may be useful to investigate the effect of COVID on medication reviews uptake and processes. Finally, to better understand the impact of policy and reimbursement models, researchers should compare the uptake of medication reviews, quality of care and patient experiences among jurisdictions with differing medication review models.

Study limitations

Our search could have missed some literature even though we followed a comprehensive search process. We also limited our search to peer-reviewed literature and full-text articles and did not include grey literature or abstracts. We identified many abstracts in this field that we did not summarize as they had insufficient detail. However, this suggests the research will continue to expand.

Conclusion

Publicly funded medication reviews in Canadian community pharmacies reduce medication-related problems and potentially improve patient health outcomes. A growing number of studies employed mostly quantitative research methods, in addition to qualitative and

mixed-method studies, to investigate community pharmacist medication reviews. Five major themes were identified – program uptake, outcomes, stakeholder beliefs and attitudes, processes and collaboration and pharmacy workplace culture. Factors influencing the uptake and implementation of medication reviews were interrelated. For example, reimbursement and use of technology to identify eligible patients facilitated uptake while insufficient collaboration contributed to negative attitudes regarding medication reviews. Future research that explicitly uses theory or theoretical frameworks will increase our understanding of medication review practices in community pharmacy. More research is needed to evaluate patient eligibility policy, medication review coverage for Indigenous people, influence of pharmacist reimbursement and practice models on outcomes, patient–pharmacist communication, strategies to identify and address patient needs, and comparisons of practice models of medication reviews between jurisdictions across the world. In this way, researchers may inform policies on sustainable delivery of medication review programs in Canada and internationally.

Supplementary Material

Supplementary data are available at *Journal of Pharmaceutical Health Services Research* online.

Supplementary File 1. PRISMA Scoping Review checklist.

Supplementary File 2. Search strategy.

Author Contributions

Damilola Olufemi-Yusuf did conceptualization, methodology, validation, investigation, writing - original draft. Janice Kung contributed to methodology, writing - review and editing. Lisa Guirguis carried out conceptualization, methodology, validation, writing - review & editing, supervision, project administration.

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Conflict of Interest

The Authors declare that they have no conflicts of interest to disclose.

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