McMaster University | HEALTH FORUM

Rapid Synthesis Appendices

Educational Strategies to Support Optimal Prescribing Practices by Pharmacists

31 August 2023

Appendix 1: Methods

Background to the rapid synthesis

This rapid synthesis mobilizes both global and local research evidence about a question submitted to the McMaster Health Forum's Rapid Response program. Whenever possible, the rapid synthesis summarizes evidence drawn from existing evidence syntheses and from single research studies in areas not covered by existing evidence syntheses and/or if existing evidence syntheses are old or the science is moving fast. A systematic review is a summary of studies addressing a clearly formulated question that uses systematic and explicit methods to identify, select and appraise research studies, and to synthesize data from the included studies. The rapid synthesis does not contain recommendations, which would have required the authors to make judgments based on their personal values and preferences.

The Forum produces timely and demand-driven contextualized evidence syntheses such as this one that address pressing health and social system issues faced by decision-makers (see our website for more details and examples - www.mcmasterforum.org/find-domestic-evidence/contextualized-es). This includes evidence syntheses produced within:

- days (e.g., rapid evidence profiles or living evidence profiles)
- weeks (e.g., rapid syntheses that at a minimum include a policy analysis of the best-available evidence which can be requested in a 10-, 30-, 60- or 90-business-day timeframe)
- months (e.g., full evidence syntheses or living evidence syntheses with updates and enhancements over time)

This rapid synthesis was prepared over a 30-business day timeframe and involved five steps:

1) submission of a question from a policymaker or stakeholder (in this case, British Columbia Ministry of Health)
2) identifying, selecting, appraising and synthesizing relevant research evidence about the question
3) conducting and synthesizing a jurisdictional scan of experiences about the question from other countries and Canadian provinces and territories
4) drafting the rapid synthesis in such a way as to present concisely and in accessible language the research evidence
5) finalizing the rapid synthesis based on the input of at least two merit reviewers.

Identification, selection, quality appraisal and synthesis of evidence

For this rapid synthesis, we searched Health Systems Evidence, PubMed for:

1) evidence syntheses
2) single studies (when no guidelines or evidence syntheses are identified or when they are older).

In Health Systems Evidence, we searched for evidence syntheses on 10 July 2023 using the filters for provider-targeted implementation strategies (all) and type of provider for pharmacists. In PubMed, we conducted an updated search (on 10 July 2023) from an existing rapid review about prescribing education interventions and adapted some of the search terms to fit the focus of the rapid synthesis. Additionally, we hand searched the review and the evidence brief on models for pharmacist prescribing (on 23 August 2023) for any relevant studies focused on educational strategies for optimal prescribing by pharmacists.

Each source for these documents is assigned to one team member who conducts hand searches (when a source contains a smaller number of documents) or keyword searches to identify potentially relevant documents. A final inclusion assessment is performed both by the person who did the initial screening and the lead author of the rapid synthesis, with disagreements resolved by consensus or with the input of a third reviewer on the team. The team uses a dedicated virtual channel to discuss and iteratively refine inclusion/exclusion criteria throughout the process, which provides a running list of considerations that all members can consult during the first stages of assessment. For this rapid synthesis, we excluded documents that focused on behaviour change interventions for clinicians in general, documents that focused on other prescribers such as physicians and nurse practitioners, and documents that focused on other types of strategies (e.g., clinical medication reviews, feedback to the patient's physicians, pharmacist-led interventions directed at patients). We also excluded documents with no clear description of the prescriber (i.e., primary studies that focused on multiple clinicians but did not distinguish the impact for pharmacists and whether they were able to prescribe in that setting).

For each evidence synthesis we included, we documented the dimension of the organizing framework (see Appendix 2) with which it aligns, key findings, living status, methodological quality (using AMSTAR), last year the literature was searched (as an indicator of how recently it was conducted), availability of GRADE profile, and equity considerations using PROGRESS PLUS.

For AMSTAR, two reviewers independently appraise the methodological quality of evidence syntheses that are deemed to be highly relevant. Disagreements are resolved by consensus with a third reviewer if needed. AMSTAR rates overall methodological quality on a scale of 0 to 11, where 11/11 represents a review of the highest quality. High-quality evidence syntheses are those with scores of eight or higher out of a possible 11, medium-quality evidence syntheses are those with scores between four and seven, and low-quality evidence syntheses are those with scores less than four. It is important to note that the AMSTAR tool was developed to assess evidence syntheses focused on clinical interventions, so not all criteria apply to those pertaining to health-system arrangements or to economic and social responses. Where the denominator is not 11, an aspect of the tool was considered not relevant by the raters. In comparing ratings, it is therefore important to keep both parts of the score (i.e., the numerator and denominator) in mind. For example, an evidence synthesis that scores 8/8 is generally of comparable quality to another scoring 11/11; both ratings are considered 'high scores.' A high score signals that readers of the evidence synthesis can have a high level of confidence in its findings. A low score, on the other hand, does not mean that the evidence synthesis should be discarded, merely that less confidence can be placed in its findings and that it needs to be examined closely to identify its limitations. (Lewin S, Oxman AD, Lavis JN, Fretheim A. SUPPORT Tools for evidence-informed health Policymaking (STP): 8. Deciding how much confidence to place in a systematic review. *Health Research Policy and Systems* 2009; 7 (Suppl1): S8).

For primary research (if included), we documented the dimension of the organizing framework with which it aligns, publication date, jurisdiction studied, methods used, a description of the sample and intervention, declarative title and key findings, and equity considerations using PROGRESS PLUS. We then used this extracted information to develop a synthesis of the key findings from the included syntheses and primary studies.

During this process we include published, pre-print and grey literature. We do not exclude documents based on the language of a document. However, we are not able to extract key findings from documents that are written in languages other than Chinese, English, French, Portuguese or Spanish. We provide any documents that do not have content available in these languages in an appendix containing documents excluded at the final stages of reviewing. We excluded documents that did not directly address the research questions and the relevant organizing framework. All of the information provided in the appendix tables was taken into account by the authors in describing the findings in the rapid synthesis.

Identifying experiences from other countries and from Canadian provinces and territories

For each rapid synthesis, we collectively decide on what countries to examine based on the question posed. For other countries we searched relevant government and stakeholder websites. In Canada, we search websites from

relevant national, provincial and territorial governments, ministries and agencies (e.g., Public Health Agency of Canada). While we do not exclude countries based on language. Where information is not available in English, Chinese, French or Spanish, we attempt to use site-specific translation functions or Google Translate.

Appendix 2: Framework to organize what we looked for

We used the framework below to categorize each of the evidence documents included in the rapid synthesis and to structure the presentation of findings in the rapid synthesis and appendices 2 and 3.

Organizing framework

- Types of educational strategies or interventions
  - Educational materials and meetings (e.g., modules, worksheets, workshops)
  - Educational outreach visits (e.g., practice visits by educator)
  - Interprofessional education (e.g., audit and feedback, case-based scenarios, experiential learning, simulation roleplay)
  - Peer-based learning (e.g., peer mentors, communities of practice)
  - Self-directed learning
  - Multi-faceted behaviour-change interventions that include education
- Mode of educational strategies or interventions
  - In person
  - Online/virtual
  - Mixed
- Types of prescribing
  - Minor ailments
  - Contraception
  - Smoking cessation
  - Adjustments to prescriptions made by other clinicians
  - Other
- Health system features that may influence the features and impacts of education
  - Governance arrangements (e.g., training requirements for new pharmacists, required continuing professional education for licensed pharmacists, requirements for expansion of scope of practice)
  - Financial arrangements (e.g., funding educational strategies or interventions)
  - Delivery arrangements (e.g., setting of practice (community or hospital) and nature of practice (individual or part of an interdisciplinary team))
- Implementation considerations
  - Behaviour change support
  - Facilitators for implementation
  - Barriers to implementation
  - Where the educational strategies are provided
  - Frequency (e.g., how often education is provided)
- Impact of strategies
  - Patient experiences
  - Patient health- and population-health outcomes
  - Costs
  - Provider experiences

Appendix 3: Key findings from highly relevant evidence documents on educational strategies to support optimal prescribing practices by pharmacists

Organizing framework		Features of educational approaches	Impacts of educational approaches	Implementation considerations for educational approaches
Types of educational strategies or interventions	Educational materials and meetings	• Educational materials included the dissemination of published guidelines, audiovisual materials, electronic publications, consultation skills, identification of drug-related problems, measurements of medication appropriateness, and how to create pharmaceutical care plans (1; 2) • Educational meetings included online learning activities (e.g., consultation scenarios consisting of adults presenting with common, acute, uncomplicated minor ailment) and workshops (e.g., in-person presentations delivered by prescribing providers) (2; 3)	• Educational materials, conferences and training, audit and feedback, outreach visits, and reminders are often incorporated into multifaceted educational interventions and were found to be effective at changing the prescribing behaviours of new prescribers (including pharmacists) in hospital settings, but more interventions for this specific group of prescribers are urgently needed (2) • The pre-post studies included in the systematic review reported that educational materials in combination with attendance of conferences and training sessions had a positive effect in prescribing practices (2) • Educational materials with reminders had no effect on prescribing changes, and educational materials with audit and feedback had mixed effects (2) • The authors of the systematic review reported that no conclusions could be drawn about the most effective types of educational strategies (2) • A primary study found that pharmacists involved in an online learning activity (i.e., consultation scenarios) increased confidence levels and knowledge (3) • A primary study conducted in Tanzania reported improved knowledge among pharmacists after reviewing educational materials and being part of one-on-on training sessions (4)	• Training materials and tools to support optimal prescribing may require additional sustained training (2; 3)

Organizing framework		Features of educational approaches	Impacts of educational approaches	Implementation considerations for educational approaches
	Educational outreach visits	• Outreach visits involved trained individuals who meet with pharmacists in practice settings to provide personalized training (1; 5)	• A continuing education program using personalised training and virtual tools improved pharmacist-controlled drug prescription competencies (5)	• Additional support and continuous training may be required for behaviour change (e.g., to change skills and attitudes) (5)
	Interprofessional education	• Interprofessional prescribing training involved pharmacists and other professionals where scenarios were presented to them and worked together to implement evidence-based prescriptions (6) • Audit and feedback involved a description of clinical performance over time with or without clinical recommendations (1)	• A primary study focusing on an interprofessional prescribing simulation consisting of pharmacists, nurses and medical students was found to be feasible and acceptable, and increased self-efficacy among participants (6)	• Collaboration between pharmacists and other prescribers may reduce duplication of prescribing efforts (e.g., medication reviews) (6)
	Peer-based learning	• Pharmacists delivered in-person tutorials and workshops to ensure a standardized method of prescribing (7-9)	• A pharmacist-led training workshop to clinical pharmacists and other prescribers reduced inappropriate prescribing patterns of NSAIDs in high-risk patient populations from 27.7% to 9.0% (8) • A peer-based training and professional development planning that involved peer mentorship and feedback improved confidence levels and prescribing practices among pharmacists (9)	• Key facilitators of a peer-based training involved mentorship and feedback from experienced prescribers and access to refresher educational courses and online training (9)
	Self-directed learning	• Self-directed learning involved online training materials and use of clinical tools (10)	• Pharmacists found that a clinical tool focused on safe opioid prescribing to have a positive effect on their ability to identify risk factors (10)	• None identified in the included studies

Appendix 4: Key findings from highly relevant jurisdictional experiences on educational strategies to support optimal prescribing practices by pharmacists

Table 1: Experiences in other countries of strategies to support optimal prescribing practices by pharmacists

Jurisdiction	Summary of findings
Australia	*Types of educational strategies or interventions* • In Victoria, pharmacists undertake a structured credentialing program that includes an online workshop, clinical competence assessment, group tutorials, partnered charting cases and a case-based objective structure clinical examination (OSCE) • Queensland University of Technology delivers a course called Safe Prescribing and Quality Use of Medicines for allied health professionals that includes professional, legal and ethical information as well as essential skills required for prescribing o In addition, students will need to complete 120 hours of learning in practice under the supervision of a designated medical practitioner; the course has self-directed learning and workshop components *Mode of educational strategies or interventions* • Safe Prescribing and Quality Use of Medicines course delivered by Queensland University of Technology includes self-direct learning components as well as virtual and in-person workshops *Types of prescribing* • Minor ailments o Medications for conditions including nausea and vomiting, rhinitis, and acute musculoskeletal pain may be administrated under the North Queensland Community Pharmacy Scope of Practice Pilot o Treatments for mild skin conditions may be provided by participating pharmacists under the Victorian Community Pharmacist Statewide Pilot o A UTI training program with an online module allows pharmacists to prescribe antibiotics under the Urinary Tract Infection Pharmacy Pilot - Queensland (UTIPP-Q), which is now a permanent service o Treatments for uncomplicated UTIs may be prescribed by participating pharmacists under the New South Wales (NSW) Pharmacy Trial and the Victorian Community Pharmacist Statewide Pilot • Contraception o Hormonal contraception may be administered under the North Queensland Community Pharmacy Scope of Practice Pilot o Resupply of oral contraceptive pill may be provided by participating pharmacists under the New South Wales (NSW) Pharmacy Trial provided that patients have been prescribed the pill by a GP or NP within the previous two years, and the Victorian Community Pharmacist Statewide Pilot without a prescription • Smoking cessation o Smoking cessation support may be provided under the North Queensland Community Pharmacy Scope of Practice Pilot • Other o Additional vaccines, oral health screening, weight management, chronic disease management (for risk reduction of cardiovascular disease, asthma and chronic obstructive pulmonary disease) may be administrated under the North Queensland Community Pharmacy Scope of Practice Pilot, among others *Health systems features that may influence the features and impacts of education*

Jurisdiction	Summary of findings

	• Governance arrangements
	  ○ While Australian pharmacists have the competence for structured and supervised prescribing, regulatory changes by way of an endorsement of the Pharmacy Board of Australia for scheduled medicines and additional education and training are required for autonomous prescribing
	  ○ Additional prescribing training that is the equivalent of a graduate certificate is required along with clinical training from a post-secondary institution under the North Queensland Community Pharmacy Scope of Practice Pilot which affords the full scope of practice and represents the most extensive pharmacist scope of practice expansion in Australia
	  ○ Other requirements for participation include indemnity insurance and the pharmacist's agreement to offer all services under the pilot
	  ○ Professional development in vaccination and working with Indigenous communities are required under the North Queensland Community Pharmacy Scope of Practice Pilot
	  ○ Mandatory training is required for pharmacists under the NSW Pharmacy Trial (information about this is not publicly available and only communicated to pharmacists after registration and confirmation of participation; however, the guidelines are said to follow international best practice)
	  ○ The current Australian pharmacy curriculum equips students with the competence to practice to the extent of the full scope of pharmacy practice
	• Financial arrangements
	  ○ Participating pharmacists prescribe under a fee-for-service model under the North Queensland Community Pharmacy Scope of Practice Pilot
	  ○ Pharmacist consultations are not subsidized by public health insurance schemes under the North Queensland Community Pharmacy Scope of Practice Pilot
	  ○ Participating pharmacists are reimbursed $20AUD for each service and any Pharmaceutical Benefits Scheme (PBS) gaps under the Victorian Community Pharmacist Statewide Pilot
	  ○ Under the Victorian Community Pharmacist Statewide Pilot, patients will not pay more than they would with the PBS; this is in contrast to the North Queensland pilot where patients will shoulder all costs
	  ○ A discussion of costs with patients will be required before pharmacists initiate a consultation under the North Queensland Community Pharmacy Scope of Practice Pilot
	• Delivery arrangements
	  ○ Community pharmacies with a suitable space for consultation that protects patient confidentiality and privacy is among the eligibility criteria under the North Queensland Community Pharmacy Scope of Practice Pilot
	Implementation considerations
	• Facilitators for implementation
	  ○ Pharmacist prescribing in hospital settings demonstrate competence and accuracy in prescribing compared to medical staff
	• Barriers to implementation
	  ○ There lacks a national standard for pharmacist training requirements to expand prescribing scope which may vary across different research teams undertaking pilots/trials, from short online modules to university courses
	  ○ There is a gap in the literature on independent prescribing by pharmacists as restrictive legislation that impacts the design of research studies and makes it challenging to ensure that study results can be applied across jurisdictions
	  ○ There is also inconsistency in prescribing terminology for pharmacists between jurisdictions that needs to be addressed

Jurisdiction	Summary of findings

	• Where the educational strategies are provided
	  ○ A post-secondary institution provides additional prescribing and clinical training under the North Queensland Community Pharmacy Scope of Practice Pilot
	Impacts of strategies
	• Patient experiences
	  ○ Patients have increased accessibility to care in terms of time and distance with the expansion in scope of community pharmacy practice, particularly in rural and remote communities
	  ○ There is trust among Australians for pharmacists to prescribe, owing to the profession's knowledge of medicines
	• Patient health and population health outcomes
	  ○ 87.6% of patients reported resolved UTI under the UTIPP-Q
	• Provider experiences
	  ○ Pharmacists have the option to expand prescribing scope under the North Queensland Community Pharmacy Scope of Practice Pilot, the Victorian Community Pharmacist Statewide Pilot and the NSW Pharmacy Trial
	  ○ It is of the view of community pharmacists that their skills and knowledge are more favourably leveraged with an expanded prescribing scope
	  ○ Most pharmacists view that additional training is required for an expanded prescribing scope, particularly in the areas of assessment and diagnosis
	  ○ There is preference among most pharmacists to implement a prescribing role following a supported model, but concerns are raised about the lack of support and scope conflicts with other professions

New Zealand	*Types of educational strategies or interventions*
	• A course that incorporates workshops and tutorials on principles of prescribing is offered through the joint postgraduate certificate in pharmacist prescribing program by two pharmacy schools in New Zealand
	  ○ A proactive student-led approach is to be taken by trainees
	• A 150-hour prescribing practicum is undertaken by students of two pharmacy schools with the supervision of a designated medical practitioner (DMP) through the joint postgraduate certificate in pharmacist prescribing program
	  ○ As part of the practicum, the DMP is to train, support, monitor and assess a student which culminates in a professional declaration that the student has developed the skills and competency requirements of the practicum
	  ○ Practicum activities may include clinical observations of medical/nursing/allied health staff and ward rounds, supervised prescribing, and clinical assessments
	  ○ The nature of the practicum setting may enable a student to be trained by a variety of health professionals
	Mode of educational strategies or interventions
	• There are virtual and in-person components to the joint postgraduate certificate in pharmacist prescribing program by two pharmacy schools in the country
	Types of prescribing
	• Pharmacist prescribers may modify (continue/discontinue) treatments for patients by another prescriber
	• Pharmacists must have experience in the area they intend to prescribe in order to undergo certification to become a pharmacist prescriber
	  ○ Renal, emergency admission, surgical preadmission, parenteral nutrition, paediatrics, and mental health are among examples of areas of prescribing practice

Jurisdiction	Summary of findings

	Health system features that may influence the features and impacts of education
	• Governance arrangements
	  ○ Three scopes of practice exist for pharmacists in New Zealand: 1) intern pharmacist, 2) pharmacist and 3) pharmacist prescriber
	  ○ Postgraduate qualification allows clinical pharmacists in a collaborative environment to become a pharmacist prescriber of which there are two jointly offered accredited programs in the country: 1) Postgraduate Certificate in Clinical Pharmacy in Prescribing at the University of Auckland and 2) Postgraduate Certificate in Pharmacist Prescribing at the University of Otago
	  ○ Registered pharmacists must have a minimum of two years of experience in a collaborative and patient-facing environment before enrolling in a certificate program to become a pharmacist prescriber, with each university stipulating its own additional requirements
	• Financial arrangements
	  ○ The Postgraduate Certificate in Clinical Pharmacy in Prescribing at the University of Auckland is provided at a subsidized cost to domestic students
	• Delivery arrangements
	  ○ Pharmacist prescribers practice in a collaborative environment of health professionals and are not themselves the primary clinicians for making diagnoses
	Implementation considerations
	• Tertiary education institutions in New Zealand administer postgraduate certification programs for prospective pharmacist prescribers, which include a practicum in a collaborative health team
	• Pharmacist prescribers must obtain a one-time postgraduate certification through an accredited university program, and are to meet ongoing registration requirements from time to time through a practice review as their area of practice changes or expands

United Kingdom (U.K.)	*Types of educational strategies or interventions*
	• The Royal Pharmaceutical Society sets out curriculum describing entry-level standards for post-registration foundational training, advanced pharmacists working in any patient-focused role as well as consultant-level pharmacy practice, and provides recommendations for training programs
	  ○ The types of learning experiences that should be included in training programs for foundational training consist of activities such as: practice supervision with a qualified independent prescriber, active participation in activities to develop clinical decision making skills, feedback and audit, practice supervision and exposure to practice, attending training courses, participation in multidisciplinary meetings, interprofessional learning sessions including simulation, and peer and mentor discussions
	  ○ The types of learning experiences that should be included in training programs for advanced pharmacists consist of many of the above as well as leading investigations of incidents, audit and evaluation processes, and team management
	  ○ The types of learning experiences for consultant-level pharmacy practice training include a combination of work-based learning, self-directed learning, learning with other providers, and formal learning opportunities such as regional and national training programs
	• In the U.K., Pharmacist Independent Prescribers (PIPs) often receive training to build competence in a particular area before taking on a new role
	  ○ Pharmacists must complete an accredited independent prescribers program that meets the requirements of the General Pharmaceutical Council (GPhC), including identifying a specific area of clinical practice to develop their prescribing skills, having the therapeutic and clinical knowledge relevant to their area of interest and identifying a supervisor for their learning
	• The Care Homes Independent Pharmacist Prescriber Study (CHIPPS) evaluated a pharmacist training program that consisted of face-to-face training covering the management of prescribing and deprescribing for older adults, and included case-based scenarios, which was

Jurisdiction	Summary of findings

	followed by four days of developing relationships with other providers at the care homes in which they would be working as well as an experienced pharmacist mentor
	Health system features that may influence the features and impacts of education
	• Governance arrangements
	  ○ The Royal Pharmaceutical Society defines credentialing standards of patient-focused pharmacy practice for pharmacists post-registration
	• Financial arrangements
	  ○ NHS England invested £15.9 million to support the expansion of frontline pharmacy professionals in primary care through the Pharmacy Integration Programme, including to help pharmacists access further clinical training for independent prescribing and clinical skills
	Impact of strategies
	• The Care Homes Independent Pharmacist Prescriber Study (CHIPPS) found that PIPs reported improving competence and applied their new learning throughout the delivery of the intervention, improving long term care facility residents' quality of life and medication management

United States – California	*Types of educational strategies or interventions*
	• The Accreditation Council for Pharmacy Education provides the only recognized directory of accredited providers of continuing education for pharmacists
	  ○ For California, there are 17 types of organizations (e.g., academic institutions, pharmacy associations, research centres) that provide educational materials, workshops, webinars, seminars and self-directed learning (some of which are free and some of which have out-of-pocket fees)
	Mode of educational strategies or interventions
	• Across the 17 organizations that provide continuing education, there is a mix of online and in-person training available
	Types of prescribing
	• The 'pharmacy practice bill' authorizes all pharmacists statewide to furnish (i.e., prescribe) hormonal and emergency contraception, smoking cessation services (including nicotine therapy medications), travel medications and naloxone
	• In 2019, the SB 159 granted pharmacists the authority to prescribe HIV PrEP and PEP
	• Advanced Practice Pharmacists are authorized to order and interpret drug therapy-related tests, and initiate, adjust and discontinue drug therapy
	  ○ To become an advanced practice pharmacist, an individual requires two of the three following criteria: appropriate certification from the Accreditation Council of Pharmacy Education, postgraduate residency, or provided clinical services to patients for at least one year through the collaborative practice agreement
	Health system features that may influence the features and impacts of education
	• Pharmacists must complete 30 hours of continuing education courses every two years to renew their license
	• Prior to self-administered hormonal contraception, emergency contraception and naloxone, pharmacists must complete a minimum of one hour of a board-approved continuing education program specific to the health services or an equivalent curriculum-based training program completed on or after 2014 from an accredited California school of pharmacy
	  ○ For prescribing smoking cessation/nicotine replacement, pharmacists must complete two hours of approved continuing education on smoking cessation/nicotine replacement or an equivalent curriculum-based training program completed on or after 2014 from an accredited California school of pharmacy

Jurisdiction	Summary of findings
	○ For travel medications, pharmacists must meet specific requirements such as completing a travel medicine training program (consisting of 10 hours of training) and completing two hours of continuing education per renewal period • California's bill AB 1114 allows pharmacists to bill Medi-Cal (Medicaid system in California) but reimbursement requires a completion of a two-hour continuing education session *Impact of strategies* • A California-based survey found that pharmacist prescribing of contraception in community pharmacies was found to be convenient and highly acceptable among patients
United States – Oregon	*Types of educational strategies or interventions* • Oregon State University is the only Accreditation Council for Pharmacy Education–accredited organization in Oregon, and provides both online and live continuing education and training • The Oregon State University College of Pharmacy provides training and toolkits on billing and reimbursement for pharmacist prescribing *Mode of educational strategies or interventions* • Oregon State University is the only Accreditation Council for Pharmacy Education–accredited organisation in Oregon, and provides both online and live continuing education and training *Types of prescribing* • Pharmacists are authorized to prescribe drugs and devices on Oregon's Formulary or Protocol Compendia such as: continuation of therapy including insulin, cough and cold symptom management, pseudoephedrine, benzonatate, short-acting beta agonists, intranasal corticosteroids, vulvovaginal candidiasis, COVID-19 antigen test, preventive care, emergency contraception, male and female condoms, tobacco cessation (including nicotine replacement therapy and non-nicotine replacement therapy), travel medications, HIV PrEP/PEP, contraception, diabetic blood sugar testing supplies, injection supplies, nebulizers, inhalation spaces, peak flow meters, international normalized ratio testing supplies, enteral nutrition supplies, ostomy products, and non-invasive blood pressure monitors *Health system features that may influence the features and impacts of education* • Pharmacists must complete an Accreditation Council for Pharmacy Education–approved educational training program for prescribing contraceptives, smoking cessation, and HIV prevention medications • Licenses expire June 30 of each odd year and pharmacists are required to complete 30 hours of continuing pharmacy education in pharmacy law, patient safety, pain management and cultural competency, and 23 hours of additional continuing education • Pharmacists must ensure training and education requirements are met before prescribing activities, and must be retained for six years or uploaded to their electronic licensing board • Bill HB 2028 permits health insurers and the Oregon Health Authority to provide payment or reimbursement for services provided through practice or statewide drug therapy management • The Public Health and Pharmacy Formulary Advisory Committee within the Government of Oregon are responsible for developing protocols and guidelines for pharmacists • Pharmacists are provided discounts or free access to the Oregon State University College of Pharmacy courses if they provide their license number and place of employment *Impact of strategies* • A recent study conducted in Oregon found that pharmacists that were surveyed want more training on hormonal contraception prescribing and preferred less than four hours of live trainings, on-demand webinars, and online self-study programs

Jurisdiction	Summary of findings
United States - Idaho	*Types of prescribing* • House Bill 182 authorizes pharmacists to independently prescribe medications that do not require a new diagnosis and involve minor conditions and conditions diagnosed with a Clinical Laboratory Improvement Amendments (CLIA)-waived test, with professional judgment • Pharmacists are authorized to prescribe for minor conditions (i.e., lice, cold sore, motion sickness prevention, uncomplicated urinary tract infections), devices (i.e., inhalation spacer, nebulizer, diabetes blood sugar testing supplies, pen needles, syringes for patients with diabetes), antimicrobial drugs based on CLIA-waived test (i.e., influenza, group A streptococcal pharyngitis), clinical gaps in care (i.e., statins, short-acting beta agonists), travel medication, supplement a valid prescription drug order (i.e., flush, devices, supplies, local anesthetics for IV Port Access), emergency situations (i.e., diphenhydramine, epinephrine, short-acting beta agonists), and Lyme disease prophylaxis *Health system features that may influence the features and impacts of education* • Pharmacists are only allowed to prescribe drugs or devices for which they are educationally trained

Table 2: Experiences across Canadian provinces and territories of strategies to support optimal prescribing practices by pharmacists

Jurisdiction	Summary of findings

Pan-Canadian	*Types of educational strategies or interventions*
	• The Canadian Council on Continuing Education in Pharmacy (CCCEP) accredits different types of continuing education programs for pharmacy professionals in Canada, including independent study, live learning and blended learning activities, as well as conferences and regularly scheduled live series
	Mode of educational strategies or interventions
	• The CCCEP provides links to accredited learning activities that are delivered by approximately 100 continuing health education program providers in a variety of program areas, including immunization and injection, cannabis and compounding
	  ○ Delivery modes for these education programs range from print, audio and video to live conferences and blended interactive multimedia
	• The Canadian Pharmacists Association (CPhA) provides Canadian pharmacists with the knowledge, tools and resources to remain informed about developments and trends in the pharmacy profession
	  ○ The Canadian Pharmacists Association offers a series of webinars and continuing education courses for pharmacists
	Types of prescribing
	• In Canada, pharmacists in all provinces and territories except Northwest Territories and Nunavut have the authority to initiate prescribing for minor ailments/conditions
	• Pharmacists in British Columbia, Alberta, Saskatchewan, Quebec, Nova Scotia, New Brunswick, P.E.I. and Newfoundland and Labrador can prescribe prescription-only emergency contraception
	  ○ Non-prescription emergency contraception is accessible in all pharmacies in Canada
	• Pharmacists in all provinces and territories except British Columbia, Northwest Territories and Nunavut have the authority to prescribe for smoking/tobacco cessation
	• Pharmacists in most provinces and territories have the authority to adapt prescriptions for drug dosage, formulation and regimen as well as renew/extend prescriptions for continuity of care
	• Canadian pharmacists have the authority to inject certain drugs and vaccines, depending on jurisdictional regulations
	• The CPhA offers a webinar on medication safety in community pharmacy for CPhA associates

Jurisdiction	Summary of findings
	Health system features that may influence the features and the impacts of education • The Canadian Council on Continuing Education in Pharmacy (CCCEP) accredits continuing education programs for pharmacy professionals in Canada and its accreditation is recognized in all Canadian provinces and territories by pharmacy regulatory authorities

British Columbia (B.C.)	*Types of educational strategies or interventions*
	• The College of Pharmacists of British Columbia requires pharmacy professionals to complete the Professional Development and Assessment Program (PDAP) which consists of pharmacists documenting and submitting at least six learning records and completing a minimum of 15 hours of continuing education and five hours of accredited learning
	• The University of British Columbia (UBC) offers a range of virtual independent study programs that enable pharmacists to improve and expand their knowledge in patient care and keep them current on the latest developments in the pharmacy profession while attaining their professional development goals
	• The Canadian Pharmacy Practice Program (CP3) is a bridging program offered through UBC to International Pharmacy Graduates and Canadian-trained pharmacists who are re-entering practice or want to update core pharmacy skills
	  ○ Individual instructional modules are available to pharmacists previously licensed to practice in Canada who want to re-enter practice or update their skills
	Mode of educational strategies or interventions
	• PDAP mobile app allows pharmacists registered with the College of Pharmacists of BC to enter, edit and submit their continuing education activities through their mobile devices
	  ○ Pharmacists can also submit their continuing education learning records through the College's secure eServices website
	• UBC delivers educational programs through their online learning platform
	• The CP3 program consists of 12 weeks of online instruction, a Structured Practical Training (SPT) placement for 12.5 weeks, and a one-day "Getting Ready" MOCK session for the final month
	Types of prescribing
	• Pharmacists in B.C. are authorized to prescribe for 21 minor ailments and for contraception
	• UBC offers clinical education on prescribing for minor ailments
	• Training on long-term, permanent and emergency contraception is offered to pharmacists by UBC
	• Additional learning materials on contraception will be released by UBC in the future
	• UBC offers a number of independent study programs for pharmacists' continuing education in the areas of allergic rhinitis, management of alcohol use disorder, opioid stewardship and drug interactions with antiretroviral medications
	Health system features that may influence the features and the impacts of education
	• All pharmacists and pharmacy technicians registered with the College of Pharmacists of BC must participate in professional development activities annually as part of the Professional Development and Assessment Program (PDAP)
	• Pharmacists may be eligible for an exemption from participating in professional development activities if they are or expect to be on medical, compassionate, maternal or paternal leave
	• International Pharmacy Graduates must be enrolled in the full CP3 bridging program and successfully complete the 12.5-week Structure Practical Training (SPT) in order to be licensed by the College of Pharmacists of BC

Jurisdiction	Summary of findings
	• In July 2022, the B.C. government announced funding of more than $10 million in bursaries and professional development funding for allied health professionals, including a $3 million allocation to the Health Science Professional Bargaining Association to support the educational training of pharmacists and other allied healthcare providers *Implementation considerations* • The College of Pharmacists of BC's PDAP consists of pharmacists documenting and submitting at least six learning records and completing a minimum of 15 hours of continuing education and five hours of accredited learning • The CP3 program consists of 12 weeks of online instruction, a Structured Practical Training (SPT) placement for 12.5 weeks, and a one-day "Getting Ready" MOCK session for the final month o Students of the CP3 program participate in four days of online synchronous learning every week for 12 weeks o CP3 program tuition and fees are billed to participants and can cost up to $13,875
Alberta	*Type of educational strategies or interventions* • The Alberta College of Pharmacy (ACP) requires pharmacists to participate in ongoing professional development and competence programs, including an annual professional development log (reviewed), self-assessment tools and practice assessments *Types of prescribing* • Section 16 of the Pharmacists and Pharmacy Technicians Profession Regulation does not specify a list of drugs but rather it states that pharmacists may prescribe all Schedule 1 drugs and blood products o However, pharmacists are expected to limit their prescribing to situations where they possess a comprehensive understanding of the patient, the patient's medical condition and the medication in question • Pharmacists are also authorized to prescribe narcotics, controlled drugs and targeted drugs in accordance with the ACP controlled drugs and substances exemption guidelines • Pharmacists do not need additional training to prescribe in an emergency; however, pharmacists can be granted additional prescribing authorization, allowing them to initiate and/or manage drug therapy (initial access prescriptions) • Pharmacists seeking additional prescribing authorization must have at least one year of full-time experience with direct patient care (waived for entry-level Canadian PharmD grads since 2018), and display the necessary competencies required to enhance patient care *Health system features that may influence the features and impacts of education* • The Alberta College of Pharmacy (ACP) is the governing and regulatory body for pharmacists in Alberta and requires pharmacists to participate in ongoing professional development and competence programs *Implementation considerations* • The ACP has developed tools to not only help evidence assessors evaluate potential candidates but also to allow candidates (pharmacists) to evaluate their own preparedness (four tools include a self-assessment form, a case narrative form, a case checklist, and a collection of FAQs)
Saskatchewan	*Types of educational strategies or interventions* • The Saskatchewan College of Pharmacy Professionals (SCPP) is the self-governing body of pharmacy in the province that provides workshops and online resources for additional training requirements and develops evidence-based guidelines for pharmacists prescribing (medSask) *Types of prescribing*

Jurisdiction	Summary of findings
	• Pharmacists in Saskatchewan who meet certain conditions can prescribe drugs for minor ailments (e.g., acid reflux, cold sores, headaches, hormonal contraception, insect bites, mild acne, shingles), provide emergency refills, renew/extend prescriptions, or change dosage/formulation • Pharmacists may only prescribe Schedule 1 medications and must follow the medSask evidence-based guidelines • Pharmacists required additional Advanced Method Certification and receive authorization from the SCPP to provide injections (e.g., vaccines) • Pharmacists have recently been allowed to order lab tests and conduct point of care testing (e.g., small blood samples) to advise patients on certain medications and specific ailments, such as diabetes or cholesterol • Mandatory training to sell low-dose codeine products as Schedule II drugs is required by pharmacists in Saskatchewan *Health system features that may influence the features and impacts of education* • The SCPP requires pharmacists to complete 15 hours of continuing education annually for license renewal • Minor Ailments and Self-Care: Basics online training is required for pharmacists practicing in a self-care environment who wish to prescribe • Courses are available for those interested in a higher-level, in-depth overview of medSask prescribing guidelines, including practice cases

Manitoba	*Types of educational strategies or interventions*
	• There are many resources for pharmacist prescribing, such as educational materials and self-directed learning:
	  ○ The Fundamentals of Prescribing for Manitoba Pharmacists presentation (video/slides)
	  ○ The Self-Limiting Conditions Independent Study Program for Manitoba Pharmacists
	  ○ The Uncomplicated Cystitis Independent Study Program for Manitoba Pharmacists
	Types of prescribing
	• Medications for self-limiting conditions may be prescribed by trained and authorized pharmacists
	• Medications for uncomplicated and recurrent cystitis may be prescribed by trained and authorized pharmacists
	• Medications for smoking cessation may be prescribed by trained and authorized pharmacists
	• Pharmacists may extend prescriptions for a chronic condition in coordination with the usual prescriber, which does not include narcotic and other controlled drugs
	• Pharmacists may modify the dosage, formulation or regimen of a prescription in coordination with the patient and the usual prescriber
	Health system features that may influence the features and impacts of education
	• Pharmacists in Manitoba are required by the College of Pharmacists of Manitoba to complete a minimum of 15 to 25 hours of accredited learning activities annually to renew their licenses for registration
	• Viewing of the Fundamentals of Prescribing for Manitoba Pharmacists presentation (video/slides) is a common requirement across the required training and authorization for various types of prescribing
	  ○ Pharmacists may expand their scope of practice to prescribe for self-limiting conditions by meeting specific program of study and application requirements
	  ○ Pharmacists may expand their scope of practice to prescribe for smoking cessation by being a certified tobacco educator or have completed related training within the previous three years (Program of Assertive Community Treatment (PACT), PharmAchieve Smoking Cessation CE Program or Training Enhancement in Applied Counselling and Health (TEACH) Core course)

Jurisdiction	Summary of findings
	○ Pharmacists may expand their scope of practice to prescribe for uncomplicated cystitis by meeting specific program of study and application requirements ○ Pharmacists with advanced training may apply to register as an extended practice pharmacist and prescribe within their specialty area of practice • The Self-Limiting Conditions Independent Study Program for Manitoba Pharmacists costs pharmacists $54.62 • The Uncomplicated Cystitis Independent Study Program for Manitoba Pharmacists is free of charge with additional costs for required and recommended resources therein • Practicing in a collaborative health team is among the requirements for pharmacists wishing to register as an extended practice pharmacist • For uncomplicated cystitis, up to three pharmacist assessments are covered annually for those with a Manitoban Health card ○ Any resulting prescriptions will need to be covered by the patient's usual health insurance arrangements *Implementation considerations* • A public directory is available of pharmacists who are trained and authorized to prescribe for each of the self-limiting conditions, smoking cessation and uncomplicated cystitis ○ One-time certification for authorization to prescribe with review of the relevant resources is required
Ontario	*Types of educational strategies or interventions* • The Ontario Pharmacists Association provides information on continuing education and professional resources to help support pharmacist training • The University of Waterloo received Accredited Provider status from the Canadian Council on Continuing Education in Pharmacy (CCCCEP) in January 2022 and offers continuing professional development programs for pharmacists ○ Current program offerings include Professionalism in Clinical Learning, Antimicrobial Stewardship in Primary Care Continuing Education Program, and Management of Oral Anticoagulation Therapy (MOAT) *Health system features that may influence the features and impacts of education* • The Regulated Health Professions Act requires pharmacists and other regulated health professions in Ontario to have a Quality Assurance (QA) Program, which includes a Learning Portfolio that requires registrants to participate in and track their continuing professional development ○ Registrants must identify learning needs, choose activities to achieve their goals, and apply those learnings in their practice
Québec	*Types of educational strategies or interventions* • Pharmacists in Québec can choose from the following types of eligible continuing education activities to meet the annual training requirements of the Ordre des Pharmaciens du Québec (the Ordre): ○ Participation in a training activity of the Canadian Council for Continuing Education in Pharmacy ○ Participation in a symposium, seminar or conference ○ Participation in a university course or self-directed activity accompanied by an evaluation questionnaire ○ Writing an article or scientific text that has been published • Accredited programs for Continuing Pharmacy Education Activities must meet certain requirements *Types of prescribing* • According to the Canadian Pharmacists Association, pharmacists in Quebec have the authority to prescribe for minor ailments, renew/extend prescription, and change drug dosage, formulation and regimens

Jurisdiction	Summary of findings
	○ This aligns with changes to the *Prescription Drugs Act* in June 2015 *Health system features that may influence the features and the impacts of education* • All pharmacists in Quebec registered with the Ordre must complete 40 hours of training activities annually, and if they practice with the public, at least three of the hours must be completed at activities developed by the Ordre
New Brunswick	*Health system features that may influence the features and impacts of education* • The New Brunswick College of Pharmacists requires all pharmacists to engage in continuous professional development based on the Standards of Practice published by the National Association of Pharmacy Regulatory Authorities (NAPRA) • The Guidelines for Self Assignment of Continuing Education Credits outline qualifying and non-qualifying activities and how credits are determined, and members are required to retain related documents for a period of three years, such as materials used or received in completion of the recorded activities and any certificates of completion earned
Nova Scotia	*Types of educational strategies or interventions* • The Pharmacy Association of Nova Scotia (PANS) aims to advance the practice of pharmacy and provides a detailed prescriber's guide for pharmacists • PANS also provides online courses for pharmacists wishing to prescribe for a variety of ailments (Lyme disease, managing chronic diseases, immunizations, etc.) • The Government of Nova Scotia has many e-learning modules, each of which take about 20 to 30 minutes to complete and are available 24/7 for pharmacy staff members who are seeking additional training • Dalhousie University also provides training programs and webinars for pharmacists seeking additional training, which are free of charge (e.g., injection training, immunization, pharyngitis training, hormonal contraception) *Types of prescribing* • Pharmacists can assess and prescribe for minor ailments, including diarrhoea, haemorrhoids, nausea, coughs, headaches, sore throat, shingles, uncomplicated UTIs, hormonal contraception, mild acne and eczema • Pharmacists are authorized to administer vaccines: publicly funded (COVID-19, influenza) and others that may require additional fees (e.g., Herpes Zoster, HPV, hepatitis A and B, typhoid, varicella, MMR, Tdap) • Pharmacists are authorized to renew most medications, including controlled substance, given that an assessment is made, and the pharmacist takes full responsibility for the decision • Pharmacists can also provide chronic disease management (e.g., asthma/COPD, CVD, diabetes, obesity), and prescribe medications/nicotine replacement therapies for smoking cessation *Health system features that may influence the features and impacts of education* • The Nova Scotia College of Pharmacists acts as the governing body for the practice of pharmacy in Nova Scotia that provides Standards of Practice for pharmacists prescribing in the province (last updated July 2023) • In November 2019, Nova Scotia's Health Minister indicated that pharmacists in Nova Scotia would be paid $12 to $20 per assessment for birth control and shingles or UTI prescriptions ○ Publicly funded prescription renewals by pharmacists were capped at four services per year per patient
Prince Edward Island (P.E.I.)	*Types of prescribing* • P.E.I. pharmacists have the authority to prescribe for common ailments, including heart burn, seasonal allergies, cough, minor joint pain, sore throat and skin conditions

Jurisdiction	Summary of findings
	Health system features that may influence the features and the impacts of education • The PEI College of Pharmacy requires all register pharmacists to obtain at least 20 units of accredited learning every year ○ Accredited continuing education activities that meet the PEI College of Pharmacy requirements must be approved by the CCCEP, Dalhousie University's Continuing Pharmacy Education, the Accreditation Council for Pharmacy Education (ACPE), Maipro+ or other provincial regulatory bodies
Newfoundland and Labrador	*Modes of educational strategies or interventions* • The Newfoundland and Labrador Pharmacy Board offers accessible online training webinars and modules • The Pharmacists' Association of Newfoundland and Labrador provides multiple opportunities to support a strong community of practice for prescribing pharmacists (e.g., social media network, professional journal, resources pages) *Types of prescribing* • The Newfoundland and Labrador Pharmacy Board states that pharmacists can prescribe for all ailments other than narcotics or controlled substances, or benzodiazepines *Health systems features that may influence the features and impacts of education* • The Newfoundland and Labrador Pharmacy Board requires pharmacists intending to prescribe to complete three virtual workshops and apply for authorization ○ Pharmacists are also required to complete 15 hours of professional development each year • Persons interested in delivering educational programs to pharmacists can apply for accreditation through the Newfoundland and Labrador Pharmacy Board
Yukon	*Types of prescribing* • The Yukon government permits pharmacists to prescribe medications for minor ailments *Health system features that may influence the features and impacts of education* • The Yukon government has firm guidelines and frameworks to promote optimal and safe prescribing practices
Northwest Territories	*Types of prescribing* • The Government of the Northwest Territories state that pharmacists can only prescribe medications for continued care
Nunavut	• None reported

Appendix 5: Detailed data extractions from evidence syntheses about educational strategies to improve prescribing practices among pharmacists

Table 1: Detailed findings from systematic reviews about strategies to improve prescribing practices among pharmacists

Dimension of organizing framework	Declarative title and key findings	Living status	Quality (AMSTAR)	Last year literature searched	Availability of GRADE profile	Equity considerations

• Types of educational strategies or interventions
  ○ Educational materials and meetings
  ○ Educational outreach visits
  ○ Interprofessional education
• Mode of educational strategies or interventions
  ○ Mixed
• Health system features that may influence the features and impacts of education
  ○ Delivery arrangements
• Implementation considerations
  ○ Behavior change support
  ○ Where the educational strategies are provided
• Impact of strategies
  ○ Provider experiences
	Educational materials, conferences and training, audit and feedback, outreach visits, and reminders are often incorporated into multifaceted educational interventions and were found to be effective at changing the prescribing behaviours of new prescribers (including pharmacists) in hospital settings, but more interventions for this specific group of prescribers are urgently needed.
	
	Educational materials included the dissemination of published guidelines, audiovisual materials and electronic publications. Conferences and trainings included the participation of clinicians at workshops and lectures. Audit and feedback involved a description of clinical performance over time with or without clinical recommendations. Outreach visits involved trained individuals who met with providers in practice settings such as wards or offices. Reminders involved prompts for clinicians such as visit reminders with other healthcare providers, laboratory reports and follow-ups.
	
	There were 157 separate interventions identified from 64 eligible studies, the majority of which were classified as being effective. Of the 15 most successful strategies identified, six required active engagement with the intervention process using reminders and four provided specific feedback to prescribers using audit and feedback. However, no firm conclusions could be drawn about the most effective educational interventions.
		No	4/10	2010	No	• None identified

• Types of educational strategies or interventions
  ○ Educational materials and meetings
  ○ Interprofessional education
	Pharmacist education and training programs targeting Pharmacist Independent Prescribers (PIPs) in the U.K. included accreditation processes, training to use tools supporting services, and interprofessional relationship development and medication review training, and focused largely on dementia, pain and antipsychotic and cardiovascular medication
	
	Practical knowledge provided in training and education activities mostly consisted of medication review (46), medication discontinuation (31), medication change (26), multidisciplinary interventions (22), monitoring recommendations (21), care home
		No	4/9	2019	No	• None identified

Dimension of organizing framework	Declarative title and key findings	Living status	Quality (AMSTAR)	Last year literature searched	Availability of GRADE profile	Equity considerations
	staff training (13), medication initiation (12), error management (7), medication reconciliation (4) and using the STOPP/START tool (2).					

• Types of educational strategies or interventions
  ○ Interpersonal education
  ○ Educational materials and meetings
  ○ Peer based learning
  ○ Multi-faceted behaviour change intervention
• Mode of educational strategies
  ○ In person
• Types of prescribing
  ○ Other
• Implementation consideration
  ○ Behaviour change support
	Educational strategies targeting practices often include interpersonal education, multi-faceted behaviour change, and peer-based learning to reduce potentially inappropriate prescribing
	
	This scoping review aimed to identify educational and behavioural change strategies to reduce potentially inappropriate prescribing. Identified strategies described to reduce potentially inappropriate prescribing included environmental restricting, peer supports and collaboration, constructive feedback and monitoring, and checklists.
		No	6/9	2020	No	• Occupation

• Types of educational strategies or interventions
  ○ Educational materials and meetings
• Mode of educational strategies
  ○ In-person
• Types of prescribing
  ○ Other
	There is limited information on educational interventions to improve prescribing competencies for non-medical prescribers, but one study reported improved knowledge among pharmacists after reviewing educational materials and being part of one-on-on training sessions
	
	Six studies demonstrated the efficacy of specific prescribing training based on the WHO Guide to Good Prescribing in increasing prescribing competency. Only one study evaluated educational interventions targeting pharmacists that was conducted in Tanzania. Pharmacists were provided educational materials (posters), individual knowledge examination, and one-on-one training sessions with simulated clients. The intervention group performed significantly better on the knowledge examination.
		No	4/9	2013	No	• None identified

Table 2: Summary of findings from primary studies about strategies to improve prescribing practices among pharmacists

Dimension of the organizing framework	Study characteristics	Sample and intervention description	Declarative title and key findings
• Types of educational strategies or interventions ○ Educational materials and meetings	*Focus of study:* To evaluate the feasibility, acceptability and efficacy of a simulated interprofessional prescribing course	Two fourth-year medical students, three pharmacists independent prescribing students, three nurse prescribing students and two simulated patients attended the masterclass. The three pharmacists independent prescribing students and	A simulated interprofessional prescribing training program involving pharmacists was found to improve pharmacist self-efficacy

Dimension of the organizing framework	Study characteristics	Sample and intervention description	Declarative title and key findings
○ Interprofessional education	*Publication date:* 2015 *Jurisdiction studied:* Scotland *Methods used:* Pilot before and after study	three nurse prescribing students were all post-registration. The simulated interprofessional prescribing masterclass used three scenarios that were designed by an expert panel. Participants worked together to formulate and implement evidence-based prescriptions.	The training program was found to be feasible and acceptable while increasing self-efficacy. A larger trial is warranted to better understand the potential effectiveness of the program.
• Types of educational strategies or interventions ○ Educational materials and meetings • Mode of educational strategies or interventions ○ Online/Virtual • Types of prescribing ○ Minor ailments	*Focus of study:* To evaluate a brief interactive animation electronic learning activity *Publication date:* 2020 *Jurisdiction studied:* United Kingdom *Methods used:* Pre-intervention and post-intervention online surveys and semi-structured interviews	Eleven nurse and four pharmacist prescribers were included in the study. The electronic learning activity involved a consultation scenario by a prescriber with an adult presenting with a common, acute, uncomplicated self-limiting respiratory tract infection, with the aim of supporting a 'no antibiotic prescribing strategy.'	An electronic learning intervention supporting appropriate antibiotic prescribing by nurse and pharmacist independent prescribers (PIPs) was found to be acceptable and feasible, and showed slight improvements in communicating with patients for some participants Participants of the e-learning program showed high levels of confidence and knowledge pre-intervention and post-intervention, and future work should add complex clinical content before conducting a full trial.
• Types of educational strategies or interventions ○ Educational materials and meetings ○ Educational outreach visits • Mode of educational strategies or interventions ○ Mixed • Types of prescribing ○ Minor ailments • Impact of strategies ○ Provider experiences	*Focus of study:* To evaluate the effectiveness of a continuing education program targeting pharmacy staff to improve controlled drug prescription competencies *Publication date:* 2022 *Jurisdiction studied:* Medellin, Colombia *Methods used:* A multicentre, prospective, parallel-group, cluster-randomized, controlled clinical trial	A total of 372 pharmacy staff in Medellin and the Metropolitan Area in Colombia. A web-based social networking site, a virtual course, a dispensing information system and face-to-face training.	A continuing education program using virtual tools and personalized training improved pharmacy staff controlled drug prescription competencies and the integration of social network–type web platforms, virtual courses and drug information software with personalized training can enhance ambulatory pharmacy services Although the education program was found to improve competencies, it did not enhance skills and attitudes for dispensing and providing advice on using tramadol, suggesting that self-directed learning, continuing education programs and other traditional activities of education alone may not facilitate changes in practice. The authors propose that pharmacy staff may require additional and continuous training and sustained support to help change behaviour in practice.
• Types of educational strategies or interventions ○ Educational materials and meetings	*Focus of study:* To understand the impact of pharmacist-led interventions on prescribing rates of nonsteroidal anti-inflammatory	A total of 814 charts from persons 18 years or older, with an NSAID order, were retrieved from a family medicine residency centre in Ohio.	Pharmacist-led educational workshops focusing on improving prescribing practices can reduce inappropriate NSAID prescribing

Dimension of the organizing framework	Study characteristics	Sample and intervention description	Declarative title and key findings

• Mode of educational strategies or interventions
  ○ In-person
• Types of prescribing
  ○ Other
• Implementation considerations
  ○ Frequency
  ○ Provider experiences
• Impact of strategies
  ○ Patient health outcomes
	drugs (NSAID) in a family medicine residency centre
	
	Publication date: September 2020
	
	Jurisdiction studied: United States
	
	Methods used: Pre- and post-intervention
		Prior to the intervention, a three-month retrospective chart review was conducted to identify the number of charts with an NSAID order. For the intervention, pharmacists were giving an educational intervention on NSAID prescribing. Another chart review was completed three months after the intervention.	This study found that one in-person training workshop was effective at reducing inappropriate NSAID prescribing. In the longer term, this may reduce negative health outcomes.
			
			However, polypharmacy may create additional challenges for physicians to account for patient medications. Collaboration between pharmacists and physicians (e.g., medication review) may reduce this barrier.

• Types of educational strategies or interventions
  ○ Educational materials and meetings
  ○ Interprofessional education
• Mode of educational strategies or interventions
  ○ In-person
• Types of prescribing
  ○ Other
• Implementation consideration
  ○ Frequency
  ○ Facilitators for implementation
• Impact of strategies
  ○ Provider experiences
	Focus of study: To evaluate training program for pharmacists independent prescribers (PIP) in the United Kingdom
	
	Publication date: 15 June 2022
	
	Jurisdiction studied: England, Ireland, Scotland
	
	Methods used: Pre- and post-intervention
		A total of 17 PIP completed the training program and all questionnaires. Pharmacists' experience levels ranged from five to 40 years, with four to five years of prescribing experience. Additionally, eight general practitioner and two home care providers participated in the post-intervention interview, as a means of data triangulation.
		
		All PIP participants were invited to partake in a two-day training workshop. Proceeding this participants participated in a six-month long intervention centred on educational training and peer-based learning.
			Peer-based educational interventions, incorporating mentorship and feedback can increase confidence in PIP
			
			The results of this study demonstrated that a six-month peer-based educational intervention regarding proper prescribing practices improved the confidence and prescribing abilities of PIPs. Key facilitators of this intervention included mentorship and feedback from experienced general practitioners. Further, refresher educational courses and online training opportunities were noted as important components for future training interventions.

• Types of educational strategies or interventions
  ○ Self-directed learning
• Mode of educational strategies or interventions
  ○ Online/Virtual
• Types of prescribing
  ○ Other
	Focus of study: To understand the perceptions of pharmacists on a clinical tool that aims to increase opioid prescribing
	
	Publication date: January 2020
	
	Jurisdiction studied: Canada (Vancouver, B.C.)
	
	Methods used: Mixed methods intervention (literature search,
		The Medication Review, Optimization, Reassessment, and Education (MORE) clinical tool was developed and shared for use with 14 clinical pharmacists at St. Paul's Hospital over a three-week period in February 2018; nine responded to the post-intervention survey.	Pharmacists reported that a clinical tool to increase the safety of opioid prescribing had a positive impact on their ability to identify risk factors but some thought the criteria in the clinical tool was limiting
			
			The MORE tool was developed to target opioid prescribing in the hospital or at discharge by empowering staff to optimize opioid prescribing. The MORE tool was helpful to some of the clinical pharmacists in terms of identifying risk factors and possible interventions. While the tool was found to be useful and can be easily integrated into

Dimension of the organizing framework	Study characteristics	Sample and intervention description	Declarative title and key findings
	focus groups, pilot trial, and survey)		practice, the respondents wished for a streamlined version to improve its use.

Appendix 6: Documents excluded at the final stage of reviewing

Document type	Hyperlinked title
Evidence syntheses	A mixed-methods evaluation of clinician education modules on reducing surgical opioid prescribing
	A model for assessing reflective practices in pharmacy education
	A multifaceted stewardship intervention helps curb steroid overprescribing in hospitalized patients with acute exacerbations of COPD
	A systematic review of audience response systems in pharmacy education
	A systematic review of interventions and programs targeting appropriate prescribing of opioids
	A systematic review of interventions to improve analgesic use and appropriateness in long-term care facilities
	A systematic review of the effects of continuing education programs on providing clinical community pharmacy services
	An evaluation of a collaborative pharmacist prescribing model compared to the usual medical prescribing model in the emergency department
	Audit and feedback interventions involving pharmacists to influence prescribing behaviour in general practice: A systematic review and meta-analysis
	Behavior change interventions and policies influencing primary healthcare professionals' practice – An overview of reviews
	Bundle interventions used to reduce prescribing and administration errors in hospitalized children: A systematic review
	Clinical and economic impacts of clinical pharmacists' interventions Iran: A systematic review
	Clinician education unlikely effective for guideline-adherent medication prescription in low back pain: Systematic review and meta-analysis of RCTS
	Community pharmacy interventions for health promotion: Effects on professional practice and health outcomes
	Cost-effectiveness of clinical pharmacy education on infection management among patients with chronic kidney disease in an Indonesian hospital
	Defining and enhancing collaboration between community pharmacists and primary care providers to improve medication safety
	Designing a pharmacist opioid safety and intervention tool
	Educational interventions to improve prescribing competency: A systematic review
	Effectiveness of interventions to improve the anticholinergic prescribing practice in older adults: A systematic review
	Establishing a pharmacist-prescriber partnership in publicly funded primary healthcare clinics to optimise antibiotic prescribing in the western cape: an exploratory study
	Evaluating the impact of education on pharmacist tobramycin dose recommendations for cystic fibrosis and a review of perceptions on pharmacist-led charting
	Evaluation of a multicomponent intervention consisting of education and feedback to reduce benzodiazepine prescriptions by general practitioners: The BENZORED hybrid type 1 cluster randomized controlled trial
	Evaluation of pharmacist guided intervention using procalcitonin and respiratory virus testing
	Evaluation of the effects of a drug with fiscalized substance dispensation, health education, and pharmacovigilance continuing education program in Colombia drugstores and drugstores/pharmacies: Study protocol of a multicenter, cluster-randomized controlled trial
	Exploring the perspectives and strategies of Ontario community pharmacists to improve routine follow-up for patients with diabetes: A qualitative study
	Improving community pharmacist-delivered care for patients with psychiatric disorders filling an opioid prescription
	Infertility management and pharmacotherapy: What every pharmacist should know
	Interdisciplinary deprescribing of aspirin through prescriber education and provision of patient-specific recommendations

Document type	Hyperlinked title
	Interventions for improving pharmacist-led patient counselling in the community setting: A systematic review
	Interventions to improve the appropriate use of polypharmacy for older people
	Interventions to optimise prescribing for older people in care homes
	Interventions to reduce medication errors in adult medical and surgical settings: A systematic review
	Interventions to reduce the prescription of inappropriate medicines in older patients
	Minimizing prescribing errors: A phenomenological exploration of the views and experiences of independent prescribing pharmacists
	Opioid misuse and overdose: Changes in pharmacist practices and outcomes
	Patient-centered care interventions to reduce the inappropriate prescription and use of benzodiazepines and z-drugs: A systematic review
	Pharmacist-driven oral oncolytic medication education and consent
	Pharmacist-led education-based antimicrobial stewardship interventions and their effect on antimicrobial use in hospital inpatients: A systematic review and narrative synthesis
	Pharmacist-led intervention on the inappropriate use of stress ulcer prophylaxis pharmacotherapy in intensive care units: A systematic review
	Preparing pharmacists for the community pharmacist consultation service: A questionnaire survey
	Process evaluation for the care homes independent pharmacist prescriber study (CHIPPS)
	Protocol for a cluster randomised controlled trial to determine the effectiveness and cost-effectiveness of independent pharmacist prescribing in care homes: The CHIPPS study
	Reducing medication errors for adults in hospital settings
	Retrospective chart review of advanced practice pharmacist prescribing of controlled substances for pain management at the Harry S. Truman Memorial Veterans' Hospital
	Systematic review of interventions to improve prescribing
	The effect of pharmacist-led interventions in optimising prescribing in older adults in primary care: A systematic review
	The Pennsylvania project: Pharmacist intervention improved medication adherence and reduced health care costs
	The pharmacist prescriber: A psychological perspective on complex conversations about medicines: introducing relational prescribing and open dialogue in physical health
	Use and evaluation of a mentoring scheme to promote integration of non-medical prescribing in a clinical context
	Using multiple approaches to develop a physician-pharmacist collaborative care intervention to facilitate appropriate prescribing for older adults with multimorbidity

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