

REVIEW ARTICLE

Clinical Pharmacist Interventions for Medication Adherence and Glycemic Control in Type 2 Diabetes: Lessons From Canadian Health Systems

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Abstract

Background: Type 2 diabetes mellitus requires sustained medication adherence, regular monitoring, patient education, and timely intensification of therapy. Clinical pharmacists are increasingly involved in these activities, but the extent of their role depends heavily on health-system organization and scope-of-practice regulations. Canada provides an informative example because pharmacist responsibilities differ between provinces while national diabetes guidance supports interprofessional, patient-centred care.

Objective: To review the impact of pharmacist-led interventions on medication adherence and glycemic control in adults with type 2 diabetes and examine how Canadian health-system models can facilitate their integration into routine care.

Methods: A narrative review was undertaken using Diabetes Canada clinical practice guidance, Canadian regulatory and government sources, Canadian pharmacist-led diabetes studies, and international systematic reviews evaluating medication adherence, glycemic outcomes, and multidisciplinary diabetes care.

Results: Pharmacist interventions including medication review, adherence assessment, patient education, laboratory monitoring, therapeutic optimization, prescribing, and structured follow-up are associated with improved diabetes management. Canadian evidence is particularly notable from Alberta, where pharmacists with additional prescribing authorization may initiate and modify prescription therapy. In the RxING study conducted across 12 Alberta community pharmacies, pharmacist-led initiation and titration of basal insulin reduced mean glycosylated hemoglobin (A1C) from 9.1% to 7.3% over 26 weeks. Ontario illustrates a different model through the publicly funded MedsCheck for Diabetes program, which emphasizes medication review, education, identification of drug-related problems, and communication with primary-care providers. These provincial examples demonstrate that pharmacist-led diabetes care can be implemented through both expanded prescribing models and collaborative medication-management systems.

Conclusion: Pharmacists can contribute meaningfully to medication adherence, glycemic control, cardiovascular risk reduction, and continuity of diabetes care. Canadian experience suggests that the greatest benefit is achieved when pharmacist interventions are supported by structured follow-up, access to clinical information, appropriate scope of practice, remuneration, and integration with primary-care teams.

Keywords: type 2 diabetes; clinical pharmacist; medication adherence; glycemic control; Canada; A1C; pharmaceutical care; primary care

1. Introduction

Type 2 diabetes mellitus is a chronic disease requiring continuous self-management, pharmacotherapy, monitoring, and prevention of cardiovascular and microvascular complications. Although increasingly effective glucose-lowering therapies are available, achieving therapeutic targets remains dependent on appropriate medication selection, adherence, persistence, patient education, and timely treatment modification.

Diabetes Canada recommends individualized glycemic targets, with an A1C of $\leq 7.0\%$ considered appropriate for most adults with type 1 or type 2 diabetes.[1] Contemporary diabetes management also extends beyond glucose lowering and increasingly incorporates cardiovascular protection, chronic kidney disease prevention, weight management, hypoglycemia avoidance, and shared decision-making.

These increasingly complex treatment requirements create an important role for clinical pharmacists. Pharmacists may identify adherence barriers, reconcile medications, identify therapeutic gaps, educate patients, monitor adverse effects, recommend or prescribe treatment modifications, facilitate access to medications, and coordinate follow-up.

Canada provides a particularly useful health-system example because pharmacy practice is regulated provincially. Consequently, pharmacists operate under different scopes of practice, funding models, and degrees of integration with primary care. Rather than representing a limitation alone, this variation illustrates several possible models for incorporating pharmacists into diabetes management.

This review examines the evidence supporting pharmacist-led diabetes interventions and uses Canadian systems to illustrate how these services can be incorporated into routine clinical practice.

2. Why Pharmacists Are Well Positioned to Support Diabetes Care

People with type 2 diabetes commonly receive multiple medications for hyperglycemia, hypertension, dyslipidemia, cardiovascular disease, kidney disease, and other comorbidities. Treatment therefore involves considerably more than dispensing glucose-lowering medication.

Clinical pharmacist activities may include:

- medication reconciliation;
- assessment of adherence and persistence;
- identification of adverse effects;
- assessment of hypoglycemia;
- insulin-device education;
- evaluation of renal function and dose adjustment;
- identification of untreated cardiovascular or renal risk;
- review of home glucose or continuous glucose-monitoring data;
- medication affordability and formulary assessment;
- initiation or modification of pharmacotherapy where permitted;
- laboratory monitoring; and
- structured patient follow-up.

Diabetes Canada supports interprofessional diabetes-care models and specifically recognizes pharmacists among professionals who can contribute to case management, coordination of care, self-management support, and timely modification of diabetes therapy.[2]

This is particularly relevant when therapeutic inertia is present. A patient may have repeated A1C measurements above target without adequate intensification because clinical appointments are infrequent, treatment decisions are deferred, or barriers such as adverse effects, cost, misunderstanding, and adherence are not adequately identified.

Pharmacist involvement can provide an additional point of therapeutic contact between traditional physician visits.

3. Evidence That Pharmacist Interventions Improve Diabetes Outcomes

The benefit of pharmacist involvement in type 2 diabetes has been demonstrated across multiple health systems.

A systematic review of 39 randomized controlled trials involving 5,474 participants found beneficial effects of clinical pharmacist interventions on several outcomes, including glycemic control, blood pressure, lipid parameters, medication adherence, quality of life, and cardiovascular risk. Across included studies, differences in A1C improvement between intervention and control groups ranged substantially, reflecting differences in baseline control, intervention intensity, and follow-up duration.[3]

Another systematic review focusing on community pharmacist interventions found that programs involving medication review, individualized education, adherence support, self-management training, and follow-up frequently improved medication adherence and A1C.[4]

The mechanism is likely multifactorial. Improved adherence alone may enhance glycemic control, but pharmacist interventions can also correct ineffective treatment, reduce unnecessary complexity, address adverse effects, intensify therapy, and improve patient knowledge.

Therefore, successful pharmacist-led diabetes care should not be viewed simply as an adherence intervention. It is better understood as a structured medication-management intervention addressing both patient behaviour and pharmacotherapy.

4. Alberta: An Expanded-Scope Canadian Model

Alberta provides one of the clearest Canadian examples of pharmacists practicing with an expanded clinical scope.

Pharmacists who obtain Additional Prescribing Authorization can prescribe Schedule 1 medications within regulatory requirements and their individual competence. The framework requires appropriate clinical knowledge, collaborative relationships with other healthcare professionals, access to relevant information, and appropriate documentation systems.[5]

This expanded scope allows the pharmacist's role to progress from identifying a drug-therapy problem to directly implementing a solution when clinically appropriate.

The RxING Study

The RxING study provides important Canadian evidence for this approach. The pragmatic study was conducted in 12 community pharmacies in Alberta and enrolled adults with type 2 diabetes receiving oral antihyperglycemic therapy whose A1C remained between 7.5% and 11%.^[6]

Participating pharmacists identified eligible patients, initiated insulin glargine, provided a titration strategy, and conducted structured follow-up over 26 weeks.

Mean A1C declined from 9.1% at baseline to 7.3% after 26 weeks, representing an absolute reduction of 1.8 percentage points. Approximately 51% of participants achieved an A1C $\leq 7\%$.^[6]

Although RxING used a before-after design rather than randomization and therefore cannot establish comparative effectiveness to the same degree as a randomized controlled trial, it demonstrated an important health-system principle: pharmacists with prescribing authority can move beyond identifying uncontrolled diabetes to actively addressing it.

Follow-up of RxING participants also showed that some glycemic improvement was lost after structured study follow-up ended, highlighting another important lesson: pharmacist interventions should be designed as continuing care rather than isolated encounters.^[7]

5. Beyond Glycemia: The Canadian Rx EACH Experience

Diabetes management should not focus on A1C alone.

The Alberta-based Rx EACH randomized controlled trial evaluated a pharmacist-led cardiovascular risk-reduction strategy across community pharmacies. A diabetes subgroup analysis included 573 participants and examined an intervention involving medication-therapy management, laboratory assessment, individualized cardiovascular-risk evaluation, and treatment adjustment.^[8]

Compared with usual care, the intervention resulted in a significant reduction in estimated cardiovascular risk over three months and was associated with improvement in individual cardiovascular risk factors, including A1C, blood pressure, and LDL cholesterol.[8]

This model is particularly relevant to contemporary type 2 diabetes management because cardiovascular and renal risk now strongly influence medication selection.

The clinical pharmacist should therefore ask not only:

“Is the patient’s glucose controlled?”

but also:

“Is the patient’s overall diabetes-related cardiovascular and renal risk being optimally treated?”

6. Ontario: A Publicly Funded Medication-Management Model

The Canadian experience also demonstrates that meaningful pharmacist involvement does not necessarily require independent prescribing authority.

Ontario’s publicly funded MedsCheck program provides eligible patients with one-to-one pharmacist medication reviews. People living with type 1 or type 2 diabetes are specifically eligible for MedsCheck services, including individuals who may not otherwise meet polypharmacy criteria.[9]

The program is designed to improve medication understanding, identify drug-therapy problems, support appropriate medication use, and improve adherence and clinical outcomes. Pharmacists review the patient’s medications, identify relevant concerns, provide education, and communicate issues requiring follow-up to prescribers.

This represents a different health-system model from Alberta.

The Alberta model demonstrates the potential of **pharmacist-led therapeutic implementation**, whereas Ontario's MedsCheck framework illustrates **funded medication assessment, education, adherence support, and collaborative intervention**.

Both approaches can contribute to diabetes care.

7. Team-Based Primary Care as a System Enabler

The effectiveness of pharmacist care is influenced by how well it connects with the rest of the healthcare system.

Canadian diabetes guidance has long supported the chronic-care model, emphasizing proactive follow-up, patient self-management, interprofessional care, clinical-information systems, reminders, and coordinated treatment modification.[2]

Ontario's Family Health Team model similarly organizes primary care around multidisciplinary teams responsible for chronic disease management, including diabetes. Team composition varies according to local needs, but the broader principle is important: chronic diseases are better managed when responsibility is distributed across appropriately trained professionals rather than concentrated within episodic physician encounters.

For pharmacists, effective integration requires access to laboratory values, diagnostic information, current treatment plans, and mechanisms to communicate interventions with physicians, nurses, diabetes educators, and dietitians.

Without this infrastructure, pharmacists may identify important problems yet remain unable to close the therapeutic loop.

8. A Canadian-Inspired Pharmacist Diabetes Care Model

Lessons from Canadian practice can be translated into a practical pharmacist-led pathway.

Step 1: Identify patients at risk

Prioritize patients with:

- A1C above individualized target;
- repeated refill gaps;
- complex medication regimens;
- recent diabetes-related hospitalization;
- recurrent hypoglycemia;
- insulin-use difficulties;
- cardiovascular or renal disease;
- medication affordability concerns; or
- evidence of therapeutic inertia.

Step 2: Determine why control is inadequate

Before automatically adding medication, determine whether poor glycemic control reflects:

- medication nonadherence;
- incorrect administration;
- adverse effects;
- inadequate treatment intensity;
- dietary or lifestyle factors;
- cost;
- cognitive barriers;
- misunderstanding of treatment;
- inappropriate dosing;
- progressive beta-cell dysfunction; or
- another medical problem.

Step 3: Perform comprehensive medication optimization

The pharmacist should evaluate glucose-lowering therapy alongside:

- kidney function;
- cardiovascular disease;
- heart failure;
- obesity;
- hypoglycemia risk;
- drug interactions;
- blood pressure;
- lipid therapy; and
- overall medication burden.

Step 4: Implement or recommend treatment changes

Depending on local scope of practice, the pharmacist may:

- independently prescribe;
- modify therapy under collaborative authority;
- provide a formal recommendation to the prescriber; or
- coordinate referral for treatment intensification.

Step 5: Provide targeted adherence intervention

Adherence interventions should address the actual cause of nonadherence rather than rely solely on generic counselling.

Approaches may include:

- regimen simplification;
- synchronization of medication refills;
- adherence packaging;
- reminders;
- written medication schedules;
- injection-device training;
- management of adverse effects;
- cost-conscious therapeutic alternatives; and
- shared decision-making.

Step 6: Establish structured follow-up

Follow-up should reassess:

- A1C;
- home glucose or continuous glucose-monitoring data;
- adherence;
- hypoglycemia;
- adverse effects;
- weight;
- renal function;
- treatment implementation; and
- progress toward individualized goals.

The RxING follow-up experience suggests that benefits may diminish when structured follow-up disappears.[7]

9. Measuring the Impact of Pharmacist Diabetes Services

Programs should measure outcomes beyond the number of consultations completed.

Useful clinical outcomes include:

- change in A1C;
- percentage reaching individualized A1C targets;
- hypoglycemia;
- blood pressure;
- LDL cholesterol;
- weight;
- renal-function monitoring; and
- cardiovascular-risk indicators.

Medication-use outcomes may include:

- proportion of days covered;
- refill adherence;
- treatment persistence;
- medication discrepancies resolved;
- number of drug-therapy problems corrected; and
- treatment intensification where indicated.

Patient-centred outcomes may include:

- diabetes knowledge;
- treatment satisfaction;
- confidence with medication administration;
- quality of life; and
- shared decision-making.

Health-system outcomes may include emergency visits, hospitalizations, physician workload, service utilization, and healthcare expenditure.

10. Challenges Within the Canadian Model

Canada should not be interpreted as having a single standardized pharmacist diabetes-care system.

Pharmacy regulation is provincial and territorial, and pharmacists' authority to initiate prescriptions, adapt therapy, order laboratory tests, and perform other clinical activities varies between jurisdictions.[10]

Remuneration also differs, and an expanded legal scope does not automatically result in widespread implementation.

Important barriers include:

- inadequate reimbursement;
- insufficient protected pharmacist time;
- fragmented electronic health records;
- limited communication with primary-care providers;
- inconsistent access to laboratory data;
- variable pharmacist training;
- lack of private consultation space;
- differing provincial formularies; and
- uncertainty regarding clinical responsibility.

These differences make Canada useful precisely because it demonstrates that scope of practice, information infrastructure, funding, and professional integration determine whether pharmacist expertise translates into measurable clinical benefit.

11. Implications for Other Health Systems

The main lesson from Canada is not that every healthcare system should reproduce a specific provincial program.

Rather, Canadian experience suggests several transferable principles:

Pharmacists need access to patients who are not reaching treatment goals.

Medication review should be linked to the authority or mechanism required to act on identified problems.

Clinical information, particularly laboratory data, should be accessible.

Pharmacist services require structured follow-up rather than isolated consultation.

Payment models should reward clinically meaningful services rather than medication dispensing alone.

Pharmacists should be integrated into multidisciplinary diabetes care rather than functioning as an independent parallel service.

Where pharmacists have broad prescribing authority, Alberta demonstrates the potential for direct therapeutic management. Where prescribing remains more restricted, programs resembling Ontario's MedsCheck can still strengthen adherence, education, medication safety, and collaboration with prescribers.

12. Conclusion

Clinical pharmacist interventions can improve the management of type 2 diabetes through medication optimization, adherence support, education, therapeutic monitoring, and structured follow-up.

Canadian experience provides useful examples of how these interventions can be incorporated into health systems.

Alberta demonstrates the clinical potential of expanded pharmacist prescribing, laboratory access, and direct medication management. Ontario demonstrates how publicly funded medication-review services can embed pharmacist involvement into chronic disease care even under a different scope-of-practice framework.

The strongest model is therefore not defined by a single professional activity. It is a system in which pharmacists are able to:

Identify → Assess → Educate → Optimize → Follow up → Communicate → Reassess.

For patients with type 2 diabetes, pharmacist involvement should increasingly be viewed not as an optional supplementary service but as one component of coordinated, multidisciplinary chronic disease management.

Ethics & Declarations

Author Contributions

All authors contributed to the study conception and design. Material preparation, data collection, and analysis were performed by all authors. All authors read and approved the final manuscript.

Ethics Approval and Consent to Participate

Ethical approval was not required for this study. There were no participants so consent was not needed.

Consent for Publication

Consent for publication was not required for this study.

Competing Interests

The author declares that he has no competing financial or non financial interests

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Data sharing is not applicable to this article.

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