Review Article

Optimizing Anticoagulation in Atrial Fibrillation: The Role of Clinical Pharmacists in Canadian Practice

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RECEIVED	REVISED	ACCEPTED	PUBLISHED ONLINE
10 September 2026	15 September 2026	20 September 2026	30 September 2026

Citation details: Mohamed Abdellatif (2026). Optimizing Anticoagulation in Atrial Fibrillation: The Role of Clinical Pharmacists in Canadian Practice. International Journal of Clinical Pharmacy and Medicine, 1(4), Article 2.

Abstract

Atrial fibrillation (AF) is a major preventable cause of ischemic stroke and is increasingly encountered across hospital, ambulatory, and community pharmacy practice in Canada. Although oral anticoagulants substantially reduce thromboembolic risk, real-world pharmacotherapy remains complicated by inappropriate dose reduction, declining renal function, interacting medications, unnecessary concomitant antiplatelet therapy, poor adherence, transitions of care, and uncertainty surrounding interruption for procedures. Canadian practice offers a particularly important role for pharmacists because of their expanding prescribing authority and involvement across inpatient, primary care, anticoagulation clinic, and community settings. The Canadian Cardiovascular Society/Canadian Heart Rhythm Society approach emphasizes assessment of stroke risk using the CHADS-65 algorithm and generally favours direct oral anticoagulants (DOACs) over warfarin for eligible patients. Clinical pharmacists can improve anticoagulant safety by confirming indication, selecting the appropriate agent and dose, calculating renal function correctly, identifying drug interactions, eliminating unnecessary antithrombotic therapy, monitoring adherence and laboratory parameters, and ensuring appropriate transitions between hospital and community care. Canadian studies have further demonstrated that pharmacist-managed anticoagulation can achieve high-quality anticoagulant control and that pharmacist prescribing can address undertreatment of AF. This narrative review discusses practical pharmacotherapy challenges in AF anticoagulation and proposes a structured pharmacist-led approach applicable to contemporary Canadian practice.

Keywords: atrial fibrillation; anticoagulation; clinical pharmacy; pharmacists; direct oral anticoagulants; Canada; medication safety; stroke prevention

Introduction

Atrial fibrillation is the most common sustained cardiac arrhythmia encountered in clinical practice and becomes increasingly prevalent with advancing age. Its most consequential complication is thromboembolic stroke. Appropriate oral anticoagulation substantially reduces this risk and represents one of the most effective preventive interventions available for patients with AF. [1,2]

Despite the apparent simplicity of prescribing an anticoagulant, management is frequently complicated in routine practice. Patients with AF are often older adults with chronic kidney disease, coronary artery disease, heart failure, hypertension, frailty, polypharmacy, and fluctuating clinical status. Consequently, anticoagulant management involves considerably more than determining whether anticoagulation is indicated. [3]

Common medication-related problems include inappropriate DOAC dose reduction, failure to adjust therapy when renal function deteriorates, clinically important drug interactions, continuation of antiplatelet therapy without a current indication, inadequate adherence assessment, and inappropriate interruption around procedures. These issues make anticoagulation particularly suitable for structured clinical pharmacist involvement. [3,4]

The Canadian Cardiovascular Society (CCS) and Canadian Heart Rhythm Society (CHRS) provide a distinctly Canadian approach to stroke prevention through the CHADS-65 algorithm. [1] The current comprehensive CCS/CHRS AF guideline remains the 2020 guideline while a new AF guideline is under development for 2026–2027. [5]

This review examines the pharmacotherapeutic role of clinical pharmacists in optimizing anticoagulation for AF, with emphasis on Canadian recommendations and models of practice.

Stroke Prevention in the Canadian Context

Canadian recommendations differ somewhat from international approaches that rely primarily on the CHA_2DS_2-VASc score. The CCS/CHRS strategy uses the CHADS-65 approach to simplify identification of patients requiring anticoagulation. [1,2]

In practical terms, oral anticoagulation is generally indicated in patients with nonvalvular AF who are aged 65 years or older or who have at least one traditional $CHADS_2$ risk factor: congestive heart failure, hypertension, diabetes mellitus, or previous stroke/transient ischemic attack. For eligible patients without a contraindication, DOAC therapy is generally preferred to warfarin. [1,2] The pharmacist's initial assessment should therefore address three questions:

1. Is anticoagulation indicated?
2. Is the selected anticoagulant appropriate for this patient?
3. Is the prescribed dose appropriate today?

The third question deserves particular emphasis. Anticoagulant appropriateness is dynamic. A DOAC prescription that was appropriate six months earlier may become inappropriate after weight loss, acute kidney injury, introduction of an interacting medication, gastrointestinal bleeding, or progression of chronic kidney disease. [6]

Clinical pharmacists should therefore treat anticoagulation assessment as an ongoing process rather than a one-time prescribing decision.

Selecting Between a DOAC and Warfarin

For most patients with nonvalvular AF who require anticoagulation, DOACs offer important advantages over warfarin, including predictable pharmacokinetics, fewer food interactions, fewer routine monitoring requirements, and a lower risk of intracranial hemorrhage. [1,6,7,8,9,10] However, DOACs are not universally appropriate.

Warfarin remains necessary or preferred in selected situations, particularly patients with mechanical prosthetic heart valves and patients with AF associated with significant rheumatic mitral stenosis. Canadian guidance also highlights increasing uncertainty as renal function approaches kidney failure because patients with advanced kidney disease were underrepresented or excluded from pivotal DOAC trials. [1,6]

The pharmacist should therefore confirm that the clinical terminology “AF” has not inadvertently led to automatic DOAC prescribing in a patient whose valvular or renal status requires a different approach.

Other considerations include adherence capability, drug interactions, gastrointestinal absorption, cost and provincial drug coverage, frequency of monitoring, patient preferences, and previous bleeding or thromboembolism. [6]

The Problem of Inappropriate DOAC Dose Reduction

One of the most frequent anticoagulation-related medication problems is prescribing a reduced DOAC dose when the patient does not meet the product-specific reduction criteria. Clinicians may understandably reduce doses in older or frail patients because of concerns about bleeding. However, DOAC dosing should generally follow the evidence-based criteria used for the individual medication rather than an empirical concept of “starting low.” [6]

Dose-reduction requirements differ among apixaban, rivaroxaban, dabigatran, and edoxaban. They should not be extrapolated from one DOAC to another. [6] A pharmacist reviewing a DOAC prescription should therefore verify:

- indication;
- age;
- actual body weight where relevant;
- serum creatinine;
- calculated creatinine clearance;

- concomitant medications;
- previous bleeding;
- prescribed dose and frequency; and
- whether the patient actually meets drug-specific dose-reduction criteria.

The distinction between estimated glomerular filtration rate reported automatically by the laboratory and creatinine clearance used in many DOAC dosing recommendations is particularly important. [6]

Renal Function: More Than Reading the eGFR

Renal impairment is a common source of prescribing errors because DOACs differ in the extent of renal elimination. For medication dosing, pharmacists should recognize that laboratory-reported eGFR and Cockcroft-Gault creatinine clearance are not necessarily interchangeable. The pivotal DOAC trials and product dosing recommendations have commonly relied on calculated creatinine clearance. [6]

This distinction becomes clinically important in older adults, individuals at extremes of body size, and patients whose renal function is near a dosing threshold. Canadian guidance recognizes that oral anticoagulation is supported by substantially stronger evidence in mild-to-moderate CKD than in advanced kidney failure. Evidence becomes progressively less certain in stage 4–5 CKD and dialysis populations. [2,6]

Renal function should therefore be reassessed periodically and more frequently when deterioration is likely. A practical approach is to reassess following: [6]

- acute kidney injury;
- hospitalization;
- dehydration;
- initiation or escalation of diuretics;
- acute infection;
- major changes in body weight;
- introduction of nephrotoxic medication; or
- progression of known CKD.

A pharmacist should not wait for the annual medication review when an intercurrent illness has materially changed renal function.

Drug Interactions and Antithrombotic Stewardship

DOACs have fewer interactions than warfarin but are not interaction-free. P-glycoprotein and cytochrome P450 pathways are clinically relevant for several agents. Strong inhibitors may increase anticoagulant exposure and bleeding risk, whereas strong inducers can lower concentrations and potentially reduce efficacy. [6]

A structured medication reconciliation should specifically examine: [6]

- azole antifungals;
- macrolide antibiotics;
- selected anticonvulsants;
- rifampin;
- certain antiretroviral medications;
- antiarrhythmics;
- nonsteroidal anti-inflammatory drugs;
- antiplatelet agents; and
- complementary or herbal products.

The combination of an anticoagulant and an antiplatelet agent deserves particular attention. Patients frequently remain on aspirin indefinitely after an earlier myocardial infarction or percutaneous coronary intervention. However, the continuing presence of coronary artery disease does not automatically justify indefinite combination therapy. The CCS recommends oral anticoagulant therapy alone in patients with AF and stable coronary or arterial vascular disease when there has been no acute coronary syndrome or revascularization procedure during the preceding 12 months, because routine combination therapy increases bleeding without sufficient evidence of additional ischemic benefit. [1,11] This represents a high-value target for pharmacist intervention. Every patient receiving both a DOAC and aspirin should prompt the question: What is the current indication for both medications? If no active indication remains for antiplatelet therapy, deprescribing the antiplatelet agent may substantially improve medication safety.

Adherence: The Hidden Pharmacokinetic Problem

Unlike warfarin, DOAC therapy provides no routine INR result that indirectly signals adherence. Their relatively short half-lives mean that missed doses can rapidly reduce anticoagulant protection. Consequently, a prescription that appears pharmacologically optimal may provide inadequate stroke prevention if adherence is poor. [6] Pharmacists are particularly well positioned to identify this problem because they can combine patient interviewing with dispensing information. Medication review should explore:

- missed doses;
- refill gaps;

- confusion regarding once- versus twice-daily treatment;
- intentional omission because of bruising;
- medication cost;
- difficulty swallowing;
- use of compliance packaging;
- cognitive impairment; and
- misunderstanding regarding duration of treatment.

Questions should be nonjudgmental. Asking "How many doses did you miss during the last two weeks?" may identify adherence problems more effectively than asking whether the patient is "compliant."

Monitoring the Patient Rather Than the INR

The absence of routine coagulation monitoring for DOAC therapy should never be interpreted as absence of monitoring altogether. Patients should undergo periodic assessment of: [6]

- renal function;
- hemoglobin;
- platelet count when clinically indicated;
- evidence of occult or overt bleeding;
- liver function where appropriate;
- weight;
- medication interactions;
- adherence; and
- continued indication for therapy.

New anemia in a patient receiving anticoagulation should not simply trigger iron supplementation without consideration of occult blood loss. Similarly, recurrent falls should lead to assessment of modifiable fall and bleeding risks rather than automatic discontinuation of anticoagulation. Canadian guidance emphasizes that bleeding-risk assessment should identify reversible factors and that elevated bleeding risk does not necessarily eliminate the net clinical benefit of anticoagulation. [1,6]

Transitions of Care: A High-Risk Period

Hospital admission and discharge create numerous opportunities for anticoagulation error. A patient may arrive on a DOAC that is held because of surgery, acute kidney injury, gastrointestinal bleeding, or an invasive procedure. Problems occur when temporary medication changes are inadvertently converted into permanent ones.

At discharge, the clinical pharmacist should reconcile: [3]

- preadmission anticoagulant;
- inpatient anticoagulant therapy;
- reason therapy was interrupted;
- intended restart date;
- final anticoagulant and dose;
- renal function;
- antiplatelet therapy;
- interacting medications; and
- required follow-up.

Clear documentation is essential. Instructions such as “restart when safe” transfer ambiguity to the next clinician. Whenever possible, the discharge plan should state a specific date or clearly defined clinical condition for resumption. Community pharmacists should subsequently confirm that the patient received the intended prescription and that duplicate anticoagulant prescriptions have been discontinued. [3,6]

Periprocedural Management

Interruption of anticoagulation for procedures remains a frequent source of inappropriate prolonged discontinuation. Management depends on several factors: [12,13]

- anticoagulant used;
- renal function;
- procedural bleeding risk;
- timing of the procedure; and
- thromboembolic risk.

For most DOAC-treated patients, interruption is relatively short and routine heparin bridging is not required. [12,13] Pharmacist involvement can help standardize interruption and resumption protocols while preventing unnecessarily long periods without anticoagulation. The growing Canadian interest in pharmacist involvement in periprocedural anticoagulation management reflects the complexity of coordinating these decisions across hospitals, specialty clinics, primary care, and community pharmacy.

Evidence Supporting Pharmacist-Led AF Management

The rationale for pharmacist involvement extends beyond theoretical medication expertise. A Canadian randomized clinical trial conducted in 27 community pharmacies in Alberta evaluated pharmacist-led identification, assessment, and prescribing of anticoagulation for patients with untreated, undertreated, or newly detected AF. [14] The trial demonstrates that pharmacists can move beyond identifying medication problems to directly addressing gaps in stroke-prevention pharmacotherapy. Canadian experience with pharmacist-managed warfarin therapy is similarly encouraging. [15,16] A study involving four Ontario family health teams and 40 community pharmacies in Nova Scotia evaluated 963 patients and reported a mean time in therapeutic range of approximately 74%, with a time-weighted mean exceeding 76%. [17] These results illustrate the quality of anticoagulation control achievable through pharmacist-led models incorporating point-of-care INR testing and decision-support systems. Broader evidence is consistent with these Canadian findings. A 2024 systematic review and meta-analysis found that pharmacist-led anticoagulation interventions improved treatment appropriateness and reduced total bleeding and hospitalizations or readmissions, but did not demonstrate statistically significant reductions in thromboembolic events or mortality. [4] These findings suggest that pharmacists can contribute at multiple stages of the anticoagulation pathway: detection of untreated patients, medication selection, prescribing, monitoring, adherence assessment, education, and long-term follow-up.

A Practical Pharmacist-Led Anticoagulation Check

A structured review can be incorporated into hospital rounds, ambulatory clinics, anticoagulation services, or community medication reviews. [1,2,6,11,12,13]

1. Indication

Confirm AF diagnosis and indication for stroke prevention using the Canadian CHADS-65 framework.

2. Anticoagulant selection

Confirm that the patient is eligible for a DOAC and does not have an indication requiring warfarin.

3. Dose

Verify the drug-specific dose using age, weight, renal function, indication, and interacting medications.

4. Renal function

Calculate appropriate renal function for dosing and determine whether repeat testing is needed.

5. Interactions

Evaluate prescribed, nonprescription, and complementary medicines.

6. Antiplatelet therapy

Determine whether aspirin or a P2Y12 inhibitor continues to have a valid indication.

7. Bleeding

Assess previous bleeding, current symptoms, hemoglobin trends, NSAID exposure, alcohol use, uncontrolled hypertension, and other modifiable factors.

8. Adherence

Evaluate missed doses, refill history, medication access, understanding, and administration technique.

9. Procedures

Identify upcoming procedures and document interruption and resumption plans.

10. Follow-up

Define who will reassess renal function, adherence, bleeding, and continued appropriateness.

This approach can be summarized as:

Indication → Drug → Dose → Kidney → Interactions → Bleeding → Adherence → Follow-up.

Opportunities for Canadian Health Systems

The next step in anticoagulation safety should be movement from individual pharmacist intervention toward systematic antithrombotic stewardship. Electronic health records can identify patients with: [3,4]

- AF without anticoagulation;
- potentially inappropriate reduced DOAC doses;
- deterioration in renal function;
- concurrent DOAC and antiplatelet therapy;
- concurrent NSAID therapy;
- duplicate anticoagulation;
- clinically relevant interacting medications; or
- prolonged anticoagulant interruption after hospitalization.

These alerts can generate pharmacist worklists rather than indiscriminate prescriber alerts, thereby reducing alert fatigue while directing medication expertise toward high-risk prescriptions. Canadian hospitals and primary-care networks could also establish pharmacist-led DOAC surveillance services analogous to traditional warfarin anticoagulation clinics. The objective would not be routine coagulation testing but routine appropriateness testing. Such programs are particularly compatible with

the evolving Canadian scope of pharmacist practice, where pharmacists in several jurisdictions can initiate, adapt, renew, and monitor prescription therapy within provincial regulatory frameworks. [18]

Discussion

Anticoagulation in AF illustrates an important evolution in clinical pharmacy. The era of warfarin required frequent laboratory monitoring and dose adjustment. DOACs simplified anticoagulation but did not eliminate medication-related problems; rather, the nature of those problems changed. Instead of predominantly managing INR values, pharmacists must now identify inappropriate doses, changing renal function, interactions, unnecessary antiplatelet therapy, nonadherence, inappropriate procedural interruption, and failures during transitions of care. [3,4,14,17] This shift supports a broader concept of anticoagulation stewardship. The clinical pharmacist should not function solely as a consultant who corrects prescriptions after errors occur. Pharmacists can prospectively identify high-risk patients, prescribe or adapt therapy where authorized, coordinate monitoring, educate patients, and integrate anticoagulation management across hospital and community care. The Canadian model is particularly well suited to this approach because pharmacists are already embedded within community pharmacies, family health teams, ambulatory clinics, hospitals, and anticoagulation services. Important evidence gaps nevertheless remain. Pharmacist scope varies substantially between provinces, and models that are successful in Alberta,

Ontario, or Nova Scotia cannot necessarily be transferred unchanged across Canada. [18] Additional pragmatic studies should evaluate clinical outcomes, cost-effectiveness, workload, health-system integration, and sustainable reimbursement for pharmacist-led anticoagulation services.

Conclusion

Optimal stroke prevention in atrial fibrillation requires more than simply prescribing an anticoagulant. Clinical pharmacists can identify untreated AF, verify anticoagulation indications, select and dose DOACs appropriately, recognize renal deterioration, manage interactions, eliminate unnecessary antiplatelet therapy, evaluate adherence, coordinate perioperative management, and prevent medication errors during transitions of care. Canadian evidence demonstrates that pharmacist-led anticoagulation services can achieve high-quality therapy and that pharmacist prescribing can directly address gaps in AF stroke prevention. [14,17] A practical next step for Canadian health systems is to expand anticoagulation management from traditional warfarin monitoring toward comprehensive antithrombotic stewardship, with pharmacists taking responsibility for systematic surveillance of the indication, dose, interactions, adherence, safety, and ongoing appropriateness of anticoagulant therapy.

Ethics & Declarations

Author Contributions

The author was responsible for the conceptualization, study design, methodology, literature search, data collection, analysis, interpretation of findings, manuscript drafting, critical revision, and final approval of the manuscript. The author accepts full responsibility for the accuracy and integrity of the work.

Ethics Approval and Consent to Participate

Not applicable. This study did not involve human participants, animal experimentation, or confidential patient clinical data.

Consent for Publication

Not applicable. This narrative review contains no identifiable patient information.

Competing Interests

The author declares that they have no competing financial or non-financial interests.

Funding

The author declares that no funds, grants, or other financial support were received during the preparation of this manuscript.

Data Availability Statement

Data sharing is not applicable to this article as no new datasets were generated or analyzed during the current study.

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