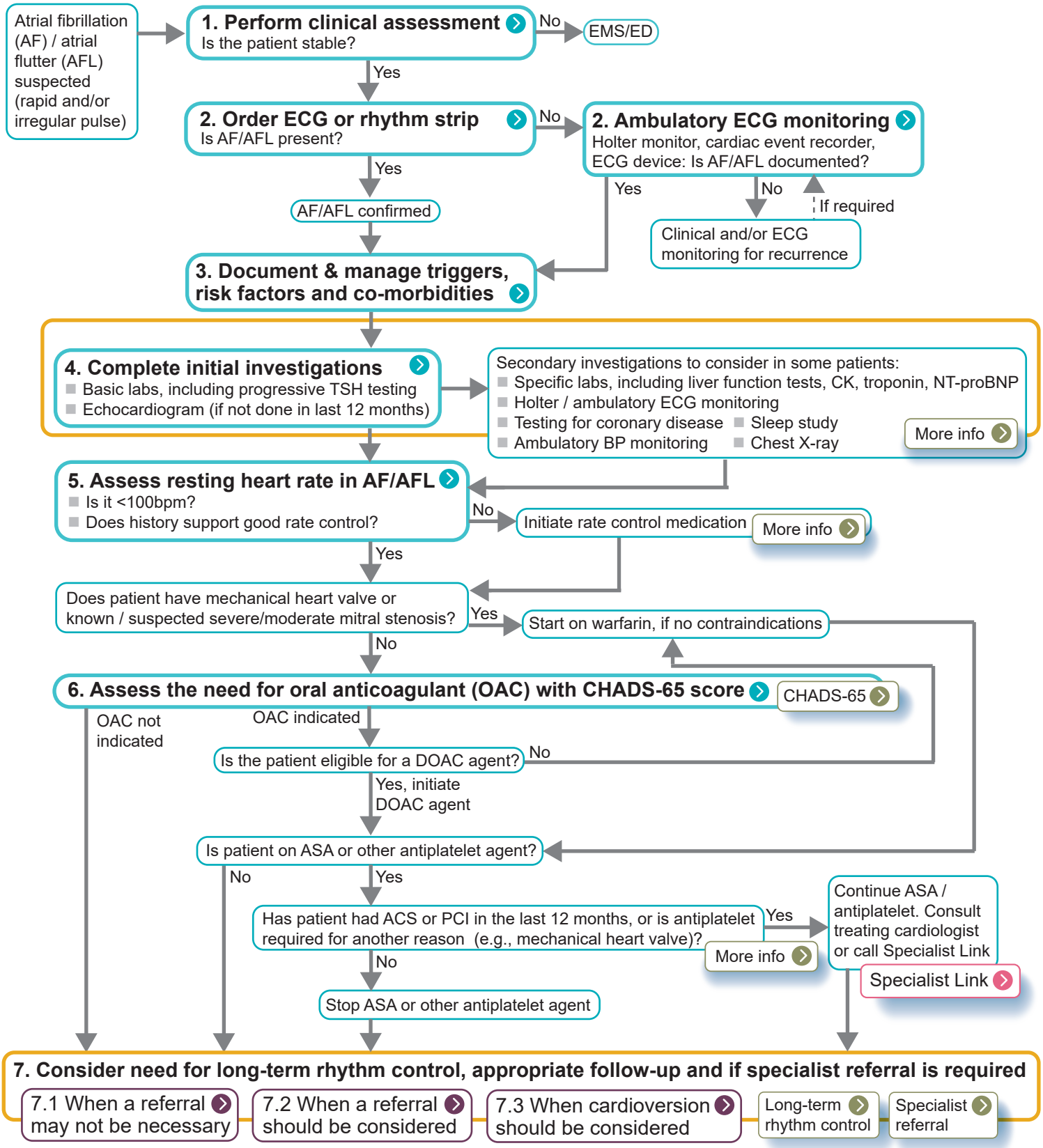
Atrial fibrillation Primary Care Pathway



PATHWAY PRIMER: ATRIAL FIBRILLATION / ATRIAL FLUTTER

Atrial fibrillation (AF) is the most common sustained dysrhythmia & will affect around one in four people over the age of 40. AF affects around 59,000 people in Alberta (overall prevalence of ~1.4%), being found in ~8% of those age 65+ & >12% of those age 80+. Untreated, it is associated with a 3 to 6 times increased risk of stroke/systemic embolism & a doubling of mortality.

Individuals with AF may be aware of a racing, irregular pulse, breathlessness, fatigue, light-headedness & reduced exercise capacity. However, around 1/3 of those with AF may be asymptomatic ("silent AF") or have non-specific symptoms. A 30-second pulse-check is a simple & cost-effective way to screen for AF in those age 65+: individuals found to have an irregular pulse should be sent for a 12-lead ECG. AF can be:

- **Paroxysmal:** Episodes self-terminating in ≤7 days
- **Persistent:** Episodes lasting >7 days or requiring termination, or
- **Permanent:** accepted as long-term rhythm

*The **type** of AF does **not affect** the decision for **anticoagulation**, with the exception of a single documented, investigated & treated episode associated with a known trigger & no prior history of similar symptoms, which likely does not warrant therapy (*see section 'Specialist referral **may not be necessary**')

Atrial flutter (AFL), (see section "**Distinct features of atrial flutter**") is characterized by a rapid, regular rhythm in the atria (often around 300 beats per minute) with a regular (e.g., at 150 bpm) or irregular ventricular rhythm. However, many SVTs can also have a rate close to 150 bpm & important to differentiate from AFL. Atrial flutter is also associated with an increased risk of stroke/thromboembolism & the overall goals of management are the same as those for AF. Rate control for AFL can sometimes be much more challenging than AF.

Like many chronic conditions, AF can have a waxing & waning course, with severity & burden of symptoms that are influenced by other illnesses & life events. However, once a pattern of recurrent AF is established, spontaneous complete resolution is unlikely, & there is currently no 'cure' for the condition. The natural history of AF is to progress from paroxysmal to persistent or permanent forms, though the time for this to occur varies widely in individual patients.

Many aspects of the treatment of AF/AFL can be managed in primary care / the medical home, & not all patients require referral to a specialist. The 3 key pillars of AF/AFL management are:

- Optimisation of triggers, risk factors & comorbidities (see section "**Management of risk factors & comorbidities**")
- Assessment & appropriate management of thromboembolic risk (see section "**Assessment & management of thromboembolic risk**")
- Management of the dysrhythmia itself (rate- ± rhythm-control) (see section "**Management of the arrhythmia (rate- ± rhythm-control)**")

Patients may experience anxiety & emotional stress due to their AFL. Reassurance & patient education may help to reduce anxiety & prevent unnecessary emergency department visits & overuse of other medical resources.

Recommendations in this document are aligned with the 2020 Canadian Cardiovascular Society (CCS)/Canadian Heart Rhythm Society Comprehensive Guidelines for the Management of Atrial Fibrillation.

Expanded details

1. Initial assessment of a patient suspected/found to have AF/AFL

A full clinical assessment should be performed to document the onset, duration & pattern of dysrhythmia, any triggers for AF/AFL, the presence or absence of risk factors & comorbidities & whether any concerning symptoms or signs are present. For patients in AF/AFL at the time of assessment, their resting heart rate & blood pressure should be recorded, & they should be examined for signs of heart failure. For all patients, their current medication should be recorded, along with their alcohol, smoking & recreational drug use history.

Patient instability may be suggested by:

- Resting heart rate >120bpm
- Dyspnea and/or signs of heart failure
- Chest discomfort/angina
- Syncope/presyncope or symptomatic hypotension (orthostatic symptoms)
- Significant & new weakness, fatigue or exercise intolerance
- Confusion or other signs of cerebral hypoperfusion

2. Electrocardiogram (ECG) confirmation of AF/AFL

The gold standard for the diagnosis of AF/AFL is a 12-lead ECG. If not possible, diagnosis can also be made on ambulatory ECG monitors (e.g., Holter or other extended ECG monitor) & some commercial ECG devices (e.g., *Kardia AliveCor™, CardioComm Heartcheck™, Apple Watch™*, some *Fitbit™* models), although when only one or 2 ECG leads are available, diagnosis may be less certain. Diagnosis is not possible by pulse check or auscultation alone.

Ambulatory ECG recording may help to;

- Establish the diagnosis of AF/AFL,
- Determine the pattern of dysrhythmia: low or high-burden paroxysmal AF/AFL, persistent or permanent AF/AFL,
- Determine whether ventricular rate-control in AF/AFL is adequate.

The most appropriate monitoring method depends on the frequency of symptoms. If symptoms occur on most days, then a 24-48h Holter monitor may be appropriate. For less frequent symptoms, patients may require longer-duration monitoring, e.g., with a 2-week cardiac event recorder. Another option for infrequent symptoms is to consider purchasing a consumer device which can record an ECG rhythm strip (noted above).

3. Management of risk factors & comorbidities

Table 3A. Common non-modifiable risk factors & contributing conditions for AF/AFL

• Genetics/strong family history of early-onset AF • Increased age • Chronic lung disease • Sick sinus syndrome (“tachy-brady syndrome”)	• Existing structural heart disease, including prior MI, cardiac surgery, valvular heart disease, congenital heart disease/cardiomyopathy • Pericardial disease

Modifiable risk factors can contribute development & progression of atrial fibrillation & can be additive in increasing the risk of atrial fibrillation. They are believed to cause atrial fibrillation via electrical & structural remodelling of the atria, neurohormonal activation, inflammation & autonomic changes. Although the evidence is limited, modifying these risk factors is expected to decrease the incidence and/or progression of atrial fibrillation & may offer other cardiovascular benefits.

Table 3B. Targets for potentially-modifiable risk factors

Risk Factor	Recommendation
Hypertension	Target ≤ 130/80 mmHg at rest
Diabetes	Target HbA1c ≤ 7.0%
Coronary heart disease	
Heart failure / Left Ventricle (LV) dysfunction/ cardiomyopathy	Ensure on guideline-directed optimal medical therapy
Supraventricular tachycardia, including Wolff-Parkinson-White syndrome	Ablation
Thyroid dysfunction	Treat to normalize thyroid stimulating hormone (TSH) levels
Obstructive sleep apnea	CPAP for moderate to severe OSA (AHI ≥ 15/h)
Obesity	Target at least 10% sustained weight loss and/or BMI < 27 kg/m^2
Alcohol consumption (acute or chronic)	Limit to ≤ 1 standard drink per day. Abstinence may be preferred in some patients.
Tobacco	Complete abstinence from tobacco products
Sedentary lifestyle	Moderate intensity aerobic exercise > 30 mn/d for 3-5d/wk Resistance exercise 2-3d/wk
Competitive endurance athletic activity, particularly in men	

4. Initial Atrial Fibrillation Investigations

In addition to ECG documentation of AF/AFL, further baseline & subsequent investigations are given in Tables 4A & 4B, including suggestions of appropriate criteria for ordering some of the tests.

Table 4A. Baseline tests to consider for all patients.

Test		Criteria for ordering
Blood tests	Complete blood count (CBC), electrolytes, creatinine, random glucose, progressive TSH	• If not done in last one month, unless recent change in clinical condition
	Lipid profile	• If not done in last 12 months
	Fasting glucose, HbA1c	• If random glucose abnormal, or • If BMI >35, or • If diagnosed as diabetic & not done in last 6 months
Imaging	Echocardiogram	• If not done in last 12 months, or • If new / worsening heart failure

Table 4B. Subsequent testing for selected patients.

	Test	Criteria for ordering
Blood tests	Creatine Kinase (CK), troponin	• If active myocarditis suggested by history: e.g., new/worsening heart failure, chest pain, fevers, arthralgia, upper respiratory tract infection
	NT-proBNP	• If clinical history suggests current heart failure
	Liver function/enzyme tests: albumin, alkaline phosphatase (ALP), alanine aminotransferase (ALT), total bilirubin, gamma-glutamyl transferase (GGT)	• If concerns about liver function, alcohol misuse

ECG & ambulatory monitoring	Holter monitor	Typically **not required**, except if needed to document the pattern of AF (see section 2), or concerns about suboptimal ventricular rate control in persistent AF
	Treadmill exercise test or stress imaging test, such as myocardial perfusion, stress echocardiography.	Typically **not required**, unless one of the following applies: • If possible *angina* that's not been investigated in last year, or • For assessment of persistent AF where symptoms suggest suboptimal *rate-control on exercise* & not already documented by other means (e.g. Holter)
	Ambulatory blood pressure monitoring	• If hypertension is not already diagnosed & a single automated office BP has been recorded as SBP **135-179** and/or DBP **90-109** & home BP monitoring is not available
Chest X ray		• If suspected significant **lung disease** & not done in last 6 months
Sleep study		• If symptoms suggest OSA: e.g., unrefreshing sleep, daytime sleepiness, partner reports snoring / apnea. Can use STOP-BANG questionnaire for assessment (www.stopbang.ca), or • If BMI >35

5. Management of the arrhythmia (rate- ± rhythm-control)

Guiding principles & initial approach to management:

A. These recommendations relate to the management of hemodynamically stable outAF. Management of AF in the Emergency room or inpatient settings has distinct considerations that are discussed elsewhere.

B. In all situations for rate- & rhythm-control, we recommend initial therapy with the **lowest dose** of the **safest therapy** that can achieve the goals of treatment, with escalation to more aggressive treatment as dictated by the progression of the illness.

C. It is common for a treatment strategy that has worked well for some time to control the symptoms of AF to begin to fail. This should prompt a renewed search for reversible triggers or drivers of AF, but such factors are often not identified & may be due to progression of AF.

D. These recommendations detail commonly used therapeutic options for rate- & rhythm-control for AF. We recognize that there is variability in the level of comfort among primary care physicians in prescribing cardiovascular mediations, in particular antiarrhythmic drugs. It is reasonable to seek either specialist advice (via Specialist Link) & in some cases formal consultation with a Cardiologist or Cardiac Electrophysiologist before initiating a rhythm control approach. Consultation with a Cardiac Electrophysiologist is required for patients considering catheter ablation for AF.

E. For an outpatient with newly diagnosed persistent AF, an initial approach of *appropriate anticoagulation* (see section **"Assessment & management of thromboembolic risk"**) & rate control, *ensuring their resting heart rate is <100 bpm* (see section **Long-term Rate Control**), has a good chance of improving their symptoms & minimizing their risk of complications from AF. This can allow time for other more complex decisions which may require specialist input (e.g., considering rhythm-control, cardioversion etc.). Rate control can usually be achieved with simple & safe medications, commonly prescribed in primary care (e.g., β-blockers, non-dihydropyridine calcium channel blockers).

Selection of a Rate or Rhythm Control Strategy

A. Figure 5A shows the Canadian Cardiovascular Society's suggested algorithm for selection of a rate or rhythm control strategy for AF treatment. Note the distinction between paroxysmal & persistent AF.

B. a single documented & treated episode of AF, especially if it was associated with a known trigger & they have no prior history of similar symptoms, likely do not warrant initiation of daily rate or rhythm control therapy.

Such patients should nevertheless receive the initial investigations listed above, be offered patient education & counselling about avoidance of triggers, & be provided an action plan in case of recurrence.

C. a **low burden** of paroxysmal AF, defined as **episodes occurring no more than once every month**, can often be successfully managed with intermittent (or "pill-in-the-pocket") antiarrhythmic drug therapy:

Appropriate candidates:	☒Contraindications:
❑ Symptomatic sustained AF episodes (≥2h) that occur <1x/month ❑ Absence of severe disabling symptoms during AF ❑ Ability to comply with instructions for PiP	• Prior myocardial infarction, severe LVD, significant structural heart disease • Hypotension during AF (SBP <100mmHg) • Sinus node dysfunction or known significant post-AF conversion pauses > 5 s • ECG conduction abnormality: PR >200 ms, QRS duration >120 ms

- The initial attempt at oral PiP must occur in an emergency department or other setting with capabilities for continuous cardiac monitoring & resuscitation. It can be helpful to provide a note explaining the process for presentation to the emergency department staff.

Procedure for oral PiP therapy		
❶Take immediate release *AV nodal blocking agent* 15-30 minutes after symptom onset:	**Diltiazem 60 mg,** or **verapamil 80 mg,** or **metoprolol 25 mg**	
❷ 30 minutes later, give a *Class Ic* antiarrhythmic agent:	>=70 kg	< 70kg
	Flecainide 300 mg or **propafenone 600 mg**	**Flecainide 200 mg** or **propafenone 450 mg**

- Patients who have a successful & uncomplicated initial trial of PiP therapy can take subsequent doses independently. They should be cautioned to *rest for at least 6h* after PiP therapy, preferably with a support person available if they require assistance. They should be advised *not to repeat the PiP procedure within 24h* & to present to the ED in the event of failure to convert within 6-8h or if they develop significant new symptoms.

D. Most recurrent paroxysmal or persistent AF will require rate and/or rhythm control therapy. To date, there is no compelling evidence for a prognostic advantage of either a rate or rhythm control strategy. Therefore, the goal for selecting an initial treatment strategy is to reduce or eliminate symptoms of AF while minimizing treatment-related toxicity.

E. Initial rhythm control therapy for persistent AF usually involves electrical cardioversion ± adjuvant antiarrhythmic drugs. In the Calgary Zone, elective cardioversions are performed by cardiologists at acute care sites, so referral to a cardiologist is needed. See table for deciding on this approach:

Initial rhythm control (electrical cardioversion ± antidysrhythmics) approach	
Preferred if:	☒ Likely not appropriate if:
❑ **AF diagnosis <1 year, even if few symptoms** ❑ **Highly symptomatic AF** ❑ **Dysrhythmia-induced or tachycardia-induced cardiomyopathies that can be affected by AF** ❑ **Structural heart disease that can be affected by AF**	• **Longstanding** (≥3 years) persistent AF • **Asymptomatic** recurring paroxysmal or persistent AF • Multiple **markers of poor response**: ❑BMI >40kg/m^2 ❑severe left atrial enlargement ❑severe, chronic valvular/myocardial disease ❑uncontrolled hypertension ❑diabetes mellitus ❑untreated obstructive sleep apnoea • **Dementia or frailty** syndrome due to non-cardiac disease

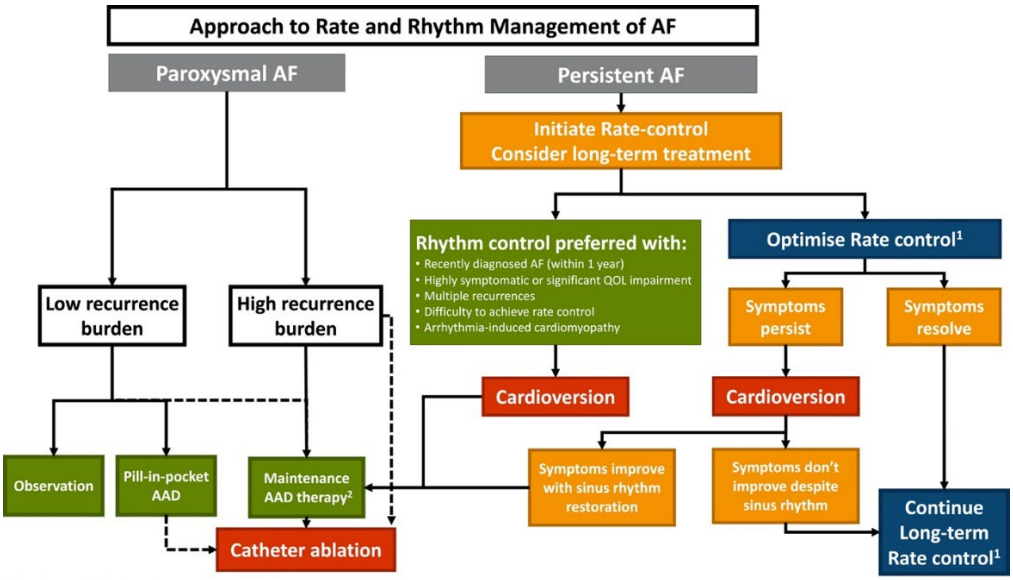
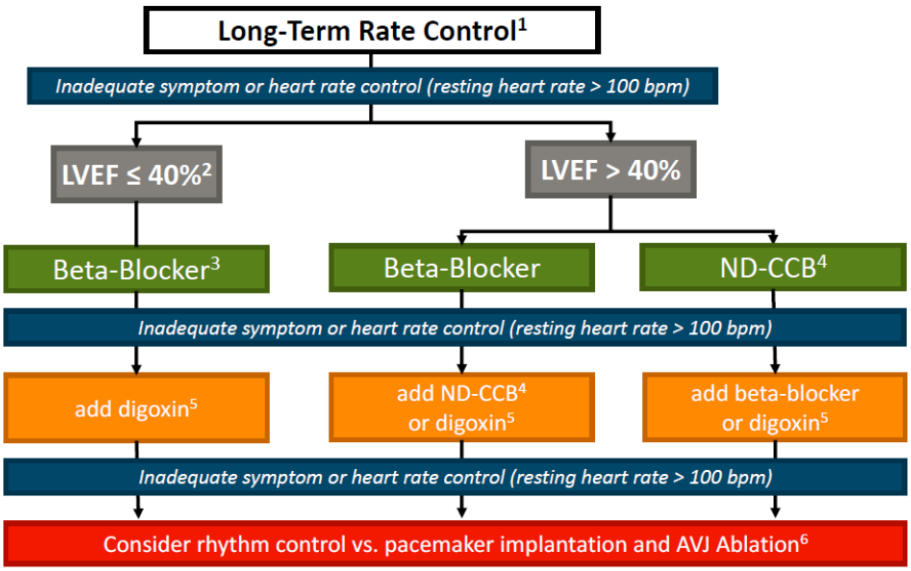


Figure 5A. Overview of rate & rhythm control therapy for AF. From: Andrade JG, et al. The 2020 CCS/Canadian Heart Rhythm Society Comprehensive Guidelines for the Management of Atrial Fibrillation. *Can J Cardiol*. 2020;36:1847-1948.

Long-term Rate Control

Figure 5B outlines the approach recommended by the *Canadian Cardiovascular Society* for long-term management of rate control of AF. Here, we include guidance about selection of therapies & treatment targets, & a listing of available medications & their dosing.



[1]Consider AF symptom burden, possibility of adverse drug reactions and patient preference.
[2]Consider catheter ablation in patients with co-existing atrial fibrillation and heart failure.
[3]Evidence-based beta-blockers proven to reduce mortality (bisoprolol, carvedilol, metoprolol) are recommended
[4]Non-dihydropyridine calcium channel blockers (diltiazem, verapamil).
[5]Digoxin is most beneficial in addition to first-line agents in those who fail to achieve satisfactory symptom or heart rate control, or as monotherapy in sedentary individuals with side-effects or contraindications to first-line agents. Therapeutic drug monitoring may be useful in adjusting digoxin dose.
[6]Consider cardiac resynchronisation therapy prior to AV junction ablation in those with reduced LVEF.

Figure 5B. Algorithm for long-term rate control of AF. From: Andrade JG, et al. The 2020 CCS/Canadian Heart Rhythm Society Comprehensive Guidelines for the Management of Atrial Fibrillation. *Can J Cardiol*. 2020;36:1847-1948.

A. **Treatment targets:** Although the ideal heart rate target for control of AF is unknown, the most important targets are the control of tachycardia-related symptoms such as palpitation, exertional limitation & prevention of the development (or exacerbation) of heart failure due to uncontrolled ventricular rates. Based on small & inconclusive randomized studies, the CCS recommends a **resting rate of ≤100 bpm** as adequate control in relatively asymptomatic persons.

   i. Some **structural** heart disease may require stricter heart rate targets (e.g., <**80** bpm at **rest**, <**110** bpm with **modest exercise**) for symptom control

   ii. Some persistent AF may have adequate resting heart rate control, but **residual exertional symptoms**: a **24h Holter** monitor or treadmill **exercise test** can help to identify rate control during exertion. Patients undergoing Holter monitoring should be reminded to perform their usual daily activities & make use of the symptom diary in order to establish symptom-rhythm correlation. We place greater weight on the **hourly average rates** contained in the detailed reports as the peak instantaneous rate can be misleading.

   iii. In difficult-to-control heart rates despite maximising rate lowering therapy, remember to search for extrinsic factors driving the tachycardia such as anemia, hyperthyroidism, hypoxia or uncontrolled heart failure.

B. Choice of medical therapy for rate control. Table 5A, adapted from the 2020 CCS AF Guideline, lists commonly-used oral agents for rate control of AF.

   i. **Non-dihydropyridine calcium channel blockers** (ND-CCB) or *β-adrenergic blockers* (βB) provide similar heart rate lowering effects as initial therapy, but ND-CCB have fewer side effects. In the absence of LVD, ND-CCB may thus be preferred.

   ii. Digoxin is rarely used for rate control due to its lack of potency & narrow therapeutic window but can be an effective adjunct when maximally tolerated dose of a ND-CCB or βB are insufficient.

Table 5A. Medical therapy for rate control.

Drug Class	Agent	Oral therapy dosing		Comments
		Initial	Typical target	
βB	Atenolol	25 mg daily	100 mg daily	➲ Agents preferred in the presence of… ☑ Hypertension or CAD: **atenolol** or **metoprolol** ☑ LVD: **bisoprolol** or **carvedilol** (carvedilol is less effective for rate control but associated with improved LV function) ☒ Contraindicated in presence of pre-excitation or bronchospasm risk ✷ Adverse effects: *bradycardia, hypotension, fatigue, & depression, erectile dysfunction*
	Bisoprolol	2.5 mg daily	10 mg daily	
	Carvedilol	6.25 mg twice daily	25 mg twice daily	
	Metoprolol	12.5-25 mg twice daily	100 mg twice daily	
ND-CCB	Diltiazem	IR 30 mg q6h-q8h or ER 120 mg daily	IR 120 mg q6h-q8h or ER 360 mg daily	➲ Once daily preparations are preferred ☒ Contraindicated in presence of pre-excitation, LVD or CHF ✷ Adverse effects: bradycardia, *hypotension, constipation* (verapamil) *& oedema* (diltiazem)
	Verapamil	IR 80 mg tid or SR 120-240 mg daily	IR 120 mg tid or SR 360 mg daily	

Digoxin	0.125 mg daily (loading not usually required in outpatient)	0.125-0.25 mg daily	➲ Rarely used alone for rate control ➲ Monitor for toxicity & serum levels ☒ Use with care in *elderly* females & those with *CKD* or concomitant *potassium-wasting diuretic* (e.g., furosemide or thiazide) ✸ Adverse effects: *GI upset, blurred vision, proarrhythmia*

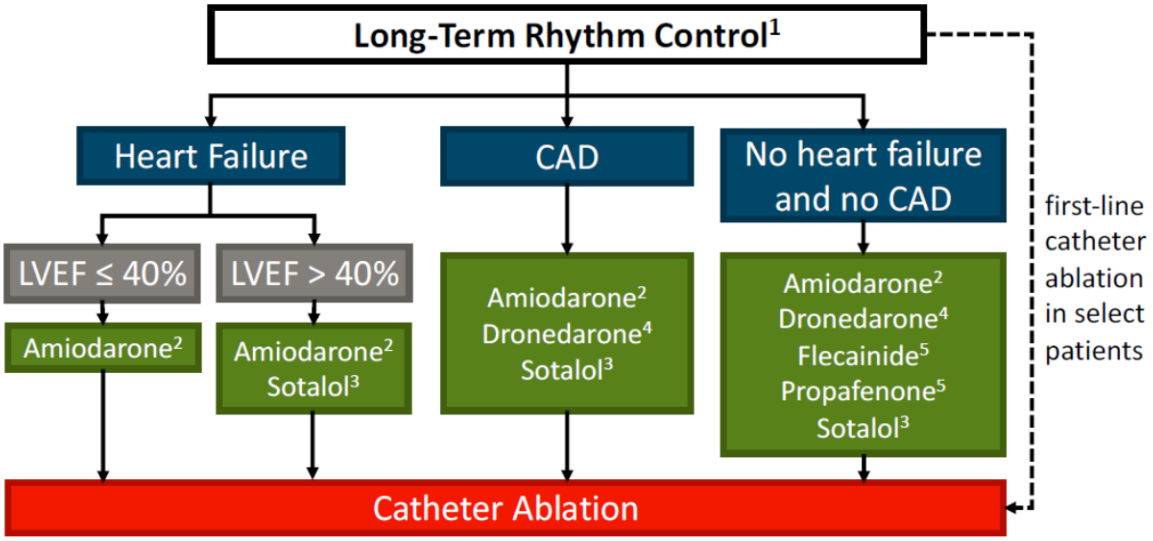
Legend: CAD, coronary artery disease; IR, immediate release; ER, extended release; LVD, left ventricular dysfunction; ND-CCB, non-dihydropyridine calcium channel blockers; SR, sustained release; q6h, every 6h; q8h, every 8h

Primary Care considerations for long-term rhythm control in AF/AFL

In many cases, initiation of rhythm-control agents, & choice of medication, will be beyond the scope of practice of the Primary Care team. Providers uncomfortable or inexperienced with the use of rhythm-control agents should consider referral to a Cardiologist or Cardiac Electrophysiologist (e.g., via Specialist Link). However, patients established on rhythm-control may be followed in Primary Care & the information below regarding dosing & monitoring of rhythm-control agents may be helpful.

Details regarding long-term rhythm control in AF/AFL

Figure 5C outlines the approach recommended by the *Canadian Cardiovascular Society* for long-term management of rhythm control of AF. Here, we include guidance about selection of therapies & treatment targets, & a listing of available medications & their dosing, as well as when to consider referral for catheter ablation.



[1]Consider AF symptom burden, possibility of adverse drug reactions and patient preference
[2]Consider alternative AADs or ablation rather than long-term amiodarone (significant risk of extra-cardiac side-effects)
[3]Sotalol should be used with caution in patients with high-risk features for torsade de pointes (≥ 65 years, women, reduced renal function, concomitant potassium-wasting diuretics). Sotalol is not recommended for patients with left ventricular hypertrophy.
[4]Dronedarone should be used with caution in combination with digoxin
[5]Class IC agent should be combined with AV-nodal blocking agent. Use caution for patients with left ventricular hypertrophy.

Figure 5C. Algorithm for long-term rhythm control of AF. From: Andrade JG, et al. The 2020 Canadian Cardiovascular Society/Canadian Heart Rhythm Society Comprehensive Guidelines for the Management of Atrial Fibrillation. *Can J Cardiol*. 2020;36:1847-1948.

A. All patients starting pharmacological rhythm control therapy should be informed that the goal is improvement in *cardiovascular outcomes, symptoms* & healthcare utilization (not necessarily elimination of all AF episodes)

B. Patients should also be informed that all rhythm control medications can have significant risks, including the risk of **pro-arrhythmia**, which can in rare circumstances be fatal.

C. The choice of antiarrhythmic drug used for long-term pharmacologic rhythm control be defined according to patient characteristics (See Figure 5C).

D. An **AV nodal-blocking agent** (ND-CCB or βB) should be used in combination with class I antiarrhythmic drugs (e.g., flecainide or propafenone) to avoid pro-arrhythmia.

E. We recommend using *amiodarone* as rhythm control only when potential for drug toxicities is considered & other choices are contraindicated or have failed.

✸ Pharmacological rhythm control should be avoided in concomitant advanced sinus or AV nodal disease unless the patient has a pacemaker or implantable defibrillator. Decisions in such cases should be guided by a Cardiologist or Cardiac Electrophysiologist.

Table 5B, adapted from the 2020 CCS AF Guideline, gives guidance on the available drugs, dosing & monitoring for pharmacological rhythm control.

Table 5B. Medical therapy for rhythm control.

Class	Drug	Dosage	Contraindications/precautions	Monitoring & parameters for discontinuing
Ic	Flecainide	**Starting dose:** 50-75 mg twice daily **Max dose:** 150 mg twice daily	Marked sinus bradycardia Advanced conduction disease Brugada syndrome LVH (ECG or echo) with repolarization abnormality (ECG) Active or history of CAD Clinical heart failure or LVEF ≤40% Severe hepatic impairment Myasthenia gravis (do not use propafenone)	**ECG** 5-7 days after initiation or ↑ dose ↓ dose or stop medication if: ☒**PR** interval >**200** ms, or higher-grade AV block ☒**QRS** duration: > **150** ms or ↑>**25%** from baseline
	Propafenone	**Starting dose:** 150 mg 3 times daily **Max dose:** 300 mg 3 times daily		
III	Sotalol	**Starting dose:** 40 mg twice daily **Max dose:** 160 mg twice daily	Advanced age (>75 years of age) Marked sinus bradycardia Advanced AV node disease Pre-existing QT_c prolongation LV dysfunction (LVEF ≤40%) LVH (ECG or echo) with repolarization abnormality (ECG) Renal impairment (CrCl <40 mL/min)	**ECG** 5-7 days after initiation or ↑ dose*, initiation of other QT-prolonging drugs* or *if hypokalaemia* ↓ dose or stop medication if **QT_c**: ≥**500** ms or ↑>**25%** from baseline Additional monitoring suggestions for **amiodarone**: ❑ Bloodwork - **electrolytes, creatinine, liver** panel, progressive **TSH**: baseline & every 3-6 months ❑ **CXR ± PFT**: baseline & repeat if new *dyspnea or cough* ❑ **Eye exam** at baseline & every year ☒ **Discontinue** if : liver *transaminases* >3 times upper limit of normal, uncontrolled *thyroid* dysfunction, suspected *pulmonary* or *ocular* toxicity
	Dronedarone	400 mg twice daily	Long-standing persistent or permanent AF Pre-existing QT_c prolongation LV dysfunction (LVEF ≤40%) HF with recent decompensation Previous amiodarone-induced lung or liver injury	
	Amiodarone	**Loading Dose:** 400 mg twice daily ×1wk→ 400 mg once daily ×2wk; or 400 mg daily ×1wk **Maintenance:** 100-200 mg daily	Marked sinus bradycardia Advanced conduction disease Pre-existing QT_c prolongation Active hepatitis or significant chronic liver disease Advanced pulmonary disease Uncontrolled thyroid dysfunction	

Legend: CAD, coronary artery disease; CrCl, creatinine clearance; CXR, chest X Ray; ECG, electrocardiogram; echo, echocardiography; LVEF, left ventricular ejection fraction; LVH, left ventricular hypertrophy; max, maximum; MI, myoardial infarction, PFT, full pulmonary function testing; QT_c, corrected QT interval, wk, week; ↑ , increased

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Catheter ablation of AF

A. **Preamble:** Catheter ablation is a procedure performed by Cardiac Electrophysiologists. In Calgary Zone, these are performed at the Foothills Medical Centre. Patient information about the procedure can be found here. The cornerstone of catheter ablation for AF is electrical *isolation* of the *pulmonary veins*, which are the origin of AF episodes in most. In symptomatic AF despite pharmacological rhythm control, catheter ablation is superior to additional trials of antiarrhythmic medication for control of AF **symptoms** & improvement in **quality of life**. Short term trials have also found that ablation confers a **rhythm control** advantage. However, except in heart failure & severe LVD, there is no high-quality data showing that catheter ablation improves survival or prevents other major cardiovascular outcomes in AF. Therefore, for the majority of patients, *catheter ablation should be chosen based on a desire for a reduction in AF symptoms and/or the desire to reduce the potential for adverse effects of rate and/or rhythm control medical therapy*.

B. **Outcomes:** Depending on the metric used, catheter ablation is successful in controlling AF in 50-80% of patients after a first procedure, over a 2-3 year time frame. Some experience atrial dysrhythmias, including AF/AFL, in the 1st few weeks after an ablation procedure as healing occurs, & these may settle within months. In our experience, 20-25% of patients require a ***second procedure*** to achieve satisfactory control if AF or other atrial dysrhythmias occur ***>3 months*** *after the initial ablation*. ✸ Each ablation procedure is associated with a 4-5% risk of complications, which include serious events such as *pericardial tamponade, stroke & mortality (1:1000)*. Complications can occur around the time of the procedure or up to 4 weeks after (e.g., atrioesophageal fistula).

C. **Who should be referred for AF catheter ablation?**

- ❑ Patients with recurrent paroxysmal or persistent AF with **significant symptoms** despite an attempt with pharmacological **rhythm control** (or patients who decline pharmacological rhythm control).
- ❑ symptomatic AF **intolerant** of rate or rhythm control pharmacotherapy e.g. highly trained athletes or others with significant sinus bradycardia
- ❑ In select cases ablation might be preferred as *first-line* therapy (e.g., rather than maintenance oral antiarrhythmic therapy) for recurrent AF in whom long-term rhythm control is desired. However, it must be recognised that AF catheter ablation is an elective procedure that currently has a significant waiting time, so even if a 'first-line' ablation strategy is desired, interim drug therapy is usually required.

Features that reduce the effectiveness of rhythm control therapy (see **"Rate or Rhythm Control Strategy"** section E), or in whom permanent AF has been accepted, need not be referred for ablation.

D. **How to refer for catheter ablation:** For patients who are followed by the AF Clinic or a Cardiac Electrophysiologist, referrals can be directed to the relevant clinic. Other patients can be referred via the Cardiac Arrhythmia Central Access & Triage (see section **"When & how to refer)**

Distinct features of atrial flutter (AFL)

Atrial fibrillation & atrial flutter are closely related, & often co-exist in the same patients. both AF & AFL can generally be managed as per the recommendations above. For **AFL alone**, there are a few relevant distinctions in management of the rate or rhythm.

A. AFL is a stable atrial circuit that often presents with a regular ventricular rhythm. In the absence of rate-controlling medication, the ventricular rate may be around **150** bpm, symptoms may be modest or absent, & patients may present initially with a tachycardia-mediated cardiomyopathy.
B. Some AFL can experience very rapid rates *(>260* bpm) due to 1:1 AV conduction. This can typically occur on *exercise* (e.g., causing exertional presyncope / syncope), or in the presence of Class 1c antiarrhythmic medications *without adequate AV node blockade*.
C. Unlike AF, AFL is more *often persistent* as opposed to paroxysmal - even initial episodes may not resolve spontaneously. Unlike AF, obtaining adequate pharmacological rate control is more difficult, **rhythm control** is more effective & therefore the preferred management in most cases without concomitant AF.
    i. For an **initial** episode of persistent AFL: electrical or pharmacological **cardioversion** should be attempted after an appropriate period of oral anticoagulation therapy.
    ii. For **recurrent** AFL: referral to a Cardiac Electrophysiologist for catheter **ablation** is an accepted first line approach for rhythm control. This procedure has a medium-term success rate of 95% with a 5% recurrence rate, & a 1-2% risk of complications.
    iii. successful ablation for AFL remain at high risk for development of AF (up to 50% within 3-5 years). Therefore, patients should be instructed to monitor for *symptoms* & seek an ECG for diagnosis in case of recurrent symptoms. The decision whether to continue oral anticoagulant therapy in this setting needs to be individualized, typically in consultation with a Cardiac Electrophysiologist.

6. Assessment & management of thromboembolic risk

A. Atrial fibrillation & Atrial flutter is an independent risk factor for stroke & all patients should have their thromboembolic risk assessed & managed. As per Canadian guidelines, **non-valvular AF/AFL** should have **oral anticoagulant** (**OAC**) therapy prescribed according to the "*CHADS-65*" algorithm shown in Figure 6A.
B. "**Valvular" AF/AFL** is defined as AF/AFL in the presence of *any mechanical heart valve or moderate/severe mitral stenosis* (rheumatic or non-rheumatic). Most of these patients should be on warfarin, not a DOAC. Note that a *bioprosthetic* valve replacement & AF can be considered as "*non*-valvular" AF, & the CHADS-65 algorithm can be used to assess their need for anticoagulation.
C. Assessment of thromboembolic risk is a dynamic process & will change as patients age (e.g., reach the age of 65) or develop comorbidities (e.g., hypertension, diabetes). Thus, for a patient not previously recommended for OAC by the CHADS-65 algorithm, this should be *reassessed* each time the patient is seen.

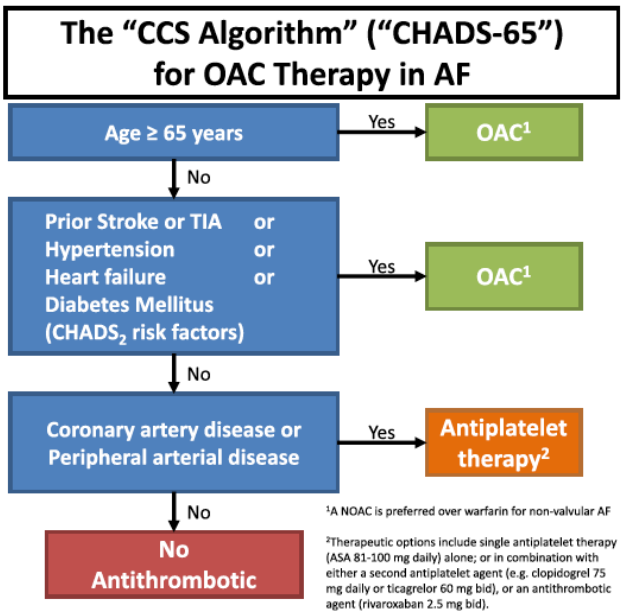

Figure 6A. Decision algorithm for antithrombotic therapy in AF: CCS "CHADS-65" algorithm. From: Andrade JG, et al. The 2020 Canadian Cardiovascular Society/Canadian Heart Rhythm Society Comprehensive Guidelines for the Management of Atrial Fibrillation. *Can J Cardiol*. 2020;36:1847-1948.

Anticoagulation tips & best practices

- *Deciding whether to anticoagulate:* the *CHADS-65* algorithm is simple to apply and, in most cases, formal consultation with Cardiology / Cardiac Electrophysiology should not be necessary. In more complex cases (see below), advice can be obtained via Specialist Link or an appropriate consult service.
- *Preferred OAC agent:* most non-valvular AF/AFL for whom OAC is indicated should be prescribed a direct oral anticoagulant agent (**DOAC: apixaban, dabigatran, edoxaban or rivaroxaban**), rather than warfarin. For patients in Alberta with Blue Cross plans, coverage can be obtained by filling out a Special Authorisation form. Coverage requires that the patient has tried warfarin for at least 2 months, or that there is a contraindication to warfarin, or there are reasons why INR testing is impractical or not feasible (e.g., remote location, foreign travel, difficult phlebotomy).
- *Preferred DOAC dose:* care should be taken to avoid under-dosing DOACs when the full dose is recommended. The main benefits of these agents in clinical trials, compared to warfarin, were seen with *full dosing*. Dosing recommendations are given in Table 6A, including circumstances where dose reduction is advised.

Table 6A. OAC dose adjustment recommendations for renal dysfunction.

CrCl	Warfarin	Apixaban	Dabigatran	Edoxaban	Rivaroxaban
CrCl >50 mL/min	Dose adjusted for INR 2.0-3.0	5 mg BID†	150 mg BID*	60 mg daily∞	20 mg daily
CrCl 30-49 mL/min	Dose adjusted for INR 2.0-3.0	5 mg BID†	Consider 110 mg BID	30 mg daily	15 mg daily
CrCl 15-29 mL/min	No RCT Data**	Very limited RCT Data§	No RCT Data¶	Very limited RCT Data¶	No RCT Data
CrCl <15 mL/min (or on dialysis)	No RCT Data‡	Very limited RCT Data¶	No RCT Data¶	No RCT Data¶	Very limited RCT Data¶

BID, twice daily; CrCl, creatinine clearance, INR, international normalized ratio; RCT, randomized clinical trial.
*Dabigatran 110 mg po BID is recommended if age ≥80 years, or ≥75 years with other bleeding risk factors including CrCl 30-50mL/min
†Apixaban 2.5 mg po BID is recommended if 2 of the 3 following criteria are present: 1) age ≥80 years, 2) body weight ≤60 kg, or 3) serum creatinine ≥133 μmol/L
∞Consider Edoxaban 30mg daily if weight ≤60 kg or concomitant potent P-Gp inhibitor therapy EXCEPT amiodarone or verapamil
**Dose adjusted warfarin has been used, but data regarding safety and efficacy is conflicting
‡Dose adjusted warfarin has been used, but observational data regarding safety and efficacy is conflicting and suggests harm.
§The ARISTOTLE trial included a small number of patients with a CrCl as low as 25 mL/min
¶Product monographs suggest the drug is contraindicated for this level of renal function.

From: Andrade JG, et al. The 2020 Canadian Cardiovascular Society/Canadian Heart Rhythm Society Comprehensive Guidelines for the Management of Atrial Fibrillation. *Can J Cardiol*. 2020;36:1847-1948.

- *Bleeding risk:* bleeding risk can be estimated using risk scores, e.g. the *HAS-BLED* score. *In most cases, even if a patient has an elevated risk of bleeding, there is still a net clinical benefit to prescribing OAC* agents, including in elderly patients. Measures to reduce bleeding risk can include: using a DOAC rather than warfarin, stopping antiplatelet agents (see below), reducing alcohol consumption, ensuring excellent BP control & prescribing gastroprotection for those at high risk of GI bleeding (e.g., a proton pump inhibitor).
- *AF/AFL already on aspirin or other antiplatelet agents:* when OAC is being initiated for AF/AFL, **most patients should have their antiplatelet agents discontinued** if they are taking them for *primary prophylaxis or if they have stable coronary or peripheral arterial disease* (no acute coronary syndrome [ACS], percutaneous coronary intervention [PCI] or peripheral arterial intervention in the last 12 months). This will significantly reduce the risk of bleeding, without increasing the risk of arterial thrombosis.
- *AF/AFL & ACS or PCI in the last 12 months:* these patients may require a period of dual or triple antithrombotic therapy (OAC + aspirin, clopidogrel or other antiplatelet agent). This can depend on their presentation & the type of stent (if any) used, & should be clarified with their Cardiologist or by contacting Specialist Link.
- *renal dysfunction:* Table 6A from the 2020 CCS AF guidelines specifies dose-adjustments & other considerations for renal dysfunction. For end-stage renal disease and/or those on haemodialysis, determining the appropriateness of anticoagulation should be a shared decision with the patient, their renal physician, their primary care physician +/- cardiology.
- *Other special populations:* deciding on appropriate anticoagulation is more complex in congenital heart disease, hypertrophic cardiomyopathy, significant liver disease, recent surgery, prior AF ablation, recent stroke, cancer & other complex medical comorbidities. In these circumstances advice could be sought from other specialists involved in the patient's care or through Specialist Link.

Patients on OACs undergoing procedures: management of antithrombotic medications around the time of an invasive procedure depends on the indication for anticoagulation, the urgency of the procedure & the type of procedure. Guidance can be found on the Thrombosis Canada website.

7. When & how to refer

7.1. Specialist referral may not be necessary if:

- **Single episode** of AF/AFL & risk-factors / comorbidities well-managed
- **Permanent** AF/AFL, with no/minimal symptoms, appropriate antithrombotic therapy & good rate control
- **Persistent** AF/AFL, with no/minimal symptoms, appropriate antithrombotic therapy, good rate control & no desire to restore sinus rhythm
- **Paroxysmal** AF/AFL, with no/minimal symptoms, appropriate antithrombotic therapy & good rate/rhythm control

7.2. **Specialist Referral.** Consider specialist referral in the following circumstances:

Referral to:	Consider referral if:	How to refer
On-call Cardiology or Cardiac Electrophysiology	❑ Significant recent change in exercise capacity or new heart failure ❑ Known history of Wolff-Parkinson-White syndrome ❑ Lightheaded or postural symptoms / systolic BP <90 mmHg ❑ Resting heart rate 120-140 bpm ❑ Complex anticoagulation decisions when other relevant factors are present (e.g., MI/ACS/coronary stenting/stroke in the last 12 months)	Calgary area paging system or RAAPID for urgent matters, Specialist Link for non-urgent matters
General Internal Medicine or Weight Management Clinic	❑ Optimization of co-morbid conditions (e.g., hypertension, diabetes, obstructive sleep apnea) ❑ Management of other contributing conditions (e.g., active thyroid dysfunction, lung disease) ❑ Significant obesity (e.g., BMI >35)	Outpatient referral to chosen Clinic
General Cardiology	❑ recent symptoms of angina or known coronary disease ❑ heart failure / LV dysfunction ❑ valvular heart disease or congenital heart disease ❑ persistent AF/AFL where DC cardioversion is being considered ❑ Patients where initial rhythm-control is being considered	Outpatient referral to chosen Cardiology Clinic
Calgary Atrial Fibrillation Clinic or a Cardiac Electrophysiologist	❑ Complex decisions regarding rate-control (e.g., pacemaker & AV node ablation when simple rate-control medications are ineffective or not tolerated) ❑ Complex decisions regarding rhythm-control (e.g., failed one or more antiarrhythmic drugs, consideration of AF ablation) ❑ Recurrent typical atrial flutter where ablation may be indicated ❑ Prior AF/AFL ablation with recurrences of dysrhythmia ❑ AF at a young age (e.g., <50 years old)	Calgary AF Clinic (FMC or SHC) referral Cardiac Arrhythmia Central Access & Triage

7.3 **Cardioversion referral.** Consider referral for cardioversion if:

- ❑ Patient unstable due to AF/AFL (call EMS or send patient to Emergency Department)
- ❑ New diagnosis of persistent AF/AFL, with duration <1 year
- ❑ Persistent AF/AFL, with rhythm control strategy chosen & not returned to sinus rhythm on antiarrhythmic drugs

BACKGROUND

About this pathway

- This pathway is intended provide evidence-based guidance to support primary care & specialty care providers in caring for Atrial Fibrillation/Flutter.

Authors & conflict of interest declaration

- This pathway was developed by a multi-disciplinary team led by primary care & cardiology. Names of participating reviewers & their conflict of interest declarations are available on request.

Pathway review process, timelines

- Primary care pathways undergo scheduled review every 3 years, or earlier if there is a clinically significant change in knowledge or practice. The next scheduled review is June 2025. However, we welcome feedback at any time. Please email comments to Info@calgaryareapcns.ca

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DISCLAIMER

This pathway represents evidence-based best practice but does not override the individual responsibility of health care professionals to make decisions appropriate to their patients using their own clinical judgment given their patients' specific clinical conditions, in consultation with patients/alternate decision makers. The pathway is not a substitute for clinical judgment or advice of a qualified health care professional. It is expected that all users will seek advice of other appropriately qualified & regulated health care providers with any issues transcending their specific knowledge, scope of regulated practice or professional competence.

PROVIDER RESOURCES

Advice options

Non-urgent advice is available to support family physicians.

- General Cardiology electronic advice is available across the Calgary Zone via Alberta Netcare eReferral eConsult (responses are received within five calendar days). Visit the eReferral Learning Centre for more information.
- In the Calgary Zone, specialistlink.ca connects family physicians & specialists in real time via a tele-advice line. Family physicians can request non-urgent advice online at specialistlink.ca or by calling **403-910-2551**. The service is available from 8h00-17h00 (with some exceptions), Monday to Friday (excluding statutory holidays). Calls are returned within two hours.

Community resources

Alberta Healthy Living Program: https://www.albertahealthservices.ca/info/Page13984.aspx		
For: a chronic condition & a primary care provider, that are physically able to attend sessions.	**Services offered:** Education: health professionals or volunteers teach disease-specific & general interest classes. Offered in English, Cantonese, Mandarin, & Punjabi. Nutrition Services: RDs facilitate various classes. Individual appointments available in Cantonese, Hindi, & Punjabi. Better Choices, Better Health: 6-week self-management workshop to live successful, healthier lives. Offered in English, Cantonese & Punjabi. Group Exercise: Supervised group exercise monitored by health professionals.	**Referral by:** healthcare providers (any) or patient self-referrals.
Weight management (Calgary Weight Management Centre): https://www.cwmc.ca/		
For: patients where overweight or obesity could be a contributing factor to their AF/AFL or comorbidities	**Services offered:** medical assessment & personalized treatment, including counseling regarding diet, physical activity & psychological aspects of weight management.	**Referral by:** healthcare providers.
Calgary AF Clinic FMC and Calgary AF Clinic SHC		
For: more complex decisions regarding rate- or rhythm-control, patients who may require ablation or a pacemaker, patients age <50	**Services offered:** patient education, AF nurse assessment, AF Clinic physician assessment, access to ablation, pacemakers	**Referral by:** Family physicians, nurse practitioners, ED physicians

Checklist to guide your review of this patient with a <u>new</u> diagnosis of AF/AFL

- ❑ Confirm **diagnosis** of AF/AFL: is there a 12-lead ECG of the dysrhythmia? Is the pattern of dysrhythmia established (first ever episode, paroxysmal AF, persistent AF, permanent AF)? Is the patient in AF/AFL right now?
- ❑ History & physical exam, including HR, BP, assessment for signs of heart failure. Check for "red flag" symptoms & signs, including: **angina, heart failure, syncope/presyncope**, a history of **Wolff Parkinson White** syndrome, resting **heart rate >120** bpm. Such patients may require specialist advice or urgent assessment & treatment.
- ❑ Assess & address **modifiable risk factors**. Consider appropriate referral for further testing or management of these conditions.
- ❑ Check if all appropriate initial **investigations** have been completed / ordered.
- ❑ Consider the need for antithrombotic therapy using the **CHADS-65** algorithm for non-valvular AF/AFL.
- ❑ Assess & manage the heart rate, aiming for a **resting** heart rate in AF/AFL of **<100** bpm.
- ❑ Consider whether *rhythm-control* is desirable. This may require specialist consultation regarding anti-arrhythmic drugs, cardioversion, etc.
- ❑ Decide on appropriate *follow-up*. Many patients can be followed in primary care if their risk factors/comorbidities are being well managed, they are appropriately anticoagulated, their resting heart rate is appropriate, & their symptoms are well controlled on rate- and/or rhythm-control medication.
- ❑ Consider appropriate further *referral* to:
    - ❑ Internal Medicine, for additional management of medical comorbidities (e.g., hypertension, diabetes, thyroid disease)
    - ❑ General Cardiology, for coronary disease, valvular heart disease, heart failure
    - ❑ Cardiac Electrophysiology / AF Clinic, for specialized decisions about rate or rhythm management (e.g., escalating antiarrhythmic therapy, ablation, requirement for a pacemaker).

Checklist to guide your <u>follow-up</u> of this patient with a known diagnosis of AF/AFL

- ❑ Has the **pattern** of AF changed?
- ❑ Have the patient's **symptoms or quality of life** changed?
- ❑ If they are in AF/AFL, is the **resting** heart rate **<100** bpm & is their **blood pressure** satisfactory?
- ❑ Are their **comorbidities & risk factors** being appropriately managed?
- ❑ Are they experiencing any **side-effects** from their medications?
- ❑ Are their rate- ± rhythm-**control** medications still effective? Do they need titration of the dosage of medications used for their dysrhythmia?
- ❑ Are they on appropriate antithrombotic therapy based on the **CHADS-65** algorithm for non-valvular AF? Remember that this score can change with age (65+) or with new comorbidities.
- ❑ Are there new factors/comorbidities affecting antithrombotic strategy & dosage such as change in renal function? Have they experienced any increased **risk of bleeding** since antithrombotic initiation?
- ❑ Do they need any further *investigations* e.g., repeat ECG, Holter monitor to assess 24 h rate-control?
- ❑ Do they need referral for specialist management of their comorbidities or their rhythm?
- ❑ Decide on appropriate *follow-up* interval.

PATIENT RESOURCES

MyHealth.Alberta.ca Atrial Fibrillation	https://myhealth.alberta.ca/health/AfterCareInformation/pages/conditions.aspx?hwid=ut2756
MyHealth.Alberta.ca Atrial Flutter	https://myhealth.alberta.ca/health/AfterCareInformation/pages/conditions.aspx?hwid=abs1806
Heart & Stroke Foundation AF information	https://www.heartandstroke.ca/heart/conditions/atrial-fibrillation
Canadian Cardiovascular Society patient resources	https://ccs.ca/companion-resources/
Cleveland Clinic AF information	https://my.clevelandclinic.org/health/diseases/16765-atrial-fibrillation-afib