The Canadian Cardiovascular Society's

ATRIAL FIBRILLATION GUIDELINES

Canadian Cardiovascular Society

Leadership. Knowledge. Community.

ATRIAL FIBRILLATION GUIDELINES

About this Pocket Guide

This pocket guide is a quick-reference tool that features diagnostic and treatment recommendations based on the CCS Atrial Fibrillation Guidelines (2010, 2012, and 2014).

These recommendations are intended to provide a reasonable and practical approach to care for specialists and allied health professionals. They are subject to change as scientific knowledge and technology advance and practice patterns evolve, and are not intended to be a substitute for clinical judgment. Adherence to these recommendations will not necessarily produce successful outcomes in every case.

Please visit www.ccs.ca for more information or additional resources.

Acknowledgements

The CCS would like to thank the many Atrial Fibrillation Guideline Panel members who contribute countless hours to guideline development as well as our knowledge translation program. We appreciate their dedication and commitment to the CCS and to this important atrial fibrillation management resource. A complete list of guideline authors can be found at www.ccs.ca and our Atrial Fibrillation Program co-chairs are listed below:

CCS Atrial Fibrillation Guideline Co-Chairs

Charles R. Kerr (2004-2006), Denis Roy (2004-2006), Anne M. Gillis (2009-2011), Allan C. Skanes (2010-2012), Jeff S. Healey (2011-2014), Atul Verma (2012-Present), Laurent Macle (2014-Present)

Table of Contents

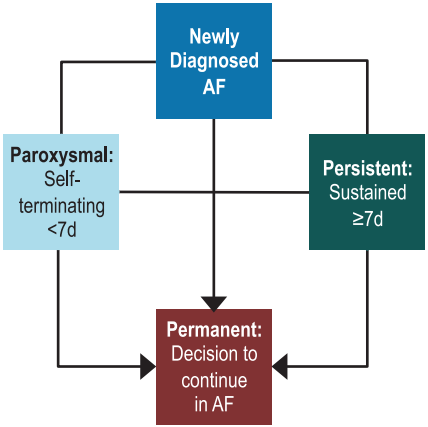
Baseline Evaluation for All Patients

History and Physical Exam	
Establish Pattern (New Onset, Paroxysmal, Persistent or Permanent) • Establish Severity (including impact on quality of life) • Identify Etiology • Identify reversible causes (hyperthyroidism, ventricular pacing, supra-ventricular tachycardia, exercise, etc) • Identify risk factors whose treatment could reduce recurrent AF or improve overall prognosis (i.e. hypertension, sleep apnea, left ventricular dysfunction, etc) • Take social history to identify potential triggers (i.e. alcohol, intensive aerobic training, etc) • Elicit family history to identify potentially heritable causes of AF (particularly lone AF)	• Determine thromboembolic risks • Determine bleeding risk to guide appropriate antiplatelet or antithrombotic therapy • Review prior pharmacologic therapy for AF, both for efficacy and adverse effects • Measure blood pressure and heart rate • Determine patient height and weight • Comprehensive precordial cardiac examination and assessment of jugular venous pressure, carotid and peripheral pulses to detect evidence of structural heart disease
12-Lead Electrocardiogram • Document presence of AF • Assess for structural heart disease (myocardial infarction, ventricular hypertrophy, atrial enlargement, congenital heart disease) or electrical heart disease (ventricular pre-excitation, Brugada syndrome)	• Identify risk factors for complications of therapy for AF (conduction disturbance, sinus node dysfunction or abnormal repolarization) • Document baseline PR, QT and QRS intervals.
Echocardiogram • Document ventricular size, wall thickness and function • Evaluate left atrial size (if possible, left atrial volume)	• Exclude significant valvular or congenital heart disease (particularly atrial septal defects) • Estimate ventricular filling pressures and pulmonary arterial pressure
Other • Complete blood count • Coagulation profile • Renal function	• Thyroid and liver function • Fasting lipid profile • Fasting glucose

Investigation	Potential Role
Chest radiography	Exclude concomitant lung disease, heart failure, baseline in patients receiving amiodarone
Ambulatory electrocardiography (Holter monitor, event monitor, loop monitor)	Document AF, exclude alternative diagnosis (atrial tachycardia, atrial flutter, AVNRT/AVRT, ventricular tachycardia), symptom-rhythm correlation, assess ventricular rate control
Treadmill exercise test	Investigation of patients with symptoms of coronary artery disease, assessment of rate control
Trans-esophageal echocardiography	Rule out left atrial appendage thrombus, facilitate cardioversion in patients not receiving oral anti-coagulation, more precise characterization of structural heart disease (mitral valve disease, atrial septal defects, cor triatriatum, etc)
Electrophysiologic Study	Patients with documented regular supra-ventricular tachycardia (i.e. atrial tachycardia, AVNRT/AVRT, atrial flutter) that is amenable to catheter ablation
Serum calcium and magnesium	In cases of suspected deficiency (i.e. diuretic use, gastro-intestinal losses) which could influence therapy (i.e. sotalol)
Sleep Study (ambulatory oximetry or poly-somnography)	In patients with symptoms of obstructive sleep apnea or in select patients with advanced symptomatic heart failure
Ambulatory blood pressure monitoring	In cases of borderline hypertension or to assess blood pressure control
Generic testing	In rare cases of apparent familial AF (particularly with onset at a young age) with additional features of conduction disease, Brugada syndrome or cardiomyopathy

Established Patterns and Severity of Atrial Fibrillation

Patterns of Atrial Fibrillation

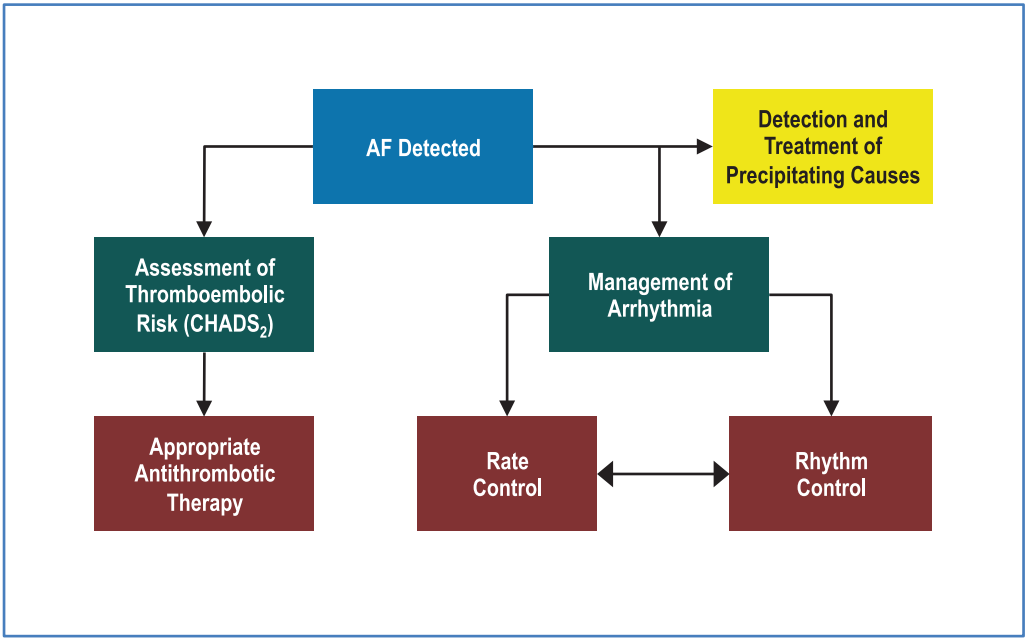


SAF Score*

SAF Score	Impact on QOL**
Class 0	Asymptomatic
1	Minimal effect on QOL
2	Minor effect on QOL
3	Moderate effect on QOL
4	Severe effect on QOL

** Dorian P, Cvitkovic SS, Kerr CR; et al. Can J Cardiol. 2006; 22(5): 383-386*

*** QOL = quality of life*

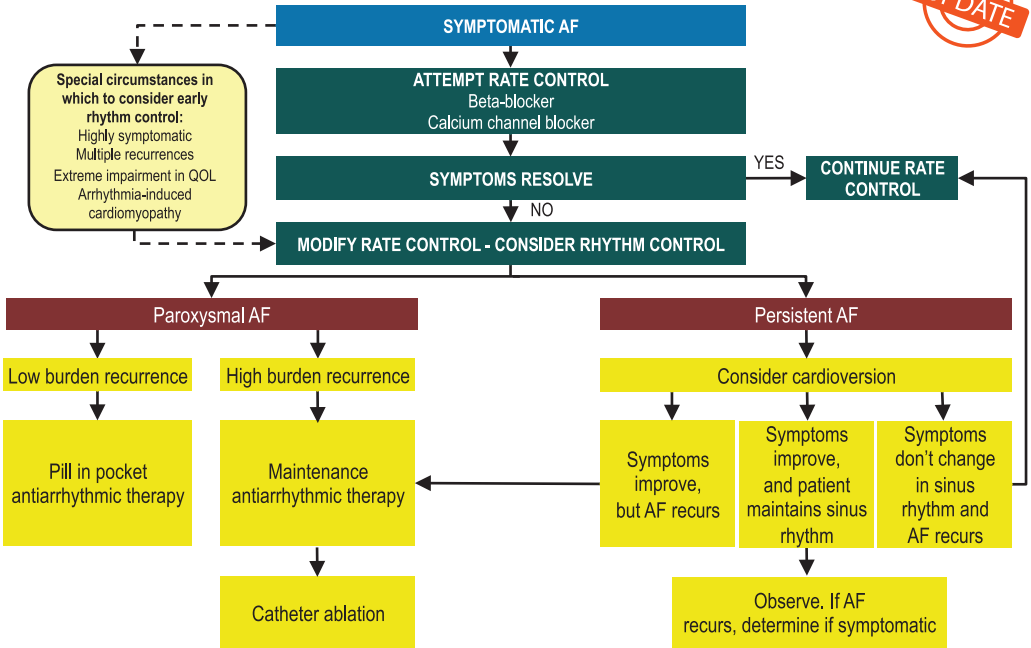

AF Detected
Detection and Treatment of Precipitating Causes
Assessment of Thromboembolic Risk ($CHADS_2$)
Management of Arrhythmia
Appropriate Antithrombotic Therapy
Rate Control
Rhythm Control

Major Goals of AF/AFL Arrhythmia Management

- Identify and treat underlying structural heart disease and other predisposing conditions
- Relieve symptoms
- Improve functional capacity/quality of life
- Reduce morbidity/mortality associated with AF/AFL
  - ✔ Prevent tachycardia-induced cardiomyopathy
  - ✔ Reduce/prevent emergency room visits or hospitalizations secondary to AF/AFL
- Prevent stroke or systemic thromboembolism

Recommendations

- We recommend that the goals of ventricular rate control should be to improve symptoms and clinical outcomes which are attributable to excessive ventricular rates. (Strong Recommendation, Low Quality Evidence)
- We recommend that the goals of rhythm control therapy should be to improve patient symptoms and clinical outcomes, and that these do not necessarily imply the elimination of all AF. (Strong Recommendation, Moderate Quality Evidence)

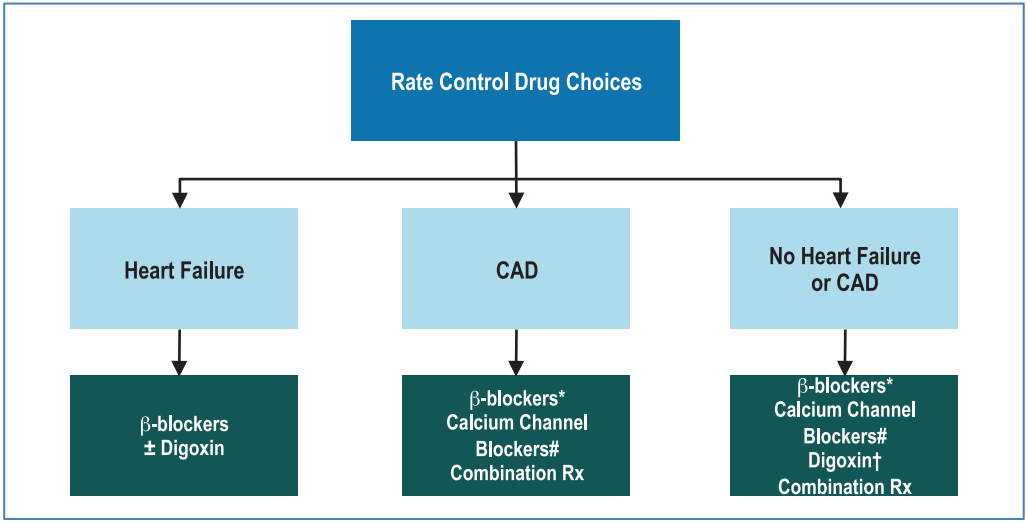


Rate and Rhythm Management

Rate Management - Recommendations

- We recommend that ventricular rate be assessed at rest in all patients with persistent and permanent AF or AFL (Strong Recommendation, Moderate Quality Evidence).
- We recommend that heart rate during exercise be assessed in patients with persistent or permanent AF or AFL and associated exertional symptoms (Strong Recommendation, Moderate Quality Evidence).
- We recommend that treatment for rate control of persistent or permanent AF or AFL should aim for a resting heart rate of <100 bpm (Strong Recommendation, High Quality Evidence).
- We recommend beta-blockers or nondihydropyridine calcium channel blockers as initial therapy for rate control of AF or AFL in most patients without a past history of myocardial infarction or left ventricular dysfunction (Strong Recommendation, Moderate Quality Evidence).
- We recommend beta-blockers as initial therapy for rate control of AF or AFL in patients with myocardial infarction or left ventricular systolic dysfunction (Strong Recommendation, High Quality Evidence).
- We recommend AV junction ablation and implantation of a permanent pacemaker in symptomatic patients with uncontrolled ventricular rates during AF despite maximally tolerated combination pharmacologic therapy (Strong Recommendation, Moderate Quality Evidence).

- We suggest that digoxin not be used as initial therapy for active patients and be reserved for rate control in patients who are sedentary or who have left ventricular systolic dysfunction. (Conditional Recommendation, Moderate Quality Evidence)
- We suggest that digoxin be added to therapy with beta-blockers or calcium channel blockers in patients whose heart rate remains uncontrolled. (Conditional Recommendation, Moderate Quality Evidence)
- We suggest that amiodarone for rate control should be reserved for exceptional cases in which other means are not feasible or are insufficient (Conditional Recommendation, Low Quality Evidence).



Drugs are listed in alphabetical order
**β-blockers preferred in CAD*
 # Non-dihydropyridine calcium channel blockers (diltiazem, verapamil)
†Digoxin may be considered as monotherapy only in particularly sedentary individuals

Managing Rate Control - Recommended Drugs

ß-Blockers

Drug	Dose	Adverse Effects
Atenolol	50 - 150 mg p.o. daily	bradycardia, hypotension, fatigue, depression
Bisoprolol	2.5 - 10 mg p.o. daily	as per atenolol
Metoprolol	25 mg - 200 mg p.o. bid	as per atenolol
Nadolol	20 - 160 mg p.o daily - bid	as per atenolol
Propranolol	80 - 240 mg p.o. tid	as per atenolol

Calcium Channel Blockers and Digoxin

Drug	Dose	Adverse Effects
Verapamil	120 - 480 mg p.o. daily 120 - 240 mg p.o. bid	bradycardia, hypotension, constipation
Diltiazem	120 - 480 mg p.o. daily 120 - 240 mg p.o. bid	bradycardia, hypotension, ankle swelling
Digoxin	0.0625 mg - 0.25 mg p.o. daily	bradycardia, nausea, vomiting,visual disturbance

- We recommend the optimal treatment of precipitating or reversible predisposing conditions of AF prior to attempts to restore or maintain sinus rhythm (Strong Recommendation, Low Quality Evidence).

- We recommend a rhythm-control strategy for patients with AF or AFL who remain symptomatic with rate-control therapy or in whom rate-control therapy is unlikely to control symptoms (Strong Recommendation, Moderate Quality Evidence).

- We recommend that the goal of rhythm-control therapy should be improvement in patient symptoms and clinical outcomes, and not necessarily the elimination of all AF (Strong Recommendation, Moderate Quality Evidence).

- We recommend use of maintenance oral antiarrhythmic therapy as first-line therapy for patients with recurrent AF in whom long-term rhythm control is desired (see Figures) (Strong Recommendation, Moderate Quality Evidence).

- We recommend intermittent antiarrhythmic drug therapy ("pill in the pocket") in symptomatic patients with infrequent, longer-lasting episodes of AF or AFL as an alternative to daily antiarrhythmic therapy (Strong Recommendation, Moderate Quality Evidence).

- We recommend that oral antiarrhythmic drug therapy should be avoided in patients with AF or AFL and advanced sinus or AV nodal disease unless the patient has a pacemaker or implantable defibrillator (Strong Recommendation, Low Quality Evidence).

Rhythm Management - Recommendations

- We recommend that an AV blocking agent should be used in patients with AF or AFL being treated with a class I antiarrhythmic drug (eg, propafenone or flecainide) in the absence of advanced AV node disease (Strong Recommendation, Low Quality Evidence).

- We recommend electrical or pharmacologic cardioversion for restoration of sinus rhythm in patients with AF or AFL who are selected for rhythm-control therapy and are unlikely to convert spontaneously (Strong Recommendation, Low Quality Evidence).

- We recommend pre-treatment with antiarrhythmic drugs prior to electrical cardioversion in patients who have had AF recurrence post cardioversion without antiarrhythmic drug pre-treatment (Strong Recommendation, Moderate Quality Evidence).

- We suggest that patients requiring pacing for the treatment of symptomatic bradycardia secondary to sinus node dysfunction, atrial or dual-chamber pacing be generally used for the prevention of AF (Conditional Recommendation, High Quality Evidence).

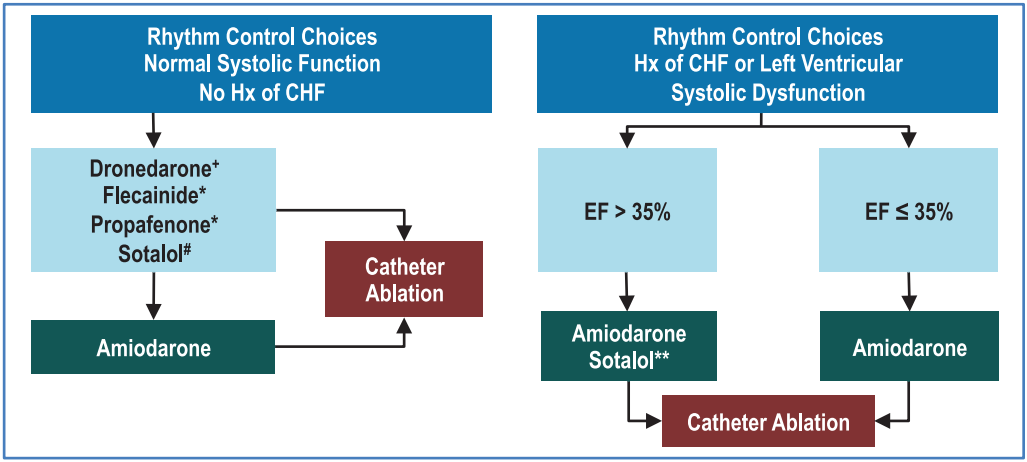
- We suggest that, in patients with intact AV conduction, pacemakers be programmed to minimize ventricular pacing for prevention of AF (Conditional Recommendation, Moderate Quality Evidence).

- We recommend that dronedarone not be used in patients with permanent AF nor for the sole purpose of rate control (Strong Recommendation, High Quality Evidence).
- We recommend dronedarone not be used in patients with a history of heart failure or a left ventricular ejection fraction < 40% (Strong Recommendation, Moderate Quality Evidence).

- We suggest dronedarone be used with caution in patients taking digoxin (Conditional Recommendation, Moderate Quality Evidence).

Practical Tip - Dronedarone is a reasonable choice for rhythm control in selected patients with AF. Typically, these would be patients with nonpermanent (predominantly paroxysmal) AF with minimal structural heart disease. Consideration should be given to monitoring for liver enzyme elevations within 6 months of initiating therapy with dronedarone.

Overview of Rhythm Management



Drugs are listed in alphabetical order

+ Dronedarone should be used with caution in combination with digoxin

- *Class I agents should be AVOIDED in CAD and should be COMBINED with AV-nodal blocking agents*

 # Sotalol should be used with caution in those at risk for torsades de pointes VT (e.g. female, age > 65 yr, taking diuretics)

*** Sotalol should be used with caution with EF 35-40% and those at risk for torsades de pointes VT (e.g. female, age > 65 yr, taking diuretics)*

Managing Rhythm Control - Recommended Drugs

Drug/Dose	Efficacy	Toxicity	Comments
Flecainide 50-150 mg BID	30-50%	Ventricular tachycardia Bradycardia Rapid ventricular response to AF or atrial flutter (1:1 conduction)	Contraindicated in patients with CAD or LV dysfunction Should be combined with an AV nodal blocking agent
Propafenone 150-300 mg TID	30-50%	Ventricular tachycardia Bradycardia Rapid ventricular response to AF or atrial flutter (1:1 conduction) Abnormal taste	Contraindicated in patients with CAD or LV dysfunction Should be combined with an AV nodal blocking agent
Amiodarone 100-200 mg OD (after 10g loading)	60-70%	Photosensitivity, Bradycardia, GI upset, Thyroid dysfunction, Hepatic toxicity, Neuropathy, Tremor, Pulmonary toxicity, Torsades de pointes (rare)	Low risk of proarrhythmia Limited by systemic side effects Most side effects are dose & duration related
Dronedarone 400 mg BID	40%	GI upset Bradycardia Hepatic toxicity	Should not be used for rate control or for rhythm control in patients with a history of CHF or LV EF < 40%. Should be used with caution when added to digoxin. Liver enzyme monitoring required. New agent – limited experience outside clinical trials.
Sotalol 80-160 mg BID	30-50%	Torsades de pointes Bradycardia Beta-blocker side effects	Should be avoided in patients at high risk of torsades de pointes VT – especially women >65 years taking diuretics or those with renal insufficiency QT interval should be monitored 1 week after starting Use cautiously when EF<40%

Catheter Ablation – Recommendations

- We recommend catheter ablation of AF in patients who remain symptomatic following an adequate trial of antiarrhythmic drug therapy and in whom a rhythm control strategy remains desired. (Strong Recommendation, Moderate Quality Evidence).

- We suggest catheter ablation to maintain sinus rhythm as first-line therapy for relief of symptoms in highly selected patients with symptomatic, paroxysmal atrial fibrillation. (Conditional Recommendation, Moderate Quality Evidence)

- We recommend curative catheter ablation for symptomatic patients with typical atrial flutter as first line therapy or as a reasonable alternative to pharmacologic rhythm or rate control therapy (Strong Recommendation, Moderate Quality Evidence).

- In patients with evidence of ventricular preexcitation during AF, we recommend catheter ablation of the accessory pathway, especially if AF is associated with rapid ventricular rates, syncope, or a pathway with a short refractory period (Strong Recommendation, Low Quality Evidence).

- In young patients with lone, paroxysmal AF, we suggest an electrophysiological study to exclude a re-entrant tachycardia as a cause of AF; if present, we suggest curative ablation of the tachycardia (Conditional Recommendation, Very Low Quality Evidence).

- **Practical Tip** - AF ablation should not be considered as an alternative to oral anticoagulation. If a patient has a high thromboembolic risk profile, then the patient should continue oral anticoagulation even after successful AF ablation. Studies of long-term monitoring have consistently shown asymptomatic episodes of AF both prior to and following ablation. Initiation of oral anticoagulation should also not be delayed when indicated in patients pending referral for AF ablation.

- **Practical Tip** - The following represents a typical, but not exclusive, profile of a patient who is referred for consideration of AF ablation today:
  - ✓ Age less than 80
  - ✓ Patients who are symptomatic with their AF
  - ✓ Patients who have tried but failed or are intolerant of antiarrhythmic drug therapy
  - ✓ Paroxysmal AF or short-standing persistent AF
  - ✓ Minimal to moderate structural heart disease (such as LV dysfunction or valvular disease)

Risk/Benefit Ratio for Ablation in Patients with Symptomatic AF

	Longstanding¶	Persistent	Paroxysmal
1st line	--	--	+
Failed 1st drug	--	+	+ +
Failed 2nd drug	+	+ +	+ + +
Failed multiple drugs	+ +	+ + +	+ + +

+ Balance of risk and benefit in favor of catheter ablation
¶ Ongoing symptomatic AF ≥ 1 year

Prevention of Stroke in AF/AFL

$CHADS_2$ Score

Risk Factor	Score
Congestive Heart Failure	1
Hypertension	1
Age ≥ 75	1
Diabetes Mellitus	1
Stroke/TIA/Thromboembolism	2
Maximum Score	6

CHA_2DS_2-VASc Score

Risk Factor	Score
Congestive Heart Failure	1
Hypertension	1
Age ≥ 75	2
Diabetes Mellitus	1
Stroke/TIA/Thromboembolism	2
Vascular Disease	1
Age 65-74	1
Female	1
Maximum Score	9

Prevention of Stroke in AF/AFL - Recommendations

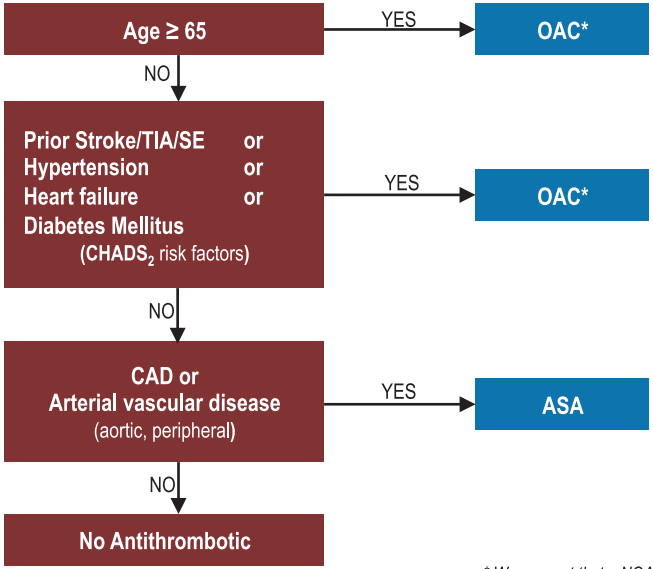
2014 UPDATE

- We recommend that all patients with AF or AFL (paroxysmal, persistent or permanent), should be stratified using a predictive index for stroke risk (for example, the "CCS algorithm" based on the $CHADS_2$ model). (Strong Recommendation, High Quality Evidence).
- We recommend that OAC therapy be prescribed for most patients with age ≥ 65 years or $CHADS_2$ ≥ 1 (the "CCS algorithm") (Strong Recommendation, Moderate Quality Evidence).
- We recommend that when OAC-therapy is indicated for patients with non-valvular AF, most should receive dabigatran, rivaroxaban, apixaban or edoxaban (when approved) in preference to warfarin. (Strong Recommendation, High Quality Evidence).
- We recommend that when OAC is indicated, warfarin be used rather than one of the NOACs for those patients with a mechanical prosthetic valve, those with rheumatic mitral stenosis and those with an CrCl of 15 - 30 mL/min (Strong Recommendation, Moderate Quality Evidence).
- We recommend that patients whose risk of stoke warrants OAC therapy, but who refuse any OAC, should receive ASA 81 mg/ day plus clopidogrel 75 mg/ day (Strong Recommendation, High Quality Evidence).

- We suggest that ASA (81 mg/day) be prescribed for patients with none of the risks outlined in the "CCS algorithm" (age < 65 years and no $CHADS_2$ risk factors) who have arterial vascular disease (coronary, aortic, or peripheral). (Conditional Recommendation, Moderate Quality Evidence)
- We suggest no antithrombotic therapy for patients with none of the risks outlined in the "CCS algorithm" (age < 65 years and no $CHADS_2$ risk factors) and free of arterial vascular disease (coronary, aortic, peripheral). (Conditional Recommendation, Low Quality Evidence)

The "CCS Algorithm" for OAC Therapy in AF

2014 UPDATE



Consider and modify (if possible) all factors influencing risk of bleeding on OAC (hypertension, antiplatelet drugs, NSAIDSs, excessive alcohol, labile INRs) and specifically bleeding risks for NOACs (low CrCl, age ≥ 75, low body weight)**

*** may require lower dosing*

* *We suggest that a NOAC be used in preference to warfarin for non-valvular AF.*

- We recommend that patients with AF who are receiving OAC should have their renal function assessed at least annually by measuring serum creatinine and calculating CrCl and should be regularly considered for the need for alteration of OAC drug and/or dose changes based on CrCl (Strong Recommendation, Moderate Quality Evidence).

For antithrombotic therapy of CKD patients, therapy should relate to CrCl as follows:

- **CrCl >30 mL/min**: We recommend that such patients receive antithrombotic therapy according to their risk as determined by the "CCS algorithm" as detailed in recommendations for patients with normal renal function (Strong Recommendation, High Quality Evidence).

- **CrCl 15-30 mL/min and not on dialysis**: We suggest that such patients receive antithrombotic therapy according to their risk as determined by the "CCS algorithm" as for patients with normal renal function. The preferred agent for these patients is warfarin (Conditional Recommendation, Low Quality Evidence).

- **CrCl <15mL/min (on dialysis)**: We suggest that such patients not routinely receive either OAC or ASA for stroke prevention in AF (Conditional Recommendation, Low Quality Evidence).

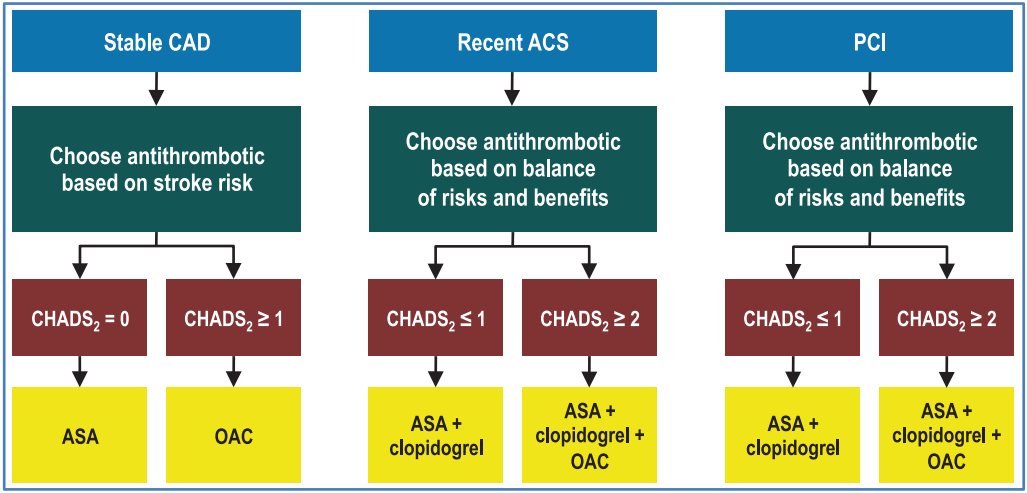
Therapeutic Choices in Patients with Chronic Kidney Disease and Stroke Risk Factors ($CHADS_2 \geq 1$)

CrCl	Warfarin	Dabigatran	Rivaroxaban	Apixaban
CrCl ≥ 60 mL/min	Dose adjusted for INR 2.0-3.0	150 mg bid or 110 mg bid	20 mg daily	5 mg bid†
CrCl 50-59 mL/min	Dose adjusted for INR 2.0-3.0	150 mg bid or 110 mg bid	20 mg daily	5 mg bid†
CrCl 30-49 mL/min	Dose adjusted for INR 2.0-3.0	150 mg bid or 110 mg bid	15 mg daily	5 mg bid Consider 2.5 mg bid†
CrCl 15-29 mL/min (not on dialysis)	No RCT Data‡	No RCT Data§	No RCT Data¶	5 mg bid (for CrCl > 25 mL/min only) Consider 2.5 mg bid†
CrCl < 15 mL/min (on dialysis)	No RCT Data‡	No RCT Data¶	No RCT Data¶	No RCT Data

† Consider Apixaban 2.5 mg po bid if age ≥ 80 and body weight ≤ 60 kg.
‡ Dose adjusted warfarin has been used, but observational data regarding safety and efficacy is conflicting.
§ Modelling studies suggest that dabigatran 75 mg bid might be safe for patients with CrCl 15-29 mL/min, but this has not been validated in a prospective cohort.
¶ No published studies support a dose for this level of renal function; product monographs suggest the drug is contraindicated for this level of renal function.

Antithrombotic Management of AF/AFL in CAD - Recommendations

- We suggest that patients with AF or AFL who have experienced ACS or who have undergone PCI, should receive antithrombotic therapy selected based on a balanced assessment of their risks of stroke, of recurrent coronary artery events and of hemorrhage associated with the use of combinations of antithrombotic therapies, which in patients at higher risk of stroke may include aspirin plus clopidogrel plus OAC. (Conditional Recommendation, Low Quality Evidence).



Management of AF in the ED – Recommendations

2014 UPDATE

- For patients with no high-risk factors of stroke with cardioversion (recent stroke or TIA within 6 months; rheumatic heart disease; mechanical valve) and clear AF onset within 48 hours or therapeutic OAC therapy for ≥ 3 weeks, we recommend that they may undergo cardioversion in the ED without immediate initiation of anticoagulation. After attempted or successful cardioversion, antithrombotic therapy should be initiated as per the CCS algorithm (Strong Recommendation, Moderate-Quality Evidence)
- For patients at high risk of stroke with cardioversion (not receiving therapeutic OAC therapy for ≥ 3 weeks with any of the following: AF episode duration not clearly < 48 hours, stroke or TIA within 6 months, rheumatic heart disease, mechanical valve), we recommend optimized rate control and therapeutic OAC for 3 weeks before and at least 4 weeks after cardioversion. (Strong Recommendation, Moderate-Quality Evidence)

- We suggest that patients at high risk of stroke* during or after cardioversion may undergo cardioversion guided by transesophageal echocardiography. Anticoagulation should be initiated immediately using intravenous heparin or low molecular weight heparin prior to cardioversion. OAC therapy should then be initiated and maintained for at least 4 weeks post cardioversion. Patients should also be referred for early expert follow-up to review ongoing antithrombotic therapy, based upon stroke risk factors. (Conditional Recommendation, Moderate Quality Evidence)

- We suggest that after conversion to sinus rhythm has been achieved, whether antiarrhythmic drug therapy is indicated should be based on the estimated probability of recurrence and the symptoms during AF. Long-term therapy will need to be determined by an appropriate outpatient consultation (Conditional Recommendation, Low Quality Evidence).

Management of AF in the ED – Recommendations

2014 UPDATE

Is Patient Stable?

YES

NO

Immediate Risk for Stroke?

Low Risk

1. Clear onset <48 hours, or
2. Therapeutic OAC ≥ 3 wks

High Risk**

No therapeutic OAC ≥ 3 weeks and one of:

1. Onset >48 hours or unknown, or
2. Stroke/TIA <6 months, or
3. Mechanical or rheumatic valve disease.

Unstable – AF causing:

1. Hypotension, or
2. Cardiac ischemia, or
3. Pulmonary edema

Rate-control

Pharmacological or electrical CV at 150-200 J
(Immediate anticoagulation in ED before CV not required)

Therapeutic OAC for 3 weeks before outpatient CV

Trans-esophageal echocardiography (TEE) guided CV

Consider urgent electrical CV if rate control not effective

Antithrombotic therapy
- Initiate (or continue) OAC upon discharge from ED if age ≥ 65 or $CHADS_2$ ≥ 1
- Otherwise, initiate ASA if CAD/Vascular Disease
- Early follow-up to review long-term OAC

Antithrombotic therapy
- Continue OAC for ≥4 weeks after CV
- Early follow-up to review long-term OAC

Antithrombotic therapy
- Initiate immediate OAC* in ED and continue for ≥4 weeks
- Early follow-up to review long-term OAC

Antithrombotic therapy
- Initiate immediate OAC* in ED and continue for ≥4 weeks if 'high risk' **
- Early follow-up to review long-term OAC

* ***Immediate OA*** = *a dose of OAC should be given just prior to cardioversion – either a novel direct oral anticoagulant (NOAC) or a dose of heparin or low molecular weight heparin with bridging to warfarin if a NOAC is contraindicated.*

Management of AF in the ED – Recommendations

Recommended IV Drugs for Rate Control

Drug	Dose	Risks
Diltiazem*	0.25 mg/kg IV bolus over 10 min; repeat at 0.35 mg/kg IV	Hypotension, bradycardia
Metoprolol	2.5-5mg IV bolus over 2 min; up to 3 doses	Hypotension, bradycardia
Verapamil*	0.075-0.15mg/kg over 2 min	Hypotension, bradycardia
Digoxin	0.25 mg IV each 2 h; up to 1.5mg	Bradycardia, Digitalis toxicity

*Calcium-channel blockers should not be used in patients with heart failure or left ventricular dysfunction

Recommended Drugs for Pharmacological Conversion

Drug	Dose	Efficacy	Risks
Class 1 A Procainamide	15-17 mg/kg IV over 60 min	++	5% hypotension
Class IC* Propafenone Flecainide	 450-600 mg PO 300-400 mg PO	 +++ +++	Hypotension, 1:1 flutter, bradycardia
Class III Ibutilide	1-2 mg IV over 10-20 min Pre-treat with MgSO4 1-2 gm IV	++	2-3% Torsades de pointes

*Class IC drugs should be used in combination with AV nodal blocking agents (beta-blockers or calcium-channel inhibitors). Class IC agents should also be avoided in patients with structural heart disease.

- We recommend that in a patient with AF or atrial flutter, a decision to interrupt antithrombotic therapy for an invasive procedure must balance the risks of a thromboembolic event (as indicated by a higher $CHADS_2$ score, mechanical heart valve, or rheumatic heart disease) with those of a bleeding event (as indicated by a higher HASBLED score and procedures with higher bleeding risks) (Strong Recommendation, Low Quality Evidence).

- We suggest that interruption of antithrombotic therapy in a patient with AF or AFL is not necessary for most procedures with a very low risk of bleeding and many procedures with a low risk of bleeding including cardiac device implantation (pacemaker or implantable defibrillator)(see Table) (Conditional Recommendation, Low Quality Evidence, High Quality Evidence for cardiac device implantation).

- We recommend that interruption of antithrombotic therapy in a patient with AF or AFL will be necessary for most procedures with an intermediate or high risk of major bleeding (see Table) (Strong Recommendation, Low Quality Evidence).

Bleeding Risks for Various Invasive / Surgical Procedures

High Risk	Intermediate Risk	Low Risk	Very Low Risk
• neurosurgery (intracranial or spinal surgery) • cardiac surgery (coronary artery bypass or heart valve replacement) • major vascular surgery (abdominal aortic aneurysm repair, aortofemoral bypass) • major urologic surgery (prostatectomy, bladder tumour resection) • major lower limb orthopedic surgery (hip/knee joint replacement surgery) • lung resection surgery • intestinal anastomosis surgery • selected invasive procedures (kidney biopsy, prostate biopsy, cervical cone biopsy, pericardiocentesis, colonic polypectomy or biopsies)	• other intraabdominal surgery • other intrathoracic surgery • other orthopedic surgery • other vascular surgery	• laparoscopic cholecystectomy • laparoscopic inguinal hernia repair • dental procedures • dermatologic procedures • ophthalmologic procedures* • coronary angiography • gastroscopy or colonoscopy • selected invasive procedures (bone marrow aspirate and biopsy, lymph node biopsy, thoracentesis, paracentesis, arthrocentesis) • cardiac device implantation surgery (pacemaker or implantable defibrillator)**	• dental extractions (1 or 2 teeth) or teeth cleaning • skin biopsy or skin cancer removal • cataract removal

** Selected ophthalmic procedures may be high risk such as those with retrobulbar block*

***Based on results from BRUISE CONTROL trial (Birnie et al, N Engl J Med 2013; 368:2084-2093)*

- When a decision to interrupt aspirin or clopidogrel therapy for an invasive procedure has been made for a patient with AF or AFL, we suggest that the interruption begin 5-7 days prior to the day of the procedure excepting those procedures with a very high risk of bleeding when we suggest that the interruption begin 7-10 days prior to the procedure (Conditional Recommendation, Low Quality Evidence).
- When a decision to interrupt warfarin therapy for an invasive procedure has been made for a patient with AF or AFL, we suggest that the interruption begin 5 days prior to the procedure and that a procedure with a low bleeding risk may proceed when the INR is <1.5 and a procedure with an intermediate or high bleeding risk may proceed when the INR is <1.2 (Conditional Recommendation, Low Quality Evidence).
- When a decision to interrupt warfarin therapy for an invasive procedure has been made for a patient with AF or AFL, we suggest that bridging therapy with LMWH or UFH be instituted when the INR is below that patient's therapeutic INR target in a patient at high risk of thromboembolic events ($CHADS_2$ ≥3, mechanical heart valve, stroke or TIA within three months, rheumatic heart disease) (Conditional Recommendation, Low Quality Evidence).

- We recommend that when LMWH or UFH bridging is used for an invasive procedure such therapy be started prior to the procedure when the INR is less than 2.0 and be stopped 24 hours prior to the procedure for LMWH and 4-6 hours prior to the procedure for UFH (Strong recommendation, Low Quality Evidence)

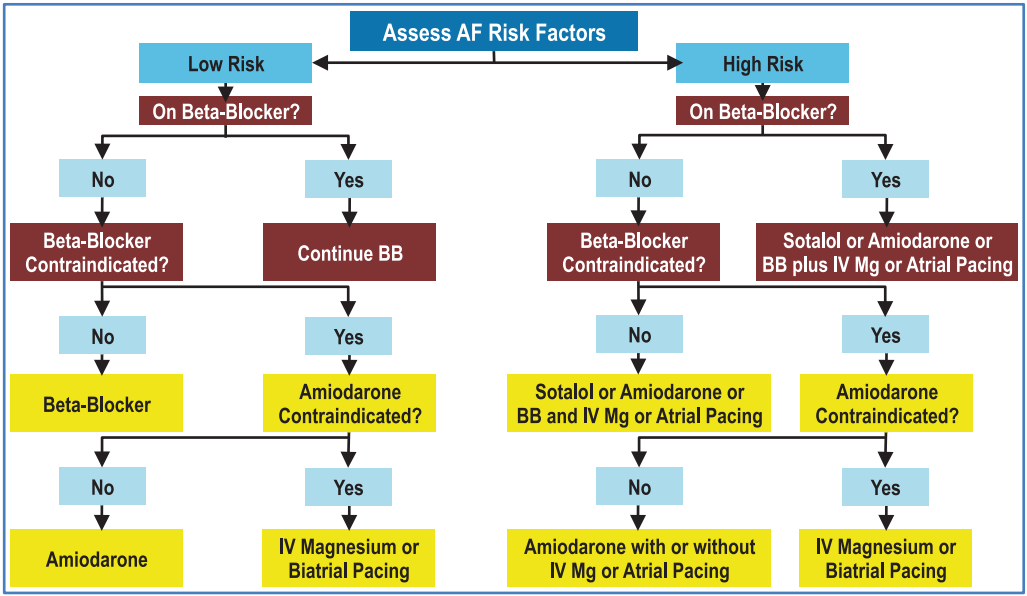
- When a decision to interrupt apixaban or rivaroxaban therapy for an invasive procedure has been made for a patient with AF or AFL, we suggest that the interruption begin 1-2 days prior to the day of a procedure with a low risk of major bleeding and 2-3 days prior to the day of a procedure with an intermediate or high risk of major bleeding (Conditional Recommendation, Low Quality Evidence).
- When a decision to interrupt dabigatran therapy for an invasive procedure has been made for a patient with AF or AFL, we suggest that the interruption begin 1-2 days prior to the day of a procedure with a low risk of major bleeding and 2-3 days prior to the day of a procedure with an intermediate or high risk of major bleeding provided that the CrCl is ≥80 mL/min (Conditional Recommendation, Low Quality Evidence). The longer portion of these ranges should be used in patients with CrCl 50-80 mL/min, an additional day should be added for patients with CrCl 30-50 mL/min. In case the patient's CrCl is found to be <30 mL/min, one more day of dabigatran withdrawal should be added (Conditional Recommendation, Low Quality Evidence).

2014 UPDATE

- When LMWH or UFH bridging is used for an invasive procedure, we suggest that such therapy be restarted after the procedure when hemostasis is established (usually 24 hours for a procedure with a low risk of bleeding and 48-72 hours for a procedure with an intermediate or high risk of bleeding) in prophylactic dosages for the first 24 to 72 hours and then increased to therapeutic dosages. Bridging is then continued until an OAC is therapeutic (Conditional Recommendation, Low Quality Evidence).

- When warfarin, ASA, or clopidogrel therapy has been interrupted for an invasive procedure, we suggest that such therapy be restarted after the procedure when hemostasis is established (usually 24-48 hours for a procedure with a low risk of bleeding and 48-72 hours for a procedure with an intermediate or high risk of bleeding) (Conditional Recommendation, Low Quality Evidence).

- When apixaban, dabigatran, or rivaroxaban therapy has been withdrawn for an invasive procedure, we suggest that such therapy be restarted after the procedure one day after hemostasis is established (usually 48 hours for a procedure with a low risk of bleeding and 72 hours for a procedure with an intermediate or high risk of bleeding) (Conditional Recommendation, Low Quality Evidence).


Assess AF Risk Factors
Low Risk
High Risk
On Beta-Blocker?
On Beta-Blocker?
No
Yes
No
Yes
Beta-Blocker Contraindicated?
Continue BB
Beta-Blocker Contraindicated?
Sotalol or Amiodarone or BB plus IV Mg or Atrial Pacing
No
Yes
No
Yes
Beta-Blocker
Amiodarone Contraindicated?
Sotalol or Amiodarone or BB and IV Mg or Atrial Pacing
Amiodarone Contraindicated?
No
Yes
No
Yes
Amiodarone
IV Magnesium or Biatrial Pacing
Amiodarone with or without IV Mg or Atrial Pacing
IV Magnesium or Biatrial Pacing

Prophylactic Therapies for the Prevention of Post-Operative Atrial Tachyarrhythmias

Therapy	Dosage*	Cautions	Adverse Effects
Pre-op beta blocker	in usual therapeutic dose (i.e. metoprolol 50 mg) PO q12h or q8h for at least 2 pre-op days, day of surgery, and at least 6 post-op days	reactive airways disease, decompensated CHF	sinus bradycardia AV block hypotension bronchospasm
Pre-op amiodarone	10 mg/kg/day (rounded to nearest 100 mg) divided into two daily PO dosages for 6 pre-op days, day of surgery, and 6 post-op days	30%-50% reduction in the dosages of other drugs with antiarrhythmic or sinus/AV nodal effects and warfarin will be required	sinus bradycardia AV block hypotension torsade de pointes VT (rare) pulmonary toxicity (rare)
Post-op amiodarone	900 – 1200 mg IV over 24 hrs beginning within 6 hours of surgery, then 400 mg PO tid each of the next 4 days	30%-50% reduction in the dosages of other drugs with antiarrhythmic or sinus/AV nodal effects and warfarin will be required	sinus bradycardia AV block hypotension torsade de pointes VT (rare) pulmonary toxicity (rare)
Magnesium sulfate	1.5 gm IV over 4 hrs first pre-op day, immediately post-op, and next 4 post-op days. Other trials have omitted the pre-op dosage	renal failure	hypotension (rare) sedation (very rare) respiratory depression (very rare)

** Dosages used in the randomized studies vary widely and the optimal dosages for this indication have not been established. The dosages provided are those used in the largest positive trial of that therapy and are referenced to that study.*

Your CCS AF App Needs Updating!

iCCS replaces our individual guideline apps and contains the most up-to-date guideline information

Download the iCCS App today

For more information visit **CCS.CA/apps**

Please visit us at

www.ccs.ca

Canadian Cardiovascular Society

Leadership. Knowledge. Community.

Printing of this pocket guide made possible through funding provided by Bayer and the Bristol-Myers Squibb and Pfizer alliance.

Science For A Better Life

Bristol-Myers Squibb

Pocket Guide Version: September 2015

ATRIAL FIBRILLATION GUIDELINES