

Provincial Clinical Knowledge Topic

Atrial Fibrillation, Adult Emergency Department

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Revision History

Version	Date of Revision	Revision	Revised By
1.0	September 2015	New topic created and disseminated	
2.0	December 2015	<ul style="list-style-type: none"> - Removed D5 0.9% NaCl infusion from "bolus" list and move to list of "maintenance" infusions - Clarifications to rate control medications section - Changed target oxygen saturation from 92% to 90% - Added Heart Healthy diet - Removed transthoracic echo - Added optional repeat dose for verapamil - Adjusted wording related to Electrical Cardioversion 	Dr Michael Bullard Dr Ni Lam Dallas Belbeck
3.0	April 2016	<ul style="list-style-type: none"> - Initial energy setting changed to 150-200 joules to match CCS guidelines 	Dr Hall Erin Hayward Sarah Searle
4.0	December 2016	<ul style="list-style-type: none"> - Digoxin dose changed from from 0.01 to 0.015 mg/kg to 8 to 12 micrograms/kg 	Dr Ni Lam Sarah Searle
4.1	April 2017	<ul style="list-style-type: none"> - Figure 1. 2014 CCS Risk Stratification algorithm NO to right of CAD box changed to a YES 	Dr Ni Lam Sarah Searle

Important Information Before You Begin

The recommendations contained in this knowledge topic have been provincially adjudicated and are based on best practice and available evidence. Clinicians applying these guidelines should, in consultation with the patient, use independent medical judgment in the context of individual clinical circumstances to direct care. This knowledge topic will be reviewed periodically and updated as best practice evidence and practice change.

The information in this topic strives to adhere to Institute for Safe Medication Practices (ISMP) safety standards and align with Quality and Safety initiatives and accreditation requirements. Some examples of these initiatives or groups are: Health Quality Council Alberta (HQCA), Choosing Wisely campaign, Safer Health Now campaign etc.

While there are other published guidelines for the management of AF, the recommendations and suggestions in this document are based on the most updated Canadian Cardiovascular Society (CCS) guidelines.¹ Although not explicitly stated, these guidelines may also be applicable to the ED management of atrial flutter.

The PICO-D questions are key clinical questions that have been used to guide research using the **P**opulation/**P**roblem, **I**ntervention, **C**omparison, **O**utcome, **D**esign format. These questions are listed in Appendix A.

Links to PICO-D questions are throughout the document (example [PICO 1](#)). Click on the link with your mouse to follow the link. Under the PICO question heading you will find a link to return you to your initial place in the document.

Rationale

Atrial fibrillation (AF) is the most common cardiac arrhythmia presenting to the ED.^{2, 3} Clinically, AF is important because of potentially disabling symptoms and increased risk of stroke, transient ischemic attack (TIA), systemic embolism, heart failure and all-cause mortality.⁴⁻⁷ The prevalence of AF increases substantially with advancing age and more than 25% of Canadians over the age of 75 will develop AF.³ AF represents 0.5% of all ED visits and among patients 65 years or older who present to the ED with AF, 9% revisit the ED one or more times within 14 days.^{8, 9} Population-based data from Alberta found approximately 20% of patients are first diagnosed with AF in the ED and these patients have higher thromboembolic risk scores and are associated with a 2.4 times higher adjusted odds risk for stroke or mortality at one year.⁷ From 2012 – 2014, there were 12,901 Alberta ED visits related to AF with 2956 (22.9%) of those patients requiring hospital admission.¹⁰ Despite robust evidence that oral anticoagulation (OAC) therapy reduces risk of embolic events and is effective and safe¹¹⁻¹⁴, these therapies are under-utilized across all healthcare settings.^{15, 16} Cerebrovascular events related to AF are clinically more severe than those not associated with AF¹⁷ and treatment is associated with considerable costs to the healthcare system.¹⁸ An opportunity exists to identify and address key barriers in AF care including early guideline-based intervention for stroke prevention. Given this data, best practices are needed to help guide the following key AF issues encountered in the ED:

- (1) Management strategies for recent-onset (first detected, recurrent paroxysmal, persistent) and symptomatic permanent AF (symptoms, onset, reversible causes, rate versus rhythm control).
- (2) Oral anticoagulation use (stroke risk stratification schemes, bleeding risk schemes, pharmacodynamics, patient preferences, cost benefits)
- (3) Disposition and follow-up options (AF clinics, primary care physician, unattached patients).

Goals of Management

1. Airway, Breathing, Circulation (ABC): Protect airway, prevent aspiration, support ventilation, volume resuscitate as needed
2. Rule out signs or symptoms of cerebrovascular accident (CVA)/transient ischemic attack (TIA) and evaluate stroke risk using the 2014 CCS algorithm for oral anticoagulation (OAC) therapy (based on the CHADS2 model with incorporation of elements of CHA2DS2-Vasc score), henceforth referred to as CHADS65¹
3. Identify hemodynamically unstable AF patients, and determine if they require immediate cardioversion
4. Differentiate recent onset AF, which encompasses both paroxysmal AF (PAF; AF which terminates within 7 days of initial detection) and persistent recurrent AF (AF which persists beyond 7 days), from permanent AF (persistent AF where rhythm control is no longer pursued)
5. Determine when to use a rate control vs rhythm control strategy
6. Determine which recent-onset AF patients can be safely cardioverted in the ED
7. Communicate with patients to determine best management strategy (rate or rhythm control, with either initial chemical or electrical cardioversion)
8. Use standardized procedural sedation protocols to support electrical cardioversion
9. Communicate and establish a safe and cost effective evidence-based approach to anticoagulation with patients (i.e. use of HAS-BLED scoring system as a risk stratification tool)
10. Establish communication with a primary care physician and/or cardiologist/specialty AF clinic for each patient at discharge to ensure appropriate follow up
11. Provide safe and appropriate discharge planning and patient/family education

Nursing Assessment and Documentation

This section contains specific considerations related to this topic. Standard assessment and documentation practices should still be followed.

1. Triage Assessment

- Vital signs, including a glucose (as indicated)
- Canadian Emergency Department Information Systems (CEDIS) chief complaint with specific AF Canadian Triage and Acuity Scale (CTAS) modifiers¹⁹:
 - Palpitations / irregular heartbeat: acute onset, ongoing; chest pain; history or documented lethal arrhythmia; resolved.
 - Chest pain (cardiac features)
 - Shortness of Breath
 - Syncope/presyncope: Irregular pulse/change in rate; occurring during exercise; symptoms resolved; with prodromal symptoms or sudden position change.
 - Headache
 - Nausea/vomiting
 - General weakness
- CTAS Modifiers: Hemodynamic stability most likely first order modifiers while for “Palpitations” ‘history or documented lethal’ or ‘with chest pain, cardiac features’ are Level 2 special modifiers and ‘acute onset, ongoing’ is a Level 3 special modifier¹⁹
- Other modifiers available include:
 - Pain (acute central or chronic central with a scale 1-10/10)
 - Anticoagulant or Bleeding Disorder
 - Hemodynamic (vital signs at upper/lower ends of normal, hemodynamic compromise, shock)
 - Hypertensive (systolic blood pressure [sBP] 200-220 or diastolic blood pressure [dBP] 110-130 symptomatic or asymptomatic, sBP greater than 220 or dBP greater than 130 symptomatic or asymptomatic)
 - Respiratory Distress (mild or SpO2 92-94%, moderate or SpO2 92% or increased work of breathing, severe or SpO2 90% or fatiguing)

2. Initial Assessment/Documentation

- Presenting History: Time of onset, activity at time of onset, description of palpitations or sensation of rhythm irregularity, associated symptoms (nausea, vomiting, light-headedness), recent illness
- Past History: Previous AF- valvular (rheumatic mitral stenosis, mechanical or bio prosthetic valve, mitral valve repair) vs non-valvular AF, previous ED management (chemical vs electrical cardioversion vs rate control), previous complications (related to AF symptoms or from ED cardioversion/sedation)
 - Other medical history: hypertension (HTN), diabetes mellitus (DM), heart failure, previous cerebrovascular accident (CVA) or transient ischemic attack (TIA), coronary artery disease (CAD) or arterial vascular disease, thyroid disease
 - smoking, alcohol (ETOH), street drugs
- Medications and Allergies: All medications (including prescription, over the counter [OTC] and herbal medications)
- Systems Review:

- Respiratory: tachypnea, dyspnea
 - Cardiovascular: tachycardia, signs of dehydration, diaphoresis, chest pain, central and peripheral pulses, lung sounds, pedal edema and other signs of heart failure, rhythm strip interpretation
 - Neurological: mental status, signs of CVA
 - Gastrointestinal: nausea, vomiting, abdominal pain
3. Ongoing Assessment/Documentation:
- Respiratory: tachypnea, dyspnea
 - Cardiovascular: tachycardia, signs of dehydration, diaphoresis, chest pain, central and peripheral pulses, lung sounds, pedal edema and other signs of heart failure, rhythm strip interpretation
 - Neurological: mental status
 - Gastrointestinal: nausea, vomiting, abdominal pain

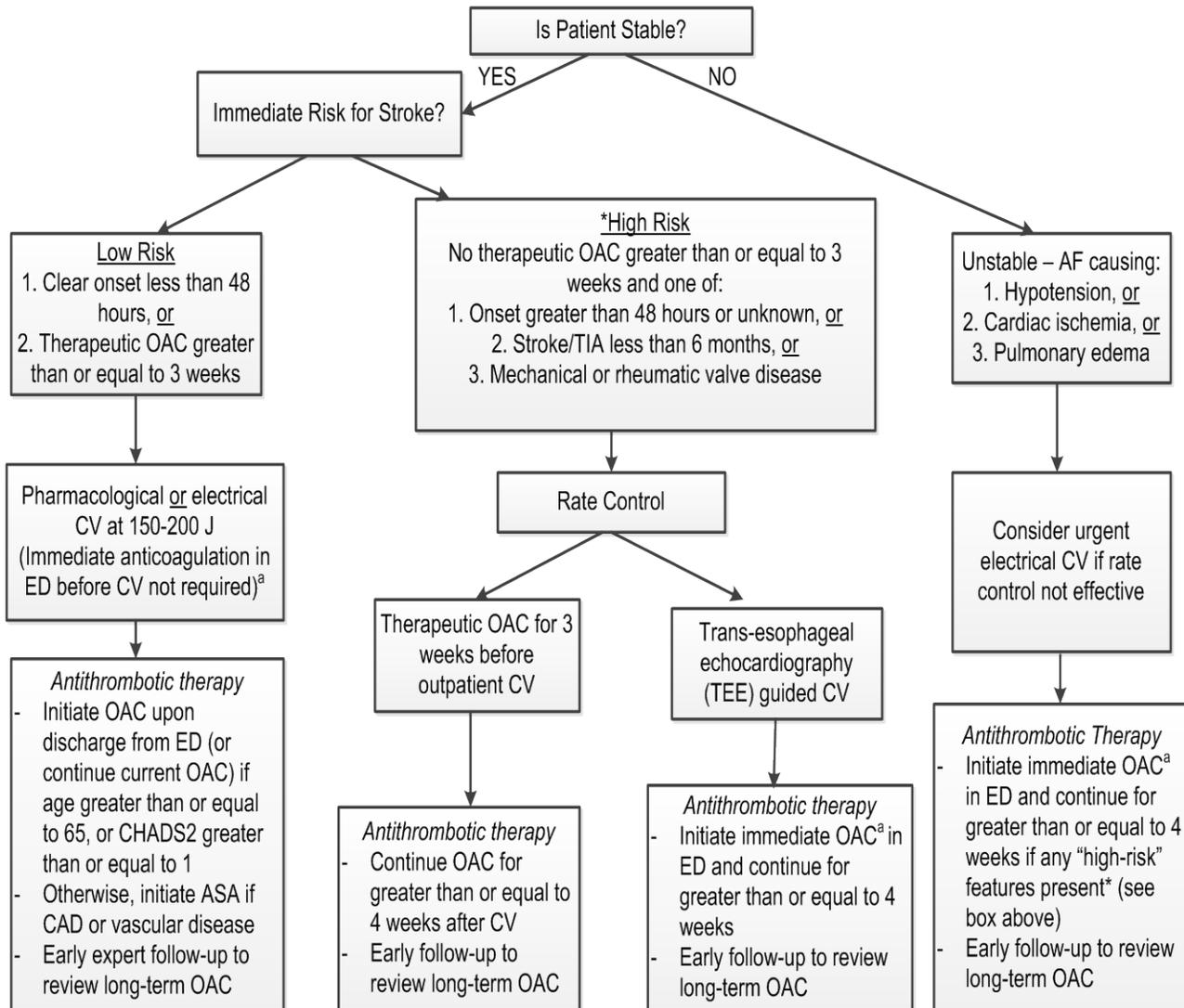
Physician Assessment and Documentation

This section contains specific considerations related to this topic. Standard assessment and documentation practices should still be followed.

1. History of Present Illness
 - Time of onset (goal is to clarify onset less than 48 hours), pattern of recurrence, description of palpitations or sensation of rhythm irregularity, associated symptoms (chest pain, syncope/presyncope, dyspnea)
2. Past History
 - Previous AF- valvular (rheumatic mitral stenosis, mechanical or bioprosthetic valve, mitral valve repair) versus non-valvular AF
 - Previous management (chemical versus electrical cardioversion versus rate control)
 - Previous complications (related to AF symptoms or from ED cardioversion/sedation)
 - Recent INR if on warfarin
 - Most recent electrocardiogram (ECG) rhythm
 - Thromboembolism risk using one of the scores below
3. Medications & Allergies
 - All medications (including prescription, over the counter [OTC] and herbal medications)
4. Review of Systems
 - Active symptoms related to cardiovascular and neurological systems
5. Social History
 - Smoking, alcohol (ETOH), drugs, prescription drug coverage
6. Physical Examination
 - Focused exam to assess hemodynamic stability, signs of congestive heart failure, or neurologic findings
7. Scoring Tools / Risk Scores
 - CCS algorithm for OAC therapy = CHADS65
 - CHADS2 and CHA2DS2-VASc criteria
 - Click [here](#) to view scoring tools in Appendix D: Stroke Risk and Bleeding Risk Calculation Tools.

Initial Decision Making

Figure 1. Decision algorithm for management of oral anticoagulation (OAC) therapy for patients who present to the ED with recent-onset atrial fibrillation (AF) requiring rate control or cardioversion (CV) in the ED



^aImmediate OAC: a dose of OAC should be given just before 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

^bAdapted from the 2014 CCS Guidelines¹

1. Is the patient unstable with their AF causing hypotension, cardiac ischemia, or pulmonary edema?^{20,21}
 - YES - Recommend immediate electrical cardioversion ([PICO 1](#)) for those patients whose recent-onset AF is the direct cause of instability.
 - Initiate oral anticoagulation (OAC) prior to cardioversion in patients not therapeutic on OAC for greater than 3 weeks and unknown onset, onset greater than 48 hours, recent transient ischemic attack (TIA)/cerebrovascular accident (CVA; within less than 6 months), or valvular heart disease. Either a direct oral anticoagulant (DOAC) or a dose of unfractionated or low molecular weight heparin (LMWH) ([PICO 2](#)) with bridge to warfarin should be continued for at least 4 weeks following cardioversion. Consider emergency Cardiology consult for transesophageal echocardiogram (TEE) to rule out evidence of thrombus once patient is reasonably stabilized (after fluid resuscitation and/or rate control).
 - Consider other causes for rapid ventricular rate in hemodynamically unstable patients as the instability may be due to other causes (e.g. hypoxia, pain, sepsis). In such scenarios, cardioversion is unlikely to be successful.

2. Is the patient stable?
 - YES - Assess for stroke risk – What is the immediate risk of stroke in the patient?
 - High risk (Not therapeutic on OAC for greater than 3 weeks plus one of the following: unknown onset of AF or AF onset greater than 48 hours, valvular heart disease, TIA/CVA in last 6 months – Proceed with rate control (resting heart rate [HR] less than 100 beats per minute [bpm]) then either delayed cardioversion or TEE-guided cardioversion as outlined below:
 - Option 1: Delayed cardioversion – control rate and initiate OAC for 3 weeks followed by outpatient cardioversion ([PICO 3](#))
 - Option 2: TEE-guided cardioversion – If availability permits, obtain TEE to rule out atrial or auricular thrombus and initiate OAC in ED prior to cardioversion ([PICO 4](#))
 - Low risk (AF onset less than 48 hours or therapeutic OAC greater than 3 weeks [if on warfarin, INR should have been therapeutic for at least 3 consecutive weeks]) – rhythm control with electrical or pharmacological cardioversion or rate control ([PICO 5](#))
 - Option 1: Immediate cardioversion – May use pharmacological ([PICO 6](#)) or electrical cardioversion ([PICO 7](#)). Initiate antithrombotic strategy upon discharge as outlined in Disposition Planning.
 - Option 2: wait and see approach – For those patients for whom a rhythm control strategy is selected, it is reasonable to initiate rate

control (resting HR less than 100 bpm) ([PICO 8](#)) and have patient return within 48 hours for reassessment of spontaneous cardioversion or need for electrical/pharmacologic cardioversion ([PICO 9](#))

3. Does the patient have permanent or persistent AF (newly detected AF sustained beyond 7 days) and is the patient hemodynamically stable?

- YES to both - Rate control: control rate (resting HR less than 100 bpm) and patient symptoms, initiate or arrange outpatient follow-up to consider oral anticoagulation. See further detail in Disposition Planning

4. Does the patient have a history of Wolff-Parkinson-White (WPW) or suggestions of pre-excitation (often manifest by very rapid (240-300 bpm), sustained, highly irregular wide complex tachycardia)?

- YES – Suggest rhythm control using electrical cardioversion in hemodynamically unstable patients or may consider using procainamide or ibutilide in those patients who are stable ([PICO 10](#)).
 - Note: Do not use atrioventricular (AV) nodal blocking agents (digoxin, calcium channel blockers, beta blockers or adenosine) to slow the rate because of the risk of inciting ventricular fibrillation

Order Set Components

Orders or their components have been added in **bold** text if recommended as default (e.g. **Bedrest**). All other orders and components would be selected based on the presentation needs of the patient. Orders that have more than one option for treatment have been entered in square brackets (e.g. warfarin 5 mg [2, 2.5, 3, 4, 6, 7.5, 10 mg] PO x 1).

General Care

- Goals of Care: utilize appropriate Goal of Care
- Activity: Suggest starting with 'Bedrest' as the default with options to include:
 - **Bedrest**
 - Bedrest – With Bathroom Privileges
 - Activity as Tolerated
- Diet / Nutrition: Suggest starting with 'NPO' as the default with options to include:
 - **NPO**
 - NPO (oral medications with sips)
 - Ice chips
 - Clear Fluids
 - Regular
 - Heart Healthy

Patient Care Orders

- Vital Signs: suggest starting with 'as per local standards' as the default with specified options for patients whom physicians have a heightened level of concern about. These orders need to be re-evaluated when the patient stabilizes or by 2 hours whichever occurs first.
- Vital Signs to include: respiratory rate (RR), pulse rate (P), blood pressure (BP), temperature (T), and oxygen saturation (O2 Sat) with options to include:
 - **as per local standards**
 - q__hr
 - q__min
- Oxygen Saturation Monitoring – Continuous: in very symptomatic or hemodynamically unstable patients
- Bedside Cardiac Monitoring – Continuous: in very symptomatic or hemodynamically unstable patients
- Neurological Vital Signs: suggest starting with 'as per local standards' as the default with specified options for patients physicians have a heightened level of concern about.
 - These orders need to be re-evaluated when the patient stabilizes or by 2 hours whichever occurs first.
- Neurological vital signs to include: Glasgow Coma Scale (GCS) with reassessments:
 - **as per local standards**
 - q__hr
 - q__min
 - Note: the physician should be notified if a patient's GCS decreases

Respiratory Care

- Note: physician should be notified if oxygen flow required to be increased by greater than 2 litres (L) to maintain the same level of oxygenation or if there is a progressive increase in the work of breathing
- Oxygen (O2) rate, O2 device, and O2 saturation options reserved for patients with specific concerns such as chronic obstructive pulmonary disease (COPD). If O2 saturation (sat) is already adequate, no supplemental O2 is required
 - **O2 Therapy – Titrate to Saturation greater than or equal to 90%**, (unless otherwise specified)
 - O2 Therapy: @__L / min via_____ to maintain O2 sat greater than or equal to _____

Intravenous Orders

- Intravenous Cannula – Insert
- Options then include:
 - Saline lock
 - IV ‘bolus’ or ‘rapid infusion’ including the following:
 - Amount (i.e. 250 mL, 500 mL, 1000 mL, 2000 mL)
 - Fluid (i.e. **0.9% NaCl infusion**, lactated ringers infusion,)
 - Run time (i.e. 15 min, 30 min, 45, min, 60 min)
 - IV ‘maintenance’
 - Rate in mL / hr (i.e. 75, 100,125, 150, 200, 250)
 - Fluid (i.e. **0.9% NaCl Infusion**, lactated ringers infusion, D5 - 0.9% NaCl infusion)

Lab Investigations

While there are no recommended default laboratory orders for patients presenting with AF, the tests that are in **bold** text are commonly ordered. The ordering of investigations that are underlined may be useful to assess severity or establish a baseline. All other lab orders (e.g. investigations for possible comorbidities) are to be selected based on the presentation needs of the patient and are in regular font.

- Hematology
 - **Complete Blood Count (CBC)**
 - PT INR (frequently requires ordering but not defaulted)
- Chemistry
 - **Electrolytes (Na, K, Cl, CO2)**
 - **Glucose Random LEVEL**
 - **Creatinine LEVEL**
 - **Urea**
 - Troponin (Troponin I or T) ([PICO 11](#))
 - Thyroid Stimulating Hormone (TSH) (in new-onset AF)
 - Natriuretic Peptide – BNP or NT-proBNP
 - Digoxin LEVEL
 - Magnesium (Mg) LEVEL
 - Phosphate LEVEL
 - Calcium (Ca) LEVEL
 - Beta HCG
- Blood Gases
 - Blood Gas Venous
- Microbiology
 - Blood Culture
- Urine Tests
 - Urinalysis
 - Urine Bacterial Culture
 - Pregnancy Test, Urine – POCT

Diagnostic Investigations

- Standard X-rays
 - GR Chest, 2 Projections: (Chest X-Ray posterior-anterior & lateral)
 - GR Chest, 1 Projection, Portable: (Chest X-Ray portable)
- Advanced Imaging
 - Echo Transesophageal
- Other
 - Electrocardiogram (ECG)

Medications

Rate Control:

Consider the following rate control agents and refer to [Appendix E](#) for a more detailed recommendation. In patients with associated heart failure, beta blockers +/- digoxin are recommended. In patients with no heart failure +/- coronary artery disease, beta blockers, calcium channel blockers, or combination are recommended.

- metopROLOL___ mg [2.5, 5 mg] IV over 2 to 4 minutes and repeat___ [1,2] times (maximum 15 mg over 10 to 15 min) q ___ [15,30 mins 1,2,4,6 hr] as required to achieve a pulse rate of less than 110 but greater than 70 bpm. Hold if sBP less than 90 mm/Hg

OR

- diltiazem___mg [0.25, 0.3, 0.35 mg/kg] IV and repeat 0.35 mg/kg x 1 after 15 minutes if required to achieve a pulse rate of less than 110 but greater than 70 bpm. Hold if sBP less than 90 mm/Hg

OR

- diltiazem___ mg/hr [5,10,15 mg/hr] IV infusion to maintain a pulse rate of less than 110 but greater than 70 bpm. Hold if sBP less than 90 mm/Hg. Infusion may be maintained up to but not exceeding 24 hours.

OR

- verapamil___ mg [0.075 to 0.15 mg/kg] IV over 2 minutes. Hold if sBP less than 90 mm/Hg. May repeat dose in 30 minutes if required

OR

- digoxin___ micrograms [8 to 12 micrograms/kg] IV in divided doses, with approximately 50% of the total dose given as the first dose, additional 25% fractions of the loading dose may be given at 4 to 8 hour intervals, until the desired effect, toxicity, or total digitalizing dose is given.

Chemical Cardioversion:

Consider the following rhythm control agents ([Appendix E](#)) for use in pharmacologic cardioversion of patients presenting with recent-onset AF. Procainamide has both an excellent safety profile and high rates of efficacy and should be considered as first line treatment in the ED. Oral propafenone or flecainide, have slower onset of action than the IV agents. Ibutilide is both fast-acting and efficacious. The risk of torsade de pointes (2-3%) with ibutilide can be mitigated with magnesium sulfate pre-treatment but the use of ibutilide should be in consultation with cardiology (see Order Set Components – Procedures, Policies & Guidelines for electrical cardioversion). Amiodarone and sotalol are not recommended for recent-onset AF.

- procainamide 15 to 17 mg/kg IV infused over 60 minutes or until cardioversion occurs.
Hold if sBP less than 100 mmHg
- OR**
- flecainide ___mg [200,300,400 mg; 4 mg/kg] PO x 1 (the majority of those who convert, about 2/3, do so within 2 hours)
- OR**
- propafenone 450 to 600 mg PO x 1
- OR**
- ibutilide 1 mg IV over 10 minutes (for patients weighing less than 60kg, dose is 0.01 mg/kg IV over 10 minutes). Because of high risk for torsades, check magnesium levels and consider infusing magnesium sulfate concurrently. Should be used with Cardiology consultation.

Other medications:

- potassium chloride (for hypokalemia)
 - KCl 10 mmol in 100 mL SWI (sterile water infusion) x [1,2,3] each over 1 hour
 - OR**
 - potassium chloride SR tab 2 tabs PO (40 mmol potassium)
 - OR**
 - potassium chloride liquid 30 mL PO (40 mmol potassium)
- magnesium sulfate 2 g IV as per parenteral monograph

Antithrombotic Therapies:

- All patients require risk stratification for stroke risk prediction using the 2014 Canadian Cardiovascular Society (CCS) algorithm CHADS65. This algorithm incorporates the CHADS2 scoring system and also uses key elements of CHADS2-Vasc to determine the need for antithrombotic therapy. See schema in Disposition Planning and [Appendix D](#).
- Estimation of bleeding risk should be performed on all patients whenever considering antithrombotic therapy using the HAS-BLED schema ([Appendix D](#)) as outlined in Disposition Planning ([PICO 12](#)).

Heparin

- enoxaparin 1 mg/kg SUBCUTANEOUSLY x 1

OR

- unfractionated heparin (UFH) 70-80 units/kg IV bolus, then 15 units/kg/h infusion
 - Adjust dose based on aPTT and hospital nomogram

OR**Antiplatelet agent**

- acetylsalicylic acid (ASA) 81 mg PO x 1

OR**Oral vitamin K antagonists**

- warfarin 5 mg [1, 2, 2.5, 3, 4, 6, 7.5, 10 mg] PO x 1

OR

Direct Oral Anticoagulants (DOACs) – should not be used in patients with severely impaired renal function (CrCl less than 30 mL/min), prosthetic heart valves and valvular heart disease including mitral stenosis ([Appendix F](#))

- rivaroxaban 20 mg PO x 1 (reduce to 15mg PO if patient's CrCl 30-49 mL/min)

OR

- dabigatran 150 mg PO x 1 (reduce to 110mg PO if patient age greater than or equal to 80 years or greater than or equal to 75 years + 1 bleeding risk factor or CrCl 30-49 mL/min)

OR

- apixaban 5 mg PO x 1 (reduce to 2.5 mg if patient age greater than or equal to 80 years, body weight less than or equal to 60 kg, or serum creatinine greater than or equal to 133 micromol/L)

Procedures, Policies & Guidelines

1. Physician

- Electrical Cardioversion
 - Immediate synchronized cardioversion recommended for rapid ventricular rate unresponsive to medications with ongoing myocardial ischemia, symptomatic hypotension or heart failure
 - Recommend to shock with 150-200 joules biphasic waveform as the initial setting
 - Synchronized cardioversion for patients with no history of valvular AF or transient ischemic attack (TIA)/cerebrovascular accident (CVA) with a clear onset of paroxysmal AF less than 48 hours OR on warfarin with a therapeutic INR for the last 3 weeks or compliant on one of the direct oral anticoagulants (DOACs) for 3 weeks
- Procedural sedation (provincial policy & procedure can be found at <http://insite.albertahealthservices.ca/9227.asp>)

2. Nursing

- Application of monitor/defibrillator and pads for synchronized cardioversion. Pad placement may be placed antero-lateral or antero-posterior ([PICO 13](#)).

Considerations for Consultation

1. Cardiology consultation in the emergency department?
 - Consideration of transesophageal echo (TEE) in persistently symptomatic patients at 48 hours or unknown onset for possible ED cardioversion
 - Phone consultation to arrange for deferred elective cardioversion and initiation of anticoagulation in ED
 - Phone consultation for patient already on rate and rhythm control where Cardiology input is required to modify current medication choices or dosing adjustments

Disposition Planning

1. We recommend hospital admission for the following patients ([PICO 14](#)):
 - Highly symptomatic patients with failure to achieve adequate rate control, decompensated heart failure or myocardial ischemia
 - Consideration may be made for patients with complex medical conditions associated with AF
2. Considerations for discharge
 - The majority of patients with recent-onset AF can be safely discharged home following adequate rate or rhythm control in the ED
 - The following considerations must be addressed prior to discharge:

Assessment of Thromboembolic and Bleeding Risk

- Patients with recent onset AF in whom a rhythm strategy was successful in achieving normal sinus rhythm (NSR) require risk/benefit determination for stroke prevention using antithrombotic therapy applying the 2014 CCS algorithm for oral anticoagulation (OAC) therapy “CHADS65” coupled with HAS-BLED to estimate bleeding risk ([Appendix D](#))
- Patients in whom a rate control strategy is selected without plans for elective cardioversion also require risk/benefit determination for stroke prevention using antithrombotic therapy applying the CCS risk stratification algorithm CHADS65 coupled with HAS-BLED to estimate bleeding risk ([Appendix D](#)).
- If the patient is being discharged on rate control for planned cardioversion in 3-6 weeks as an outpatient, anticoagulation must be initiated either as outlined previously or in direct consultation with cardiology. Discharge instructions should include monitoring for signs and symptoms of transient ischemic attack (TIA)/cerebrovascular accident (CVA) and bleeding.
- Patients presenting more than 48 hours after onset of AF or AF uncertain duration are at risk for developing atrial thrombus
 - For those who remain symptomatic after attempts at rate control, transesophageal echo (TEE) may be used to rule out atrial thrombus and if absent, may undergo cardioversion. Initiate and continue oral anticoagulation for a minimum of 4 weeks post-cardioversion.
 - For those who are stable or relatively asymptomatic, antithrombotic therapy can be initiated in the ED as outlined previously with prompt outpatient follow-up arranged or can be delayed until outpatient specialist

- consultation is obtained
- Should antithrombotic therapy be initiated using the 2014 CCS predictive index for stroke risk, the following considerations regarding choice of antithrombotic agent should be followed ([Appendix F](#)):
 - Among patients with non-valvular AF (absence of rheumatic mitral stenosis, a mechanical or bioprosthetic heart valve or mitral valve repair) requiring OAC, a direct oral anticoagulant (DOAC) should be selected in preference to warfarin ([PICO 15](#)).
 - Among patients with mechanical prosthetic valve, rheumatic mitral stenosis or estimated glomerular filtration rate of 15-30 mL/min/1.73m² requiring OAC, warfarin should be used in preference to a DOAC.
 - Heparin bridging with the initiation of warfarin should be considered in patients with high risk features (prior CVA/TIA or intracardiac thrombus, bioprosthetic valve, or mitral stenosis and low risk of intracranial hemorrhage (PICO 16). Low risk patients (nonvalvular AF, no history of CVA/TIA) can be initiated on warfarin WITHOUT heparin bridging ([PICO 16](#))
 - Heparin bridge therapy is not required when a DOAC is initiated ([PICO 17](#))

Antithrombotic medications

- enoxaparin 1 mg/kg SC x 1 followed by
 - enoxaparin 1 mg/kg SC q12h (dose adjusted for renal impairment)

OR

- unfractionated heparin (UFH) 70-80 units/kg IV bolus, then 15 units/kg/h infusion
 - Adjust dose based on aPTT and hospital nomogram or anti-Xa levels

OR

Antiplatelet agent

- acetylsalicylic acid (ASA) 81 mg PO x 1 followed by
 - acetylsalicylic acid 81 mg PO daily

OR

Oral vitamin K antagonists

- warfarin 5 mg [1, 2, 2.5, 3, 4, 6, 7.5, 10 mg] PO x 1
 - follow up instructions with a target of INR 2-3
 - if initiated in the ED needs INR initially then q 2 days until achieves therapeutic goal – primary care physician, cardiologist, or coagulation clinic to monitor

OR

Direct Oral Anticoagulants (DOACs) – should not be used in patients with severely impaired renal function (CrCl less than 30 ml/min), prosthetic heart valves and valvular heart disease including mitral stenosis ([Appendix F](#))

- rivaroxaban 20 mg PO x 1 followed by
- rivaroxaban 20 mg PO daily (reduce to 15mg PO daily if patient's CrCl 30-49 mL/min)

OR

- dabigatran 150 mg PO x 1 followed by
 - dabigatran 150 mg PO BID (reduce to 110mg PO BID if patient age greater than or equal to 80 years or greater than or equal to 75 years + 1 bleeding risk factor or CrCl 30-49 mL/min)

OR

- apixaban 5 mg PO x 1 followed by
 - apixaban 5 mg PO BID (reduce to 2.5 mg BID if patient age greater than or equal to 80 years, body weight less than or equal to 60 kg, or serum creatinine greater than or equal to 133 micromol/L)

3. Outpatient follow-up ([PICO 18](#))

- All patients presenting with recent-onset AF should have timely outpatient specialist consultation (where timely and available) or primary care follow-up arranged at the time of discharge to review and discuss the risks and benefits of long-term antithrombotics and antiarrhythmic drug therapy ([PICO 19](#))
- Outpatient echocardiography should be arranged to ensure identification of underlying structural heart disease in all patients with recent onset AF or in patients with permanent AF who have not had recent assessment

- If anticoagulation is started in the ED, follow up with either a primary care physician, cardiologist or coagulation clinic for monitoring of INR for warfarin and creatinine for DOACs should be arranged to minimize the risk of bleeding

4. Patient education / discharge instructions

- [Appendix C](#) is a link to the Health Wise patient education being trialed by Health Link and being considered for access to Alberta EDs for our patients.

Rural Considerations

The major challenges and considerations from a rural perspective are:

1. Determining time of onset of AF to be able to decide whether or not it is safe to cardiovert the patient (i.e. no clots in the atria)
2. Having the necessary human resources to be able to provide procedural sedation, manage any airway problems and provide the synchronized cardioversion
3. Ready access to Cardiologists to be able to refer their patients for assessment and transesophageal echo (TEE) -guided or delayed cardioversion
4. Timely outpatient follow-up for patients in whom anticoagulation therapy has been initiated.

Patient Experience and Expectations

Based on a meeting with 8 patient advisors in Calgary January 25, 2015, we received the following feedback and general recommendations regarding approaches to communication, care and patient expectations in the emergency department (ED):

1. They hoped we would be able to improve care consistency among ED providers.

Patient quote: "Every time I presented to the emergency department with the same condition (atrial fibrillation), each doctor provided a different treatment approach."

2. They were supporters of care pathways, checklists, protocols, etc. wherever appropriate.

Patient quote: "I am a strong supporter of care pathways as whenever I/my family member receive treatment using a pathway, the care seems clearer and more consistent"

3. While none of the patients liked long waits, they could accept them better if there was clearer communication and reassessments as required.

Patient quote: "Nobody likes to wait and I understand that sicker patients take priority, however, there needs to be improved communication and reassessments for those patients who are waiting"

4. They pointed out the importance of having a patient advocate accompany a sick person, but also allowing the advocate to be with the patient at decision critical points (e.g. initial assessment, treatment decision making, receiving bad news, etc.) was considered paramount.

Patient quote: "When I accompany my family member to the ED I am often not permitted to join them when they are moved into a treatment space. I am often told this is 'policy'."

5. They believe that improving follow up, especially for patients being discharged from the ED and being referred to a specialist, is important. This was recognized as a key safety risk for patients; having to rely on faxed referrals and a call back from the consultant's office can lead to dangerous delays or failed connections to the detriment of the patient's health and well-being.

Patient quote: "The current health care system is poorly coordinated with lots of gaps and delays, especially with referrals from one physician to another."

Preparation for Analytics

1. Key Outcomes

- Clinical
 - Successful chemical or electrical cardioversion for patients in paroxysmal atrial fibrillation (PAF)
 - Documentation of risks/benefits of anticoagulation for patients with PAF and high risk of cerebrovascular accident (CVA)/transient ischemic attack (TIA)
 - Successful rate control and discharge on anticoagulation for patients with unknown or greater than 48 hour onset of PAF
- Process
 - Electrical cardioversion performed under recognized provincial procedural sedation guidelines
 - Patients targeted for delayed cardioversion routinely able to be seen by a cardiologist in 4-6 weeks to reassess and perform elective cardioversion as indicated
 - AF admissions limited to unstable patients or those with significant complications or co-morbidities requiring hospitalization
- Patient Experience
 - Felt that the specifics of AF as it related to their presentation, and the therapeutic options, risks, and evidence were well explained
 - Did not feel disrespected if their personal therapeutic request differed from the treating physician recommendation

2. Data Elements for Capture

- Patient demographics
- Canadian Emergency Department Information Systems (CEDIS) presenting complaint and Canadian Triage and Acuity Scale (CTAS) score
- ED time markers (triage to physician, physician to consult and then to admission or physician to discharge) and outcome markers (identified as clinical decision unit patient, consulted for admission, admitted to intensive care unit or ward, died)
- ED diagnoses for AF ICD 10 I48.0 / ICD 9 427.3
- Site and zone identifiers
- CHADS2 and / or CHA2DS2-VASc scores
- Date and time of use of AF order set
- Date, time, and dose of chemical cardioversion attempt (procainamide, amiodarone, flecainide, ibutilide)
- Date and time of electrical cardioversion
- Date and time of cardiology consultation
- Date, time and dose of anticoagulants (warfarin, low molecular weight heparin [LMWH], apixaban, dabigatran, rivaroxaban)
- Follow up plan (primary care physician, cardiologist, coagulation clinic, none)
- Patient reported adverse outcomes
- Provider reported use of AF guidelines/order set

3. Proposed Reports

- Number (%) of ED patients triaged as 'Palpitation/Irregular heart rate'
- Number (%) of ED patients (by site/zone/hospital type or location)] for whom this AF order set is applied

- Number (%) of ED AF patients rate controlled vs cardioverted
- Mean and median ED lengths of time for AF patients being held in the ED prior to discharge (comparing those chemically converted +/- electrically vs electrical only)
- Number (%) of ED AF patients for whom OAC (oral anticoagulation) is recommended being discharged on anticoagulation or referred for anticoagulation
- Number (%) of ED AF patients admitted

References

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Appendix A - PICO-D Questions (Key Clinical Questions)

For information regarding PICO-D Methodology and GRADE Terminology please see [Appendix B](#)

PICO 1: In hemodynamically unstable adult patients presenting to the ED with recent onset (less than 48 hours) AF, is electrical cardioversion or stabilization (rate control, fluid resuscitation) first preferred?

[Return to Initial Decision Making](#)

Population, Patient or Problem: Adults presenting with less than 48 hour onset of AF and hemodynamic instability or ischemic chest pain

Intervention, Prognostic Factor, Exposure: electric cardioversion

Comparison: IV fluids, chemical rate control, vasopressors

Outcome: hemodynamic stability, sinus rhythm, acute cerebrovascular accident (CVA)

Design: Randomized controlled trials (RCTs) or prospective observational studies

Search Strategy: Searched Cochrane Library and PubMed using the search terms “recent onset atrial fibrillation”, “hemodynamic instability” and “cardioversion”. Limited to systematic reviews—none identified. Also searched PubMed “unstable atrial fibrillation” and “cardioversion”.

Clinical Recommendation: We recommend immediate electrical cardioversion in patients with hemodynamic instability, florid pulmonary edema or suffering acute coronary syndrome (ACS) thought to be attributable to recent onset rapid AF: “For patients whose recent-onset AF/atrial flutter is the direct cause of instability with hypotension, acute coronary syndrome, or florid pulmonary edema, we recommend that immediate electrical cardioversion be considered with immediate initiation of intravenous or low molecular weight heparin (LMWH) before cardioversion followed by therapeutic oral anticoagulation (OAC) for 4 weeks afterward (unless AF onset was clearly within 48 hours or the patient has received therapeutic OAC for 3 weeks) followed by therapeutic OAC for at least 4 weeks after cardioversion”¹.

Quality of Evidence: Low, GRADE C

Strength of Recommendation: Strong, GRADE 1

References:

1. Verma A, Cairns JA, Mitchell LB, et al; CCS Atrial Fibrillation Guidelines Committee. 2014 focused update of the Canadian Cardiovascular Society Guidelines for the management of atrial fibrillation. *Can J Cardiol.* 2014;30(10):1114-1130.

Additional Readings and General References:

Cairns JA, Connolly S, McMurry S, Stephenson M, Talajic M; CCS Atrial Fibrillation Guidelines Committee. Canadian Cardiovascular Society atrial fibrillation guidelines 2010: prevention of stroke and systemic thromboembolism in atrial fibrillation and flutter. *Can J Cardiol.* 2011; 27(1):74-90.

PICO 2: *In hemodynamically unstable adult patients presenting to the ED in AF with unknown time of onset or onset greater than or equal to 48 hours, is immediate anticoagulation indicated?*

[Return to Initial Decision Making](#)

Population, Patient or Problem: Hemodynamically unstable adults presenting in atrial fibrillation with unknown time of onset or onset greater than or equal to 48 hours

Intervention, Prognostic Factor, Exposure: Unfractionated heparin (UFH) or LMWH

Comparison: No anticoagulation

Outcome: Successful cardioversion, signs of CVA

Design: RCTs or prospective observational studies

Search Strategy: Searched Cochrane Library and PubMed using the search terms “atrial fibrillation”, “hemodynamic instability” and “anticoagulation” limited to systematic reviews

Clinical Recommendation: We suggest that anticoagulation be initiated prior to cardioversion in patients with rapid rate AF of unknown onset time/greater than 48 hours and hemodynamic instability. “For patients whose recent-onset AF/atrial flutter is the direct cause of instability with hypotension, acute coronary syndrome, or florid pulmonary edema, we recommend that immediate electrical cardioversion be considered with immediate initiation of intravenous or LMWH before cardioversion followed by therapeutic OAC for 4 weeks afterward (unless AF onset was clearly within 48 hours or the patient has received therapeutic OAC for 3 weeks) followed by therapeutic OAC for at least 4 weeks after cardioversion”¹.

Quality of Evidence: Low, GRADE C

Strength of Recommendation: Weak GRADE 2

References:

1. Verma A, Cairns JA, Mitchell LB, et al; CCS Atrial Fibrillation Guidelines Committee. 2014 focused update of the Canadian Cardiovascular Society Guidelines for the management of atrial fibrillation. *Can J Cardiol.* 2014;30(10):1114-1130.

PICO 3: *In stable adult patients presenting with AF of unknown time of onset or onset greater than or equal to 48 hours and who are anticoagulated with warfarin and therapeutic INRs x 3 weeks or on direct oral anticoagulants (DOACs), is cardioversion safe and effective?*

[Return to Initial Decision Making](#)

Population, Patient or Problem: Stable adult patients presenting with unknown or greater than or equal to 48 hours onset AF on therapeutic warfarin greater than or equal to 3 weeks

Intervention, Prognostic Factor, Exposure: Cardioversion

Comparison: Ongoing rate control and outpatient follow up

Outcome: Rates of normal sinus rhythm (NSR) at 3 weeks, percentage of paroxysmal atrial fibrillation (PAF) versus persistent AF patients, ED length of stay, patient satisfaction

Design: RCTs, meta-analysis of RCTs

Search Strategy: Searched Cochrane Library and PubMed using the search terms “atrial fibrillation”, “anticoagulation”, “cardioversion”. No limits.

Clinical Recommendation: We recommend that for patients with AF of greater than 48 hours or unknown duration undergoing elective electrical or pharmacologic cardioversion, therapeutic anticoagulation (adjusted-dose vitamin K antagonist therapy, target INR range 2.0-3.0, low-molecular-weight heparin at full venous thromboembolism treatment doses, or DOACs) be given for at least 3 weeks before cardioversion, or a transesophageal (TEE)-guided approach with abbreviated anticoagulation before cardioversion be taken, rather than no anticoagulation. “The conventional duration of a minimum of 3 weeks therapeutic anticoagulation before cardioversion and a minimum 4 weeks afterward is based on indirect pathophysiologic data and evidence from observational studies and remains arbitrary.”¹

Quality of Evidence: Low, GRADE C

Strength of Recommendation: Weak, GRADE 2, however, suggesting “we recommend” as the 3 weeks of effective anticoagulation is a generally accepted clinical standard that Cardiologists support and does try to ensure delayed cardioversion will do no harm in the form of dislodging emboli.

References:

1. You JJ, Singer DE, Howard PA, et al. Antithrombotic therapy for atrial fibrillation: antithrombotic therapy and prevention of thrombosis, 9th ed: American College of Chest Physicians evidence-based clinical practice guidelines. *Chest*. 2012;141(2 Suppl):e531S-75S. doi:10.1378/chest.11-2304.

PICO 4: In stable but symptomatic adult patients with unknown or greater than or equal to 48 hour onset presenting in AF is transesophageal echocardiography followed by cardioversion if no thrombus is identified superior to rate control, anticoagulation, and elective cardioversion at 3 weeks?

[Return to Initial Decision Making](#)

Population, Patient or Problem: Stable but symptomatic adult patients presenting with unknown or greater than or equal to 48 hour onset AF

Intervention, Prognostic Factor, Exposure: TEE followed by cardioversion if no atrial thrombus seen

Comparison: Rate control, anticoagulation, and elective cardioversion at 3 weeks

Outcome: Rates of NSR at 3 weeks, ED length of stay, patient satisfaction

Design: RCTS, meta-analysis of RCTS

Search Strategy: Searched Cochrane Library and PubMed using the search terms “atrial fibrillation”, “transesophageal echocardiography”. No limits.

Clinical Recommendation: We suggest the consideration of TEE-guided early cardioversion where TEE is available after evaluating patient factors including ability to tolerate OACs, patients’ symptoms and quality of life. Based on randomized clinical trial data, TEE-guided early

cardioversion is an effective alternative to the conventional delayed elective cardioversion and may be associated with fewer bleeding complications.

Quality of Evidence: Moderate, Grade B

Strength of Recommendation: Weak, GRADE 2

Additional Readings and General References:

Klein AL, Grimm RA, Jasper SE, et al. Efficacy of transesophageal echocardiography-guided cardioversion of patients with atrial fibrillation at 6 months: a randomized controlled trial. *Am Heart J.* 2006;151(2):380-389.

Klein AL, Grimm RA, Murray RD, et al. Assessment of cardioversion using transesophageal echocardiography investigators. Use of transesophageal echocardiography to guide cardioversion in patients with atrial fibrillation. *N Engl J Med.* 2001;344(19):1411-1420.

Manning WJ, Silverman DI, Gordon SP, Krumholz HM, Douglas PS. Cardioversion from atrial fibrillation without prolonged anticoagulation with use of transesophageal echocardiography to exclude the presence of atrial thrombi. *N Engl J Med.* 1993;328(11):750-755.

PICO 5: Among stable patients with recent onset AF (less than or equal to 48 hours), is rhythm-control superior to rate-control as a treatment strategy?

[Return to Initial Decision Making](#)

Population, Patient or Problem: Stable adult patients presenting with recent onset AF

Intervention, Prognostic Factor, Exposure: Rhythm control

Comparison: Rate control

Outcome: Rates of NSR at 3 weeks, symptom control, patient satisfaction

Design: RCTs, meta-analysis of RCTs

Search Strategy: Searched Cochrane Library and PubMed using the search terms “atrial fibrillation”, “rate control”, “rhythm control”. Limited to systematic reviews

Clinical Recommendation: We recommend, based on CCS 2014 AF guideline, that it is generally safe to proceed with cardioversion if the duration of AF is clearly less than 48 hours and the patient has no high-risk stroke characteristics.^{1,2}

Quality of Evidence: Moderate, GRADE B

Strength of Recommendation: Strong, GRADE 1

References:

1. Verma A, Cairns JA, Mitchell LB, et al; CCS Atrial Fibrillation Guidelines Committee. 2014 focused update of the Canadian Cardiovascular Society Guidelines for the management of atrial fibrillation. *Can J Cardiol.* 2014;30(10):1114-1130.
2. Gillis AM, Verma A, Talajic M, Nattel S, Dorian P; CCS Atrial Fibrillation Guidelines Committee. Canadian Cardiovascular Society atrial fibrillation guidelines 2010: rate and rhythm management. *Can J Cardiol.* 2011;27(1):47-59.

Additional Readings and General References:

Al-Khatib SM, Allen LaPointe NM, Chatterjee R et al. Rate- and rhythm-control therapies in patients with atrial fibrillation: a systematic review. *Ann Intern Med.* 2014;160(11):760-773.

Caldeira D, David C, Sampaio C. Rate versus rhythm control in atrial fibrillation and clinical Outcome: updated systematic review and meta-analysis of randomized controlled trials. *Arch Cardiovasc Dis.* 2012;105(4):226-238.

Ogawa S, Yamashita T, Yamazaki T, et al. Optimal treatment strategy for patients with paroxysmal atrial fibrillation: J-RHYTHM study. *Circ J.* 2009;73(2):242-248.

Roy D, Talajic M, Nattel S et al. Rhythm control versus rate control for atrial fibrillation and heart failure. *N Engl J Med.* 2008;358(25):2667-2677.

Testa L, Biondi-Zoccai GG, Dello Russo A, Bellocci F, Andreotti F, Crea F. Rate-control vs. rhythm-control in patients with atrial fibrillation: a meta-analysis. *Eur Heart J.* 2005;26(19):2000-2006.

Van Gelder IC, Hagens VE, Bosker HA et al. A comparison of rate control and rhythm control in patients with recurrent persistent atrial fibrillation. *N Engl J Med.* 2002;347(23):1834-1840.

Wyse DG, Waldo AL, DiMarco JP et al. A comparison of rate control and rhythm control in patients with atrial fibrillation. *N Engl J Med.* 2002;347(23):1825-1833.

PICO 6: In stable adults patients presenting to the ED in recent onset AF, is one rhythm control medication preferred over another for chemical cardioversion?

[Return to Initial Decision Making](#)

Population, Patient or Problem: Stable adults presenting recent onset of AF

Intervention, Prognostic Factor, Exposure: Procainamide

Comparison: Flecainide OR propafenone OR ibutilide

Outcome: Rate of cardioversion (effectiveness), hemodynamic stability or other side effects (safety)

Design: RCTs or prospective observational studies

Search Strategy: Searched Cochrane Library and PubMed using the search terms “atrial fibrillation” AND “cardioversion” AND “chemical” OR “pharmacologic”

Clinical Recommendation: We suggest, based on the 2010 CCS guidelines, the option of several antiarrhythmic agents in the pharmacologic cardioversion of recent-onset AF in the ED. Procainamide is commonly used in the ED and has an excellent safety profile. Oral propafenone and flecainide may be considered in the ED but have slower onset of action. Ibutilide has a quick onset of termination of AF but should be used in consultation with cardiology because of its risk of torsades de pointes. Magnesium sulfate should be administered prior to or concomitantly with ibutilide. The use of amiodarone and sotalol are not recommended for the pharmacologic cardioversion in the ED.¹

Quality of Evidence: Moderate to Low, GRADE B,C

Strength of Recommendation: Weak, GRADE 2

References:

1. Stiell IG, Macle L; CCS Atrial Fibrillation Guidelines Committee. Canadian Cardiovascular Society atrial fibrillation guidelines 2010: management of recent-onset atrial fibrillation and flutter in the emergency department. *Can J Cardiol.* 2011;27(1):38-46.

PICO 7: *In hemodynamically stable adult patients with recent onset AF (less than 48 hours), is a chemical cardioversion or electrical cardioversion strategy superior?*

[Return to Initial Decision Making](#)

Population, Patient or Problem: Stable adult patients presenting with recent onset AF

Intervention, Prognostic Factor, Exposure: Chemical cardioversion

Comparison: Electrical cardioversion

Outcome: Rates of sustained conversion, ED length of stay, safety, signs of CVA

Design: RCTs or prospective observational studies

Search Strategy: Searched Cochrane Library and PubMed using the search terms “atrial fibrillation”, “chemical cardioversion”, “electrical cardioversion” and “cardioversion”.

Clinical Recommendation: We suggest either electrical or pharmacologic cardioversion as effective methods for the restoration of sinus rhythm, based on the CCS 2010 guidelines¹. There is limited evidence to recommend a preference for one method or the other.

Quality of Evidence: Low, GRADE C

Strength of Recommendation: Weak, GRADE 2

References:

1. Gillis AM, Verma A, Talajic M, Nattel S, Dorian P; CCS Atrial Fibrillation Guidelines Committee. Canadian Cardiovascular Society atrial fibrillation guidelines 2010: rate and rhythm management. *Can J Cardiol.* 2011;27(1):47-59.

PICO 8: *In stable adults patients presenting to the ED in recent onset AF is one class of rate control medications preferred over another? What if the patient is in heart failure? What if the patient has coronary artery disease?*

[Return to Initial Decision Making](#)

Population, Patient or Problem: Stable adults presenting recent onset of AF +/- congestive heart failure (CHF); +/- coronary artery disease (CAD)

Intervention, Prognostic Factor, Exposure: Beta blocker

Comparison: Calcium channel blocker +/- digoxin

Outcome: Effective rate control, hemodynamic stability, effective cardiac output

Design: RCTs or prospective observational studies

Search Strategy: Searched Cochrane Library and PubMed using the search terms “atrial fibrillation” AND “rate control” and “heart failure” AND “coronary artery disease” limited to systematic reviews

Clinical Recommendations: We suggest, based on the CCS 2010 AF guideline¹ and 2012 AF update², that beta-blockers and nondihydropyridine calcium channel blockers be used as initial therapy for rate control of AF in most patients without a past history of myocardial infarction or left ventricular dysfunction. Digoxin may be added to therapy with beta-blockers or calcium channel blockers in patients whose heart rate remains uncontrolled but should not be used as initial therapy or in active patients. Digoxin should be reserved for rate control in patients who are sedentary or who have left ventricular systolic dysfunction. Dronedarone may be used for additional rate control in patients with uncontrolled ventricular rates despite therapy with beta-blockers, calcium channel blockers, but should be used with caution in patients taking digoxin. Dronedarone should not be used in patients with a history of heart failure or left ventricular (LV) dysfunction. Amiodarone for rate control should be reserved for exceptional cases in which other means are not feasible or are insufficient.

Quality of Evidence: Low-Moderate, GRADE B

Strength of Recommendation: Weak, GRADE 2

References:

1. Gillis AM, Verma A, Talajic M, Nattel S, Dorian P; CCS Atrial Fibrillation Guidelines Committee. Canadian Cardiovascular Society atrial fibrillation guidelines 2010: rate and rhythm management. *Can J Cardiol.* 2011;27(1):47-59.
2. Skanes AC, Healey JS, Cairns JA, et al; Canadian Cardiovascular Society Atrial Fibrillation Guidelines Committee. Focused 2012 Update of the Canadian Cardiovascular Society atrial fibrillation guidelines: recommendations for stroke prevention and rate/rhythm control. *Can J Cardiol.* 2012;28(2):125-136.

Additional Readings and General References:

Kotecha D, Holmes J, Krum H et al. Efficacy of β blockers in patients with heart failure plus atrial fibrillation: an individual-patient data meta-analysis. *Lancet.* 2014;384(9961):2235-2243.

PICO 9: In hemodynamically stable adult patients with recent onset AF (less than or equal to 48 hours), is rate control followed by reassessment for spontaneous cardioversion within the 48 hour window an effective strategy?

[Return to Initial Decision Making](#)

Population, Patient or Problem: Stable adult patients presenting with recent onset AF

Intervention, Prognostic Factor, Exposure: Rate control and reassessment

Comparison: ED cardioversion

Outcome: Meaningful percentage of spontaneous cardioversion, patient satisfaction

Design: RCTs or prospective observational studies

Search Strategy: Searched Cochrane Library and PubMed using the search terms “atrial fibrillation”, “delayed cardioversion”, “spontaneous cardioversion”, No limits

Clinical Recommendation: We recommend that the use of rate-slowing agents alone is acceptable while awaiting spontaneous conversion as long as re-evaluation and cardioversion are completed within the 48 hour window of AF onset.

The CCS 2010 guideline states: “In hemodynamically stable patients with AF/atrial flutter of known duration less than 24 hours in whom a strategy of rhythm control has been selected, after appropriate rate control patients can be discharged to return the following day for re-evaluation and cardioversion if still in AF, as long as total duration less than 48 hours.”

Quality of Evidence: Moderate, GRADE B

Strength of Evidence: Strong, GRADE 1

Additional Readings and General References:

Doyle B, Reeves M. “Wait and see” approach to the emergency department cardioversion of acute atrial fibrillation. *Emerg Med Int.* 2011;2011:545023. doi:10.1155/2011/545023.

Krahn AD, Manfreda J, Tate RB, Mathewson FA, Cuddy TE. The natural history of atrial fibrillation: incidence, risk factors, and prognosis in the Manitoba Follow-Up Study. *Am J Med.* 1995;98(5):476-484.

Roden DM. Risks and benefits of antiarrhythmic therapy. *N Engl J Med.* 1994;331(12):785-791.

PICO 10: In stable symptomatic adult patients with recent onset (less than 48 hours) AF and evidence of pre-excitation is electrical cardioversion preferred to chemical cardioversion?

[Return to Initial Decision Making](#)

Population, Patient or Problem: In stable adult patients presenting less than 48 hour onset AF with known Wolff-Parkinson-White (WPW) or very rapid AF (240-300 / min), or highly irregular wide complex tachycardia

Intervention, Prognostic Factor, Exposure: Electrical cardioversion

Comparison: Chemical cardioversion

Outcome: Successful cardioversion, incidence of malignant dysrhythmias, hemodynamic stability, ED length of stay, patient satisfaction,

Design: RCTs, meta-analysis of RCTs

Search Strategy: Searched Cochrane Library and PubMed using the search terms “atrial fibrillation” AND “pre-excitation” and “cardioversion” limited to meta-analysis or RCTs

Clinical Recommendation: We recommend the use of electrical cardioversion in patients with rapid ventricular pre-excitation during AF, according to the CCS 2010 AF guidelines: “In patients with rapid ventricular pre-excitation during AF (Wolff-Parkinson-White syndrome), urgent electrical cardioversion if the patient is hemodynamically unstable. Intravenous antiarrhythmic agents procainamide or ibutilide in stable patients. AV nodal blocking agents (digoxin, calcium channel

blockers, beta-blockers, adenosine) are contraindicated”¹.

Quality of Evidence: Low, GRADE C

Strength of Recommendation: Strong, GRADE 1

References:

1. Stiell IG, Macle L; CCS Atrial Fibrillation Guidelines Committee. Canadian Cardiovascular Society atrial fibrillation guidelines 2010: management of recent-onset atrial fibrillation and flutter in the emergency department. *Can J Cardiol.* 2011;27(1):38-46.

PICO 11: In adult patients presenting to the ED in recent onset AF with no chest pain or other symptoms of acute coronary syndrome (ACS), is a troponin indicated?

[Return to Order Set Components - Lab Investigations](#)

Population, Patient or Problem: Adults presenting with recent onset of AF with no chest pain/acute coronary syndrome (ACS) symptoms

Intervention, Prognostic Factor, Exposure: Troponin

Comparison: No troponin

Outcome: Treatment of ACS

Design: RCTs or prospective observational studies

Search Strategy: Searched “atrial fibrillation troponin” on PubMed (no limits)

Clinical Recommendation: We suggest that while there is limited evidence to suggest a utility of cardiac biomarkers in the prediction of ACS, the measurement of troponin in patients presenting with atrial fibrillation is not currently recommended for risk stratification.

Quality of Evidence: Moderate, GRADE B

Strength of Evidence: Weak, GRADE 2

Additional Readings and General References:

Gupta K, Pillarisetti J, Biria M et al. Clinical utility and prognostic significance of measuring troponin I levels in patients presenting to the emergency room with atrial fibrillation. *Clin Cardiol.* 2014;37(6):343-349.

Hijazi Z, Oldgren J, Andersson U et al. Cardiac biomarkers are associated with an increased risk of stroke and death in patients with atrial fibrillation: a Randomized Evaluation of Long-term Anticoagulation Therapy (RE-LY) substudy. *Circulation.* 2012;125(13):1605-1616.

Hijazi Z, Siegbahn A, Andersson U et al. High-sensitivity troponin I for risk assessment in patients with atrial fibrillation: insights from the Apixaban for Reduction in Stroke and other Thromboembolic Events in Atrial Fibrillation (ARISTOTLE) trial. *Circulation.* 2014;129(6):625-634.

van den Bos EJ, Constantinescu AA, van Domburg RT, Akin S, Jordaens LJ, Kofflard MJ. Minor elevations in troponin I are associated with mortality and adverse cardiac events in patients with atrial fibrillation. *Eur Heart J.* 2011;32(5):611-617.

PICO 12: Does the HAS-BLED risk stratification tools developed in aim of predicting risk of bleeding among adult patients receiving antithrombotic therapy for AF accurately estimate risk of major hemorrhage compared with clinical acumen alone?

[Return to Order Set Components – Medications](#)

Population, Patient or Problem: Adult patients with recent-onset AF
Intervention, Prognostic Factor, Exposure: HAS-BLED scoring tool
Comparison: Clinical acumen
Outcome: Accuracy of prediction tool in stratifying risk of hemorrhage
Design: Prospective observational studies

Search Strategy: Searched “atrial fibrillation” AND HAS-BLED” on PubMed (limited to systematic reviews)

Clinical Recommendation: We recommend the use of HAS-BLED for the prediction of bleeding risk, based on the CCS 2010 AF guideline. HAS-BLED “relies on fewer and more readily obtained risk factors than earlier schemata do and performs at least as well as the HEMOR2RHAGES schema in the prediction of bleeding events. Documentation of a HAS-BLED score allows the clinician to assign the patient a risk of major bleeding ranging from about 1% (score 0-1) to 12.5% (score 5) and can be useful in decisions about the relative risks of stroke vs major bleeding with various antithrombotic therapies.”¹

Quality of Evidence: Moderate, GRADE B

Strength of Recommendation: Strong, GRADE 1

Additional Readings and General References:

Cairns JA, Connolly S, McMurry S, Stephenson M, Talajic M; CCS Atrial Fibrillation Guidelines Committee. Canadian Cardiovascular Society atrial fibrillation guidelines 2010: prevention of stroke and systemic thromboembolism in atrial fibrillation and flutter. *Can J Cardiol.* 2011;27(1):74-90.

Lip GY, Frison L, Halperin JL, Lane DA. Comparative validation of a novel risk score for predicting bleeding risk in anticoagulated patients with atrial fibrillation: the HAS-BLED (Hypertension, Abnormal Renal/Liver Function, Stroke, Bleeding History or Predisposition, Labile INR, Elderly, Drugs/Alcohol Concomitantly) score. *J Am Coll Cardiol.* 2011;57(2):173-180.

Pisters R, Lane DA, Nieuwlaat R, de Vos CB, Crijns HJ, Lip GY. A novel user-friendly score (HAS-BLED) to assess 1-year risk of major bleeding in patients with atrial fibrillation: the Euro Heart Survey. *Chest.* 2010;138(5):1093-1100.

PICO 13: In adult patients requiring electrical cardioversion is anterior-posterior pad placement vs anterior-lateral pad placement superior?

[Return to Order Set Components - Procedures, Policies & Guidelines](#)

Population, Patient or Problem: Adult patients with recent-onset AF

Intervention, Prognostic Factor, Exposure: Anterior-posterior pad placement

Comparison: Anterior-lateral pad placement

Outcome: Successful cardioversion, joules required for cardioversion, number of shocks required

Design: RCTs and systematic reviews

Search Strategy: Searched “atrial fibrillation pad placement” on PubMed (limited to systematic reviews)

Clinical Recommendation: There is insufficient evidence to recommend one pad placement over the other. The published literature is restricted to persistent AF, pad placement varied, and energy levels used were lower than currently recommended; however, the accumulated evidence suggests that electrical pad placement is not a critically important factor in successful cardioversion in AF. A trial is urgently needed in recent-onset AF patients using biphasic devices and high energy levels to resolve the debate.

Quality of Evidence: Weak, GRADE C

Strength of Recommendation: Insufficient evidence

Additional Readings and General References:

Kirkland S, Stiell I, AlShawabkeh T, Campbell S, Dickinson G, Rowe BH. The efficacy of pad placement for electrical cardioversion of atrial fibrillation/flutter: a systematic review. *Acad Emerg Med.* 2014;21(7):717-726.

PICO 14: In adult patients with recent-onset AF, when is hospital admission advisable?

[Return to Disposition Planning](#)

Population, Patient or Problem: Adult patients with recent-onset AF

Intervention, Prognostic Factor, Exposure: Hospital admission

Comparison: Outpatient management

Outcome: Adequacy of symptom control, rate control, prevention of adverse events

Design: Retrospective observational studies

Search Strategy: Searched Cochrane Library and PubMed using the search terms “atrial fibrillation” AND “hospital admission”, no limits

Clinical Recommendation: We recommend hospital admission for highly symptomatic patients with decompensated heart failure or myocardial ischemia, based on CCS 2010 AF guideline¹

Quality of Evidence: Low, GRADE C

Strength of Recommendation: Strong, GRADE 1

Clinical Recommendation: We suggest limiting hospital admission to highly symptomatic patients in whom adequate rate control cannot be achieved, based on CCS 2010 AF guideline.¹

Quality of Evidence: Low, GRADE C

Strength of Recommendation: Weak, GRADE 2

References:

1. Stiell IG, Macle L; CCS Atrial Fibrillation Guidelines Committee. Canadian Cardiovascular Society atrial fibrillation guidelines 2010: management of recent-onset atrial fibrillation and flutter in the emergency department. *Can J Cardiol.* 2011;27(1):38-46.

PICO 15: In adults patients with AF and moderate to high stroke risk, are DOACs superior to warfarin in terms of prevention of CVA/TIA and bleeding risk?

[Return to Disposition Planning](#)

Population/Problem: Adults with AF and CHADS2 Score 2 or higher

Intervention: DOAC

Comparison: Warfarin

Outcomes: Decreased stroke incidence, decreased major bleeds, good outcome following bleed

Design: RCTs or prospective observational studies.

Search Strategy: Searched “atrial fibrillation cardioversion” on Cochrane library and PubMed (limited to systematic reviews)

Clinical Recommendation: We recommend, based on CCS 2014 AF guideline, that a DOAC (rivaroxaban, dabigatran or apixaban) is preferred over warfarin if OAC therapy is indicated for patients with non-valvular AF (absence of rheumatic mitral stenosis, a mechanical or bioprosthetic heart valve or mitral valve repair)¹.

Quality of Evidence: High, GRADE A

Strength of Recommendation: Strong, GRADE 1

Clinical Recommendation: We recommend, based on CCS 2014 AF guideline, that warfarin, rather than a DOAC be used in patients with a mechanical prosthetic valve, rheumatic mitral stenosis or eGFR of 15-30 mL/min/1.73 m²¹

Quality of Evidence: Moderate, GRADE B

Strength of Recommendation: Strong, GRADE 1

References:

1. Verma A, Cairns JA, Mitchell LB, et al; CCS Atrial Fibrillation Guidelines Committee. 2014 focused update of the Canadian Cardiovascular Society Guidelines for the management of atrial fibrillation. *Can J Cardiol.* 2014;30(10):1114-1130.

Additional Readings and General References:

Ruff CT, Giugliano RP, Braunwald E, et al. Comparison of the efficacy and safety of new oral anticoagulants with warfarin in patients with atrial fibrillation: a meta-analysis of randomised trials. *Lancet.* 2014;383(9921):955-962.

Salazar CA, del Aguila D, Cordova EG. Direct thrombin inhibitors versus vitamin K antagonists for preventing cerebral or systemic embolism in people with non-valvular atrial fibrillation. *Cochrane Database Syst Rev.* 2014;(3):CD009893. doi:10.1002/14651858.CD009893.pub2.

PICO 16: *In adults patients presenting to the ED with AF and with indications for anticoagulation post cardioversion, is there benefit to initiating LMWH prior to or concurrent with warfarin?*

[Return to Disposition Planning](#)

Population, Patient or Problem: Adults presenting with PAF cardioverted in the ED

Intervention, Prognostic Factor, Exposure: ED initiated warfarin

Comparison: ED initiated warfarin plus LMWH

Outcome: Risk of early clot formation (procoagulant effect + stunned myocardium), patient experience

Design: RCTs or prospective observational studies

Search Strategy: Searched “atrial fibrillation heparin bridging” on PubMed (no limits)

Clinical Recommendation: We recommend, based on the 2012 American College of Chest Physicians¹ and the 2014 AHA/ACC/HRS Guidelines for AF², that in patients with a mechanical heart valve in whom warfarin is interrupted, bridging therapy with LMWH or UFH be initiated. For patients deemed to be at high risk of thromboembolism (e.g., prior CVA/TIA or intracardiac thrombus, bioprosthetic valve, or mitral stenosis) and low risk of intracranial hemorrhage, initiation of warfarin with a heparin bridging regimen is reasonable. In patients with nonvalvular AF without a prior history of thromboembolism, the risk of a thromboembolic event during the several days typically required to achieve therapeutic anticoagulation with warfarin is very low. Thus, it is reasonable for outpatients to initiate warfarin without bridging.

Quality of Evidence: Low, GRADE C

Strength of Recommendation: Strong, GRADE 1 and Weak, GRADE 2

References:

1. You JJ, Singer DE, Howard PA, et al. Antithrombotic therapy for atrial fibrillation: antithrombotic therapy and prevention of thrombosis, 9th ed: American College of Chest Physicians evidence-based clinical practice guidelines. *Chest.* 2012;141(2)

Suppl):e531S-75S. doi:10.1378/chest.11-2304.

2. January CT, Wann LS, Alpert JS et al. 2014 AHA/ACC/HRS guideline for the management of patients with atrial fibrillation: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines and the Heart Rhythm Society. *J Am Coll Cardiol.* 2014;64(21):e1–76. doi:10.1016/j.jacc.2014.03.022.

PICO 17: *In adult patients presenting to the ED with AF and with indications for anticoagulation post cardioversion is there a benefit to initiating LMWH prior to or concurrent with DOACs?*

[Return to Disposition Planning](#)

Population, Patient or Problem: Adults presenting with PAF cardioverted in the ED

Intervention, Prognostic Factor, Exposure: ED initiated DOAC

Comparison: ED initiated DOAC plus LMWH

Outcome: Risk of early clot formation (procoagulant effect + stunned myocardium), patient experience

Design: RCTs or prospective observational studies

Search Strategy: Searched “atrial fibrillation heparin bridging” on PubMed (no limits)

Clinical Recommendation: There is insufficient evidence and lack of consensus to make a recommendation regarding initiating LMWH prior to or concurrent with DOACs post-cardioversion (no RCTs particularly for post-cardioversion). Because the time to full anticoagulation is relatively short after initiation of a DOAC, Uptodate recommends not bridging with heparin.

Quality of Evidence: Low, GRADE C

Strength of Recommendation: Insufficient evidence

PICO 18: *In stable adult patients with AF, when is outpatient specialist consultation recommended?*

[Return to Disposition Planning](#)

Population, Patient or Problem: Stable adults patients assessed in the emergency department with AF

Intervention, Prognostic Factor, Exposure: Specialist outpatient consultation

Comparison: No specific follow-up or GP assessment

Outcome: Identification of structural heart disease, adequacy of symptom control, prevention of CVA

Design: Retrospective observation studies

Search Strategy: Searched Cochrane Library and PubMed using the search terms “atrial fibrillation” AND “outpatient follow-up” AND “cardiology consult” – No relevant papers identified

Clinical Recommendation: We suggest, based on CCS 2010 AF guideline¹, that adequate follow-up be arranged to identify structural heart disease and the possible need for long-term

anticoagulation or antiarrhythmic therapy. Patients with newly detected AF should have outpatient echocardiography and referral to a cardiologist or internist.

Quality of Evidence: Low, GRADE D

Strength of Recommendation: Weak, GRADE 2

References:

1. Stiell IG, Macle L; CCS Atrial Fibrillation Guidelines Committee. Canadian Cardiovascular Society atrial fibrillation guidelines 2010: management of recent-onset atrial fibrillation and flutter in the emergency department. *Can J Cardiol.* 2011;27(1):38-46.

PICO 19: In stable patients presenting with AF in whom successful cardioversion to sinus rhythm is achieved, when is antiarrhythmic drug therapy indicated?

[Return to Disposition Planning](#)

Population, Patient or Problem: Stable adults patients presenting with AF who have achieved conversion to sinus rhythm

Intervention, Prognostic Factor, Exposure: Antiarrhythmic therapy

Comparison: No antiarrhythmic therapy

Outcome: Maintenance of normal sinus rhythm, symptom control

Design: Retrospective observational studies

Search Strategy: Searched “atrial fibrillation cardioversion” on Cochrane library and PubMed (limited to systematic reviews)

Clinical Recommendation: We suggest, based on the CCS 2010 AF guideline¹, 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.

Quality of Evidence: Low, GRADE D

Strength of Recommendation: Very weak, GRADE 3

References:

1. Stiell IG, Macle L; CCS Atrial Fibrillation Guidelines Committee. Canadian Cardiovascular Society atrial fibrillation guidelines 2010: management of recent-onset atrial fibrillation and flutter in the emergency department. *Can J Cardiol.* 2011;27(1):38-46.

Appendix B - PICO-D Methodology and GRADE Terminology

[Return to Appendix A](#)

Key components of high quality and trustworthy clinical guidance include: i) recommendations that are clearly stated and based on scientific evidence of benefits, harms and where possible, costs, and ii) a guideline rating system that is used to communicate quality and reliability of both the evidence and the strength of its recommendations. In the development of these guidelines, clinical questions were formulated based on the PICO-D format as supported by Sackett¹ and Guyatt² in their User's Guide to the Medical Literature to define the clinical question. The GRADE terminology, where possible, is used to address the questions regarding Quality of Evidence and Strength of Recommendations. The components of PICO-D format and the GRADE methodology are described below.

PICO-D

P - Population, Patient, or Problem: This element defines the group of patients or characteristics of the patients.

I - Intervention, Prognostic Factor, Exposure: This element defines the main intervention being considered.

C - Comparison: This element defines the main alternative to compare with the intervention, such as comparison of two drugs or tests, or a medication to no medication or placebo.

O - Outcome: This defines what you are trying to accomplish, measure, improve or affect.

D - Design: The type of question (related to diagnosis, harm/etiology, prognosis, or therapy) will define which study design is best suited to provide evidence to answer the clinical question.

Definitions of Study Types^{2,3}

1. **Meta-analysis:** a statistical technique that summarizes the results of several studies in a single weighted estimate, in which more weight is given to results of studies with more events and sometimes to studies of higher quality.
2. **Systematic Review:** attempts to collate all empirical evidence that fits pre-specified eligibility criteria to answer a specific research question using explicit, systematic methods selected with a view to minimizing bias. This provides more reliable findings from which to draw conclusions.^{4,5} The key characteristics of a systematic review are: i) clearly stated objectives with pre-defined eligibility criteria for studies; ii) an explicit and reproducible methodology; iii) a systematic search that attempts to identify all studies meeting the eligibility criteria; iv) an assessment of validity for the included studies, (e.g. through the assessment of risk of bias; and v) a systematic synthesis and presentation, of the characteristics and findings of the included studies.⁶
3. **Randomized Controlled Trial (RCTs):** a trial in which participants are randomly assigned to two or more groups: at least one (the experimental group) receiving an intervention that is being tested and another (the comparison or control group) receiving an alternative treatment or placebo. This design allows assessment of the relative effects of interventions.
4. **Controlled Clinical Trial (CCTs):** a trial in which participants are assigned to two or more different treatment groups in a non-randomized or quasi-randomized method. Examples of

quasi-randomized allocation are birthdate and medical record numbers. Studies in which the randomization process is not explicitly stated as randomized are considered CCTs. CCTs are more likely to suffer from bias than RCTs.

5. **Observational Studies:**

- a. **Cohort Study**²: an observational study in which a defined group of people (the cohort) is followed over time. The outcomes of people in subsets of this cohort are compared, to examine people who were exposed or not exposed (or exposed at different levels) to a particular intervention or other factor of interest. A prospective cohort study assembles participants and follows them into the future. A retrospective (or historical) cohort study identifies subjects from past records and follows them from the time of those records to the present.
- b. **Case control study**: a study design that examines a group of people who have experienced an event (usually an adverse event) and a group of people who have not experienced the same event, and looks at how exposure to suspect (usually noxious) agents differed between the two groups. This type of study design is most useful for trying to ascertain the cause of rare events, such as rare cancers.
- c. **Case Series**: analysis of series of people with the disease (there is no comparison group in case series).

GRADE Methodology

Whenever possible answers are identified from recent high quality guidelines or high quality systematic reviews and recommendations provided are based on GRADE definitions. Where guidelines or systematic reviews are not available to answer certain questions rapid reviews are undertaken and/or a consensus approach used to try to answer clinically relevant questions. **Only where the evidence is supportive and the benefits clearly outweigh the harm is a “we recommend” strength of recommendation applied.**

Table 1. GRADE Quality of Evidence²

High GRADE A	We have high confidence that the true effect lies close to that of the estimate of the effect.
Moderate GRADE B	We are moderately confident in the effect estimate: The true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different.
Low GRADE C	Our confidence in the effect estimate is low: The true effect may be substantially different from the estimate of the effect.
Very low GRADE D	We have very low confidence in the effect estimate: The true effect is likely to be substantially different from the estimate of effect.

Table 2. GRADE Strength of Recommendations²

Strong GRADE 1	Strong recommendation, with desirable effects clearly outweighing undesirable effects/burdens (or vice versa). Wording of Recommendation: We recommend in favor of / We recommend against.....
Weak GRADE 2	Weak recommendation, with desirable effects closely balanced with undesirable effects. Wording of Recommendation: We suggest in favor of / We suggest against
Insufficient evidence or no consensus	Wording of Recommendation: There is insufficient evidence or the confidence in the effect estimates is so low that the panel is unable to make a recommendation regarding....

References:

1. Sackett D, Richardson WS, Rosenberg W, Haynes RB. *How to practice and teach evidence based medicine*. 2nd ed. Churchill Livingstone; 1997.
2. Guyatt GH, Oxman AD, Vist GE, et al; for the GRADE Working Group. GRADE: an emerging consensus on rating quality of evidence and strength of recommendations. *BMJ*. 2008; 336(7650):924-926.
3. Clinical Questions, PICO & Study Designs: Formulating a Well Built Clinical Question. Dahlgren Memorial Library/ Georgetown University Medical Center.
<http://researchguides.dml.georgetown.edu/ebmclinicalquestions>. Updated February 3, 2015. Accessed January 2015.
4. Antman EM, Lau J, Kupelnick B, Mosteller F, Chalmers TC. A comparison of results of meta-analyses of randomized control trials and recommendations of clinical experts. Treatments for myocardial infarction. *JAMA*. 1992;268(2):240-248.
5. Oxman AD, Guyatt GH. The science of reviewing research. *Ann N Y Acad Sci*. 1993;703:125-133.
6. Higgins JPT, Green S, eds. *Cochrane Handbook for Systematic Reviews of Interventions*. Version 5.1.0. West Sussex, England: The Cochrane Collaboration and John Wiley & Sons, Ltd; 2008.

Appendix C - Patient Education and Discharge Material

[Return to Disposition Planning](#)

Links to MyHealthAlberta patient education:

[Atrial Fibrillation – After Your Visit](#)

[Taking Blood Thinners Other Than Warfarin: After Your Visit](#)

[Taking Warfarin Safely: After Your Visit](#)

Appendix D - Stroke Risk and Bleeding Risk calculation tools

[Return to Physician Assessment and Documentation](#)

[Return to Order Set Components- Medications](#)

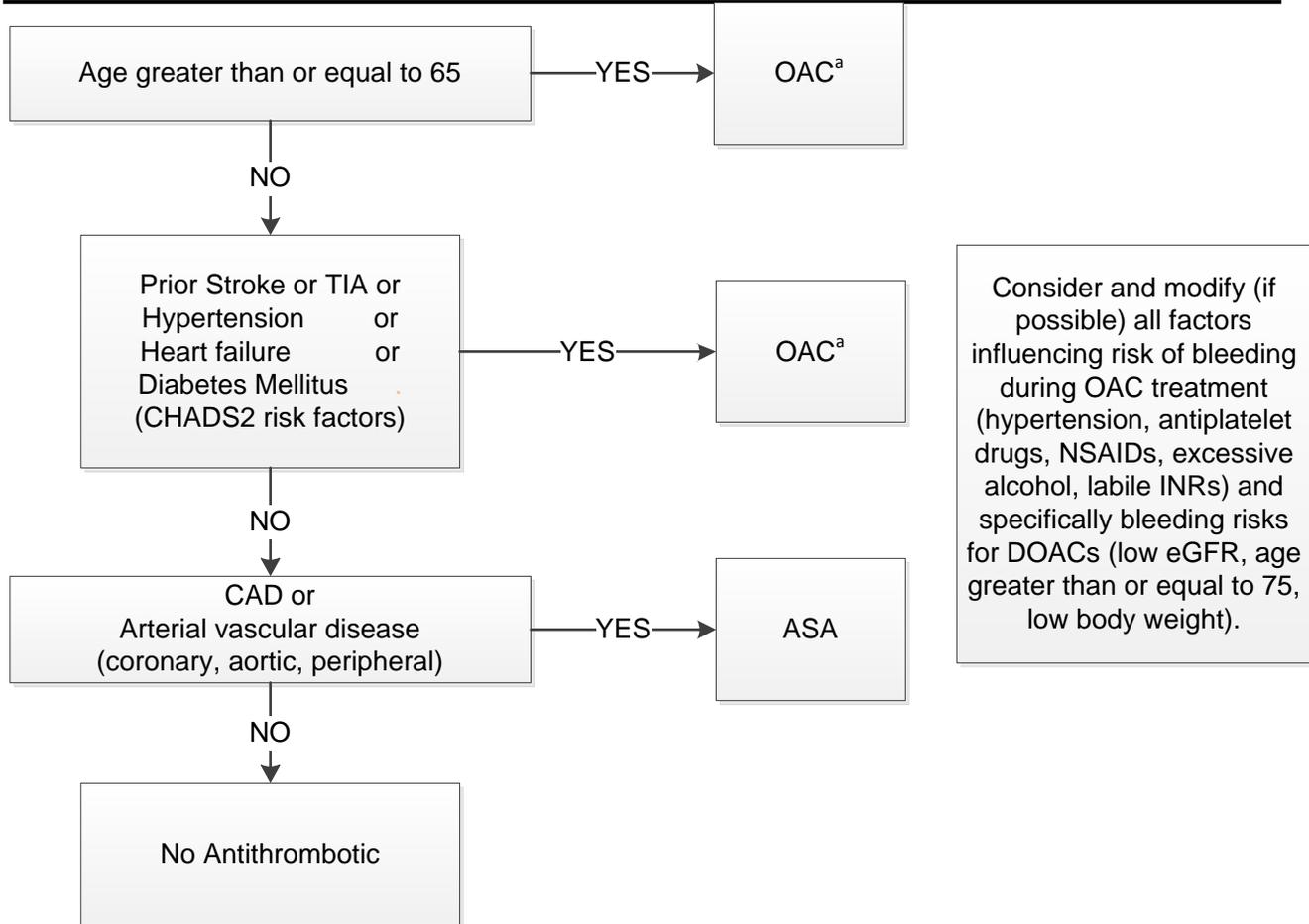
[Return to Disposition Planning](#)

All patients require risk stratification for stroke risk prediction using the 2014 Canadian Cardiovascular Society (CCS) algorithm CHADS65. Within this algorithm, the CHADS2 score can be used to guide antithrombotic therapy. While key elements of CHA2DS2-VASc (age greater than 65, history of vascular disease), are incorporated into CHADS65, the CHA2DS2-VASc score is not used to guide management. The CHA2DS2-VASc scoring system is included in this appendix for the purpose of highlighting its components and is not meant to be calculated.

Summary of 2014 CCS Risk Stratification (CHADS65) algorithm:

- OAC if age greater than/equal to 65 or CHADS2 score 1 or more
- Acetylsalicylic acid if age less than 65 and CHADS2 score 0 with history of vascular disease
- No antithrombotic if age less than 65 and CHADS2 score 0 with no history of vascular disease

Figure 1. 2014 CCS Risk Stratification algorithm



^aWe suggest that a DOAC be used in preference to warfarin for non-valvular AF.

^bAdapted from the 2014 CCS Guidelines.¹

CHADS₂ Score

(Click to view online calculator <http://www.mdcalc.com/chads2-score-for-atrial-fibrillation-stroke-risk/>)

	Points
Congestive heart failure	1
Hypertension (HTN): BP consistently greater than 140/90 mmHg OR HTN on medication	1
Age greater than or equal to 75 years	1
Diabetes Mellitus	1
Prior Stroke or TIA or Thromboembolism	2

Components of CHA₂DS₂-VASc score

(Click to view online calculator <http://www.mdcalc.com/cha2ds2-vasc-score-for-atrial-fibrillation-stroke-risk/>)

Congestive heart failure
 HTN: BP consistently greater than 140/90 mmHg OR HTN on medication
 Age greater than or equal to 75 years
 Age 65 to 74 years
 Prior Stroke or TIA or Thromboembolism
 Vascular disease (previous MI, peripheral artery disease or aortic plaque)
 Diabetes Mellitus
 Female

HAS-BLED Bleeding Risk Score

 (Click to view online calculator <http://www.mdcalc.com/has-bleed-score-for-major-bleeding-risk>)

Table 1. Clinical Characteristics Composing the HAS-BLED Bleeding Risk Score

Letter	Clinical Characteristic	Points Awarded
H	Hypertension (uncontrolled, greater than 160 mmHG sBP)	1
A	Abnormal renal and liver function ^a (1 point each)	1
S	Stroke (previous history, particularly lacunar)	1
B	Bleeding history or predisposition to bleeding ^b	1
L	Labile INRs (unstable/high INRs or therapeutic time in range less than 60%)	1
E	Elderly (age greater than 65)	1
D	Drugs (antiplatelet agents, NSAID) or excess alcohol use (1 point each)	1

^aAbnormal renal function is defined as the presence of chronic dialysis, renal transplantation or serum creatinine greater than or equal to 200 micromol/L. Abnormal liver function is defined as chronic hepatic disease (e.g., cirrhosis) or biochemical evidence of significant hepatic derangement (e.g., bilirubin more than 2x the upper limit of normal, in association with aspartate transaminase/alanine transaminase/alkaline phosphatase more than three times the upper limit normal).

^bBleeding refers to previous bleeding history or predisposition to bleeding (e.g., bleeding diathesis, anemia)

^cAdapted from Pisters et al., 2010.²

Table 2. Estimated risk of major bleeding (intracranial, hospitalization, haemoglobin decrease greater than 2g/L and or transfusion) in patients with atrial fibrillation based on HAS-BLED score

HAS-BLED Score	Bleeds per 100 patient years
0	1.13
1	1.02
2	1.88
3	3.74
4	8.70
5-9	No data

^aAdapted from Lip et al., 2011³

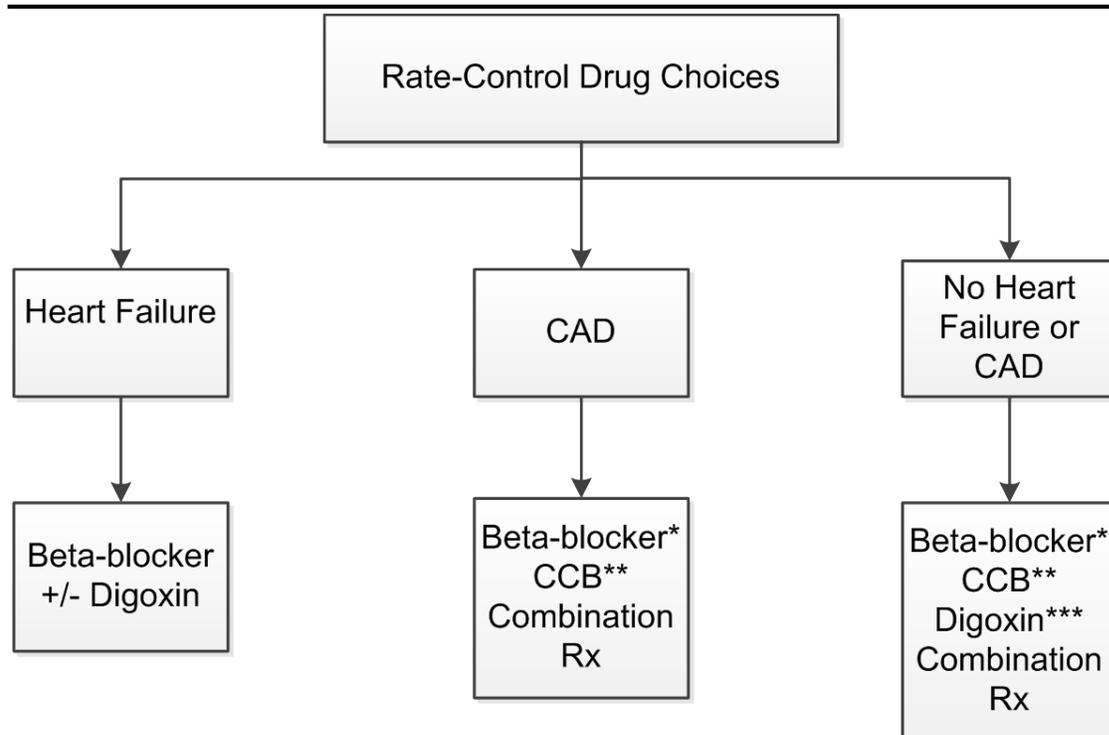
References:

1. Verma A, Cairns JA, Mitchell B, et al. 2014 Focused Update of the Canadian Cardiovascular Society Guidelines for the Management of Atrial Fibrillation. *Can J Cardiol.* 2014 Oct;30(10):1114-30
2. Pisters et al., A Novel User- Friendly Score (HAS-BLED) To Assess 1-Year Risk of Major Bleeding in Patients with Atrial Fibrillation. *CHEST* 2010; 138(5):1093-1100
3. Lip et al. Implications of the CHADS2-VASc and HAS-BLED Scores from thromboprophylaxis in atrial fibrillation. *American Journal of Medicine* 2011; 124:111

Appendix E - Rate and Rhythm Control Medications for Atrial Fibrillation

[Return to Order Set Components - Medications](#)

Figure 1. Summary of recommendations for choice of rate-control agents for various conditions. CAD, (coronary artery disease) CCB (calcium channel blocking agents) therapy¹



Drugs are listed in alphabetical order

* Beta-blockers preferred in CAD

** Non-dihydropyridine calcium channel blockers (diltiazem, verapamil)

***Digoxin may be considered as monotherapy only in particularly sedentary individuals

^aAdapted from the 2012 Update of the CCS Atrial Fibrillation Guidelines¹

Table 1. Recommended Drugs for Pharmacologic Conversion in the Emergency Department

Drug	Dose	Efficacy	Risks
Class IA			
Procainamide	15-17 mg/kg over 60 min	++	5% Hypotension
Class IC ^a			
Propafenone	450-600 mg PO	+++	Hypotension, 1:1 flutter, Bradycardia
Flecainide	300-400 mg PO	+++	Hypotension, 1:1 flutter, Bradycardia
Class III			
Ibutilide	1-2 mg IV over 10-20 min Pretreat with MgSO ₄ 1-2 mg IV	++	2-3% Torsades de pointes

^aClass 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.

^bAdapted from Stiell, Macle, and the CCS Atrial Fibrillation Guidelines Committee, 2011²

References:

1. Skanes AC, Healey JS, Cairns JA et al. Focused 2012 Update of the Canadian Cardiovascular Society Atrial Fibrillation Guidelines: Recommendations for Stroke Prevention and Rate/Rhythm Control. *Canadian Journal of Cardiology*. 2012; 28:125-136
2. Stiell IG, Macle L, and the CCS Atrial Fibrillation Guidelines Committee. Canadian Cardiovascular Society Atrial Fibrillation Guidelines 2010: Management of Recent-Onset Atrial Fibrillation and Flutter in the Emergency Department. *Can J Cardiol*. 2011;27:38-46

Appendix F - Direct Oral Anticoagulant Guideline

[Return to Order Set Components - Medications](#)

[Return to Disposition Planning](#)

Important Note: The information contained in this appendix comes from a provincial guideline and does not show the guideline in its entirety. The content below is not guaranteed to be up to date and it is recommended that the full guideline be accessed.

Please see relevant Atrial Fibrillation treatment information below from the:

Direct Oral Anticoagulant Agents Document approved by the Chief Medical Officer April 23, 2015 (document #HCS-115-01)

To access the full AHS guideline, go to:

<https://extranet.ahsnet.ca/teams/policydocuments/1/clp-prov-direct-oral-anticoagulant-agents-guideline-hcs-115-01.pdf>

Recommendations for the use of Dabigatran, Rivaroxaban, and Apixaban

- These agents do not require routine anticoagulation monitoring of PT INR or PTT
- Specific reversal agents are not currently available to control active bleeding.
- All three drugs require some degree of renal clearance, least for apixaban and greatest for dabigatran.

Atrial Fibrillation

These new DOAC's were studied in patients with non-valvular atrial fibrillation and are not appropriate for patients with rheumatic heart disease or mechanical valves. The 2014 CCS Focused Update of the Canadian Cardiovascular Society Guidelines for the Management of Atrial Fibrillation provides the following recommendations for stroke prevention:

- a) OAC therapy for most patients aged greater than or equal to 65 years or CHADS₂ score greater than or equal to one (1). When OAC therapy is indicated, most patients should receive dabigatran, rivaroxaban, or apixaban in preference to warfarin for non-valvular AF.
- b) Acetylsalicylic Acid (ASA) (81 mg/day) for patients aged less than 65 years with no CHADS₂ risk factors besides arterial disease (coronary, aortic, or peripheral).
- c) No antithrombotic therapy for patients aged less than 65 with no CHADS₂ risk factors and free of arterial vascular disease (coronary, aortic, peripheral).

Stroke risk: Patients with nonvalvular AF should be risk stratified based on stroke and bleeding risk using standard measures such as CHADS₂/CHADS₂VASc and HASBLED. There is good evidence to support use of these agents for patients with CHADS₂ greater than or equal to one (1) for dabigatran and apixaban, and for patients with CHADS₂ greater than or equal to two (2) for

rivaroxaban. With CHADS₂ scores greater than 3 (three), or with a history of prior stroke, favour the use of higher dosage dabigatran or apixaban.

Bleeding risk: Patients with active bleeding should not be on an oral anticoagulant. Once bleeding has been controlled they can be started on a DOAC, but those with recent or high bleeding risk should be considered for use of apixaban or low dose dabigatran. Those with low risk of bleeding can be started on any of the agents.

Renal function: There are significant differences in renal excretion among the agents with apixaban having the lowest and dabigatran having the highest level of renal excretion. While any of the agents can be considered with a glomerular filtration rate (GFR) greater than 60 mL/min, it is advised that lower dosages of dabigatran be used with GFR less than 50 mL/min, and that apixaban be considered as preferred with a GFR less than 30 mL/min.

Age: There were significant differences in risk and benefit achieved in patients over the age of 80 among the agents with apixaban and rivaroxaban being favoured over dabigatran in that age group.

Coronary artery disease: While overall there was no clear difference in risk of CAD associated with use of these agents in patients with AF, there were significant differences in bleeding risk in patients being treated for ACS. This is predominantly associated with use of these agents in addition to antiplatelet agents.

a) While there was a lower risk of bleeding associated with apixaban, the risk is still significant associated with dual antiplatelet therapy. There was very little evidence of benefit from an ACS standpoint, so in patients who require OAC for AF with recent ACS, the suggestion would be dual antiplatelets alone for those with CHADS₂ score less than or equal to one (1) and consider use of VKA's in those with CHADS₂ score greater than one (1) while they require dual antiplatelet therapy. Studies are in progress, looking at the efficacy and safety of single antiplatelet and DOAC. These are not yet reported but are expected to favour direct factor (Xa inhibitors) rivaroxaban or apixaban over thrombin inhibitors such as dabigatran.

Presence of arterial clot or recent stroke: The DOACs were not used in setting of recent stroke (less than six [6] months) or with acute arterial clot/embolism. The initial management of venous thromboembolism (VTE) was also handled differently with these agents with some using LMWH/UFH to DOAC or higher dosage DOAC initially. In the setting of a recent arterial clot/embolism/stroke the stroke Neurologist or Hematologist should be consulted regarding preferred agent and timing of anticoagulation. There have been reports of the occurrence or an increase in cardiac or venous clotting in setting of low dose dabigatran and rivaroxaban.

Medication interactions: While there are not many drug interactions with the DOACs there are specific situations they should be avoided if certain drugs need to be continued including: rifampin, phenytoin, carbamazepine, clarithromycin, fluconazole and other azoles and protease inhibitors.

Monitoring

- a. Anticoagulation monitoring is not routinely required.
- b. Patients who require high risk bleeding procedures, a normal INR/PTT will not exclude significant residual effect of DOAC.

- c. For dabigatran, a PTT value greater than 2 times normal is associated with increased risk of bleeding and a normal thrombin time can be used to exclude any significant residual anticoagulant effect.
- d. For Xa inhibitors (rivaroxaban and apixaban), a heparin calibrated anti-Xa level less than 0.1 will exclude any significant residual effect of rivaroxaban anticoagulant.

Recommended Dosages:

Indication	Dabigatran	Rivaroxaban	Apixaban	Additional info
AF	110 mg po bid 150 mg po bid	15 mg po daily 20 mg po daily	2.5 mg po bid 5 mg po bid	Cr Cl 30-50mL/min Cr Cl greater than 50 mL/min

Appendix G - Clinical Working Group Membership

We would like to acknowledge the contributions of the Provincial Clinical Knowledge Working Group members as follows. Your participation and time spent is appreciated.

Emergency Department Atrial Fibrillation Knowledge Topic Working Group Membership			
Name	Title	Role	Zone
Knowledge Lead			
Michael Bullard	Physician	Knowledge Lead	Provincial
Topic Lead			
Ni Lam	Physician	Topic Lead	Provincial
Working Group Members			
Allison Kirkham	Physician	Working Group Member	Edmonton Zone
Andrew McRae	Physician	Working Group Member	Calgary Zone
Brian Holroyd	Physician	Working Group Member	Edmonton Zone
Dan Banmann	Physician	Working Group Member	South Zone
Chris Hall	Physician	Working Group Member	Calgary Zone
Eddy Lang	Physician	Working Group Member	Calgary Zone
Harvey Woytiuk	Physician	Working Group Member	North Zone
Jenn Pritchard	Physician	Working Group Member	Edmonton Zone
Katherine Smith	Physician	Working Group Member	Edmonton Zone
Lyle Thomas	Physician	Working Group Member	Central Zone
Pat San Augustin	Physician	Working Group Member	Edmonton Zone
Paul Parks	Physician	Working Group Member	South Zone
Richard Martin	Physician	Working Group Member	North Zone
Sam Chow	Physician	Working Group Member	Edmonton Zone
Shawn Dowling	Physician	Working Group Member	Calgary Zone
Simon Ward	Physician	Working Group Member	Central Zone
Vanessa Davis	Physician	Working Group Member	Edmonton Zone
Bonnie Niebergall	Registered Nurse	Working Group Member	South Zone
Jennifer Belanger	Registered Nurse	Working Group Member	Calgary Zone
Jennine Desmarais	Registered Nurse	Working Group Member	North Zone
Laura Fowler	Registered Nurse	Working Group Member	Central Zone
Marg Dymond	Registered Nurse	Working Group Member	Edmonton Zone
Maria Janik	Registered Nurse	Working Group Member	Edmonton Zone
Monique Fernquist	Registered Nurse	Working Group Member	Provincial
Shelly Lynn Franklin	Registered Nurse	Working Group Member	North Zone
Thora Skeldon	Registered Nurse	Working Group Member	Central Zone
Multidisciplinary			
Roopinder Sandhu	Physician	Content Expert	Edmonton Zone
Russell Quinn	Physician	Content Expert	Calgary Zone

Stafford Dean	DIMR Representative	Content Expert	Provincial
Bill Anderson	Physician - Diagnostic Imaging Representative	Content Expert	Provincial
James Wesenberg	Laboratory Representative	Content Expert	Provincial
Steven Freriks	Pharmacy Representative	Content Expert	Provincial
Nicholas Myers	Physician	Primary Care Representative	Calgary Zone
Rod Elford	Physician	Primary Care Representative	Calgary Zone
Sofia Christoforakis	SCN Representative	Surveyor	Provincial

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For questions or feedback related to this knowledge topic please contact Clinical Knowledge Topics by emailing ClinicalKnowledgeTopics@albertahealthservices.ca