Canadian Journal of Emergency Medicine (2021) 23:604–610
https://doi.org/10.1007/s43678-021-00167-y

CAEP POSITION STATEMENT & GUIDELINES

2021 CAEP Acute Atrial Fibrillation/Flutter Best Practices Checklist

Ian G. Stiell[1,2,23] ¥Kerstin de Wit[4,5] ¥Frank X. Scheuermeyer[3] ¥Alain Vadeboncoeur[11,12] ¥Paul Angaran[18] ¥ Debra Eagles[1,2] ¥Ian D. Graham[2] ¥Clare L. Atzema[7,8] ¥Patrick M. Archambault[10] ¥Troy Tebbenham[14] ¥ Andrew D. McRae[9] ¥Warren J. Cheung[1,2] ¥Ratika Parkash[19] ¥Marc W. Deyell[20] ¥GeneviËve Baril[13] ¥Rick Mann[15] ¥ Rupinder Sahsi[16,17] ¥Suneel Upadhye[6] ¥Erica Brown[2] ¥Jennifer Brinkhurst[2] ¥Christian Chabot[21] ¥Allan Skanes[22]

Received: 8 June 2021 / Accepted: 16 June 2021 / Published online: 12 August 2021

A. Assessment and risk stratification

1. Is AF/AFL with rapid ventricular response a primary arrhythmia or secondary to medical causes?

A. Rapid rate secondary to medical causes (usually in patients with pre-existing/permanent AF) e.g., sepsis, bleeding, PE, heart failure, ACS, etc.:

- Investigate and treat underlying causes aggressively
- Cardioversion may be harmful
- Avoid aggressive rate control

B. Primary arrhythmia, e.g., sudden onset of AF/AFL

TIP: Rapid rate is more likely to be secondary to an underlying medical cause if:

- *Not sudden onset, no palpitations*
- *Known permanent AF, on OACs, old ECGs show AF*
- *No history of ED cardioversions*
- *HR <150*
- *Fever, dyspnea, pain*

✉ Ian G. Stiell
istiell@ohri.ca

1 Department of Emergency Medicine, University of Ottawa, Ottawa, ON, Canada

2 Ottawa Hospital Research Institute, Ottawa, ON, Canada

3 Department of Emergency Medicine, University of British Columbia, Vancouver, BC, Canada

4 Department of Emergency Medicine, Queen s University, Kingston, ON, Canada

5 Department of Medicine, McMaster University, Hamilton, ON, Canada

6 Division of Emergency Medicine, McMaster University, Hamilton, ON, Canada

7 Division of Emergency Medicine, University of Toronto, Toronto, ON, Canada

8 Institute for Clinical Evaluative Sciences, Toronto, ON, Canada

9 Department of Emergency Medicine, University of Calgary, Calgary, AB, Canada

10 Department of Family Medicine and Emergency Medicine, Universit Laval, Quebec, QC, Canada

11 Universit de Montr al, Montreal, QC, Canada

12 Department of Emergency Medicine, Montreal Heart Institute, Montreal, QC, Canada

13 Hpi tal de Granby, Granby, QC, Canada

14 Peterborough Regional Health Centre, Peterborough, ON, Canada

15 Trillium Health Partners, Mississauga Hospital, Mississauga, ON, Canada

16 Division of Emergency Medicine, Department of Family Medicine, McMaster University, Hamilton, ON, Canada

17 St. Mary s General Hospital, Kitchener, ON, Canada

18 Division of Cardiology, Terrence Donnelly Heart Centre, St Michael s Hospital, University of Toronto, Toronto, ON, Canada

19 Division of Cardiology, Dalhousie University, Halifax, NS, Canada

20 Heart Rhythm Services, Division of Cardiology, University of British Columbia, Vancouver, BC, Canada

21 Quebec City, QC, Canada

22 Division of Cardiology, Western University, London, ON, Canada

23 Clinical Epidemiology Unit, The Ottawa Hospital, F657, 1053 Carling Avenue, Ottawa, ON K1Y 4E9, Canada

2. Is the patient unstable?

Instability due to acute primary AF/AFL is uncommon, except for AF with rapid ventricular pre-excitation (WPW):

- *Hypotension*: SBP < 90 mmHg, or signs of shock (e.g., altered mental status)
- *Cardiac ischemia*: ongoing severe chest pain or marked ST depression (> 2 mm) on ECG despite therapy
- *Pulmonary edema*: significant dyspnea, crackles, and hypoxia

Treat unstable patient:

- Urgent electrical CV if onset < 48 h or WPW
- Consider trial of rate control if onset > 48 h

3. Is it safe to cardiovert this patient with primary AF/AFL?

When it is safe, rhythm control is usually preferable to rate control: patient quality of life, shorter length of stay, fewer hospital resources
It is safe to cardiovert if:

A. The patient has been adequately anticoagulated for a minimum of 3 weeks, OR
B. The patient is not adequately anticoagulated for > 3 weeks, has no history of stroke or TIA, AND does not have valvular heart disease, AND:

    1. Onset < 12 h ago, OR
    2. Onset 12 48 h ago and there are <2 of these CHADS-65 criteria (age ≥ 65, diabetes, hypertension, heart failure), OR
    3. Negative for thrombus on transesophageal echocardiography

Consider delaying cardioversion if recent history of frequent palpitations
Rate control acceptable, per patient and physician preference

- e.g. older patients who are minimally symptomatic with a mildly elevated HR

TIP: How to determine if therapeutic OAC x 3 weeks?

- *Based on MD judgment*
- *DOAC - confirm compliance by history*
- *Warfarin*
    - *Current INR >2.0*
    - *Recent INR values >2.0*
    - *Recent INR testing confirmed by history*
    - *No recent changes in dose*

B. Rate and rhythm control

4. Rate control for patients for whom cardioversion is unsafe

Calcium channel- and beta-blockers considered first line:

- If patient already taking oral calcium channel- or beta- blocker, choose same drug group first
- If difficulty achieving adequate rate control**,** consider using the other first-line agent, IV digoxin, or cardiology consultation

Calcium channel blocker:

- Avoid if acute heart failure or known LV dysfunction (POCUS may be helpful)
- Diltiazem 0.25 mg/kg IV over 10 min; repeat q15-20 min at 0.35 mg/kg up to 3 doses
- Start 30 60 mg PO within 30 min of effective IV rate control
- Discharge on 30-60 mg QID or Extended Release 120 240 mg once daily

Beta blocker:

- Metoprolol 2.5 5 mg IV over 2 min, repeat q15 20 min up to 3 doses
- Start 25 50 mg PO within 30 min of effective IV rate control
- Discharge on 25 50 mg BID

Digoxin is second line, as slow onset:

- 0.25 0.5 mg loading dose, then 0.25 mg IV q4 6 h to a max of 1.5 mg over 24 h; caution in renal failure
- Consider first line if hypotension or acute HF

Heart rate target: < 100 bpm at rest, < 110 walking

5. Rhythm control

Either pharmacological or electrical cardioversion acceptable, per patient and physician preference:

- Consider previous episodes; if one doesn t work, try the other

Pre-treatment with rate control agents not recommended ineffective and delays treatment
Pharmacological cardioversion:

- Procainamide IV 15 mg/kg in 500 ml NS over 60 min, maximum 1500 mg

  Avoid if SBP < 100 mm Hg or QTc > 500 ms
  Interrupt infusion if BP drops or QRS lengthens visibly (e.g., > 30%)
  Check QTc after conversion

- Amiodarone IV not recommended slow, low efficacy
- Less commonly used options include: vernakalant IV, ibutilide IV, propafenone PO and flecainide PO

Electrical cardioversion

- Setup minimum 2 staff (RN/RRT; RN/RN), 2nd physician ideal
- Procedural sedation per local practice e.g., Fentanyl, Propofol
- Pad/paddle position either antero-lateral or antero-posterior acceptable:

  Avoid sternum, breast tissue
  If failure, apply pressure with paddles, try the other position

- Start with 150 200 J synchronized avoid starting with low energy level

Many patients can be discharged as soon as 30 min after conversion if treated with IV procainamide or ECV

6. Rapid ventricular pre-excitation (WPW)

Urgent electrical CV usually required
Procainamide IV if stable

- AV nodal blocking agents contraindicated: digoxin, calcium channel-, beta-blockers, adenosine, amiodarone

C. Stroke prevention

7. Who requires anticoagulation?

Antithrombotic therapy prescribed at discharge is for long-term stroke prevention
For OAC contraindications see the McMaster Checklist
If CHADS-65 positive (any of age ≥ 65, diabetes, hypertension, heart failure, stroke/TIA) initiate OAC prior to discharge; consider shared decision making to include patients preferences with regards to risks and benefits:

- DOACs preferred over warfarin
- Use warfarin (*DOACs contraindicated)* if mechanical valve, moderate-severe mitral stenosis, severe renal impairment (*CrCl < 30 ml/min*)
- If stable CAD, discontinue ASA
- If CAD with other anti-platelets or recent PCI < 12 months, consult cardiology

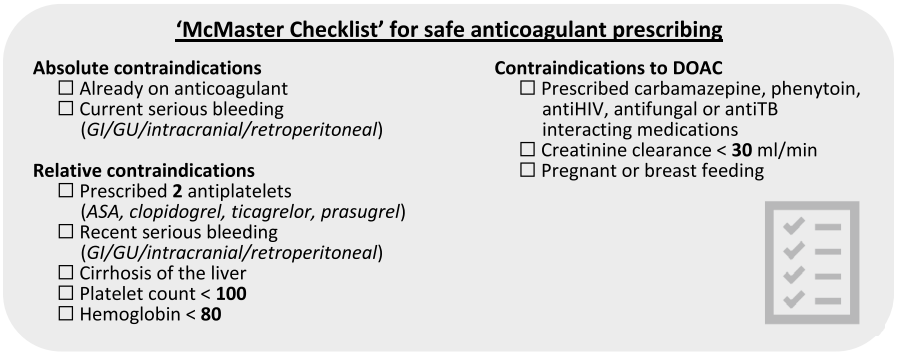
If CHADS-65 negative, OAC might be considered for a 4-week period after careful consideration of risks and benefits and a shared decision-making process with the patient; ensure patient is aware anticoagulation will be discontinued after 4 weeks
CHADS-65 negative and stable coronary, aortic, or peripheral vascular disease, ensure patient is on ASA 81 mg daily

- Patients already taking anti-platelet agents require follow-up with cardiology

If TEE-guided CV, must initiate DOAC immediately × 4 weeks

- If warfarin, need LMW heparin bridging

Patients who convert spontaneously before ED treatment should generally be prescribed OAC according to the CHADS-65 criteria



8. DOACs and warfarin

See *Thrombosis Canada* App for details; avoid in pregnancy, breastfeeding
Consult nephrology or thrombosis if CrCl < 30 ml/min
Provincial formularies may require Limited Use codes, e.g. failure of warfarin or INR monitoring not possible:

- Dabigatran 150 mg BID; use 110 mg BID if age > 80 years, or > 75 years with bleeding risk
- Rivaroxaban 20 mg daily; use 15 mg daily if CrCl 30 49 ml/min
- Apixaban 5 mg BID; use 2.5 mg BID if two of: (1) serum creatinine > 133 umol/L, (2) age > 80 years, or (3) body weight < 60 kg
- Edoxaban 60 mg daily; use 30 mg daily if CrCl 30 50 ml/min or weight < 60 kg; important drug interactions

Warfarin

- Initiate warfarin: 5 mg daily; (1 2 mg daily if frail, low weight, Asian descent):

  Heparin bridging not required unless TEE-guided CV
  Arrange for INR blood test and review after 3 or 4 doses of warfarin. Subsequent warfarin doses should be communicated to patient on the day of the INR test

D. Disposition and follow-up

9. Admission to hospital

Patients rarely require hospital admission for uncomplicated acute AF/AFL unless they:

- Are highly symptomatic despite adequate treatment
- Have ACS with significant chest pain, troponin rise, and ECG changes

  No need to routinely measure troponin, small demand rise expected

- Have acute heart failure not improved with ED treatment

10. Follow-up issues

Recommend physician follow-up < 7 days if new warfarin or rate control meds
Recommend cardiology / internal medicine follow-up in 4 6 weeks if not already followed or if new medications prescribed
Provide handout (available from *Thrombosis Canada*) describing new medication, atrial fibrillation, and follow-up; early renal function monitoring if new DOAC
Do not initiate anti-arrhythmic agents like amiodarone or propafenone in the ED
If sinus rhythm achieved, generally no need to initiate beta- or calcium channel-blockers

Box 1. Advisory committee members

Academic HSC Emergency Medicine
Ian Stiell - Ottawa
Frank Scheuermeyer - UBC
Suneel Upadhye - McMaster
Clare Atzema - Toronto
Andrew McRae - Calgary
Kerstin deWit – Queen's (Thrombosis)
Patrick Archambault - Laval
Warren Cheung - Ottawa
Debra Eagles - Ottawa
Alain Vadeboncoeur - Montreal

Ottawa Staff
Erica Brown
Jennifer Brinkhurst

Community Hospital Emergency Medicine
Troy Tebbenham - Peterborough
Rick Mann - Mississauga
Rupinder Sahsi - Kitchener
Geneviève Baril - Granby

Cardiology
Allan Skanes - Western
Paul Angaran - Toronto
Marc W. Deyell - UBC
Ratika Parkash - Dalhousie

Patient
Christian Chabot - Quebec City

Background and methods

The *2021 CAEP Acute Atrial Fibrillation/Flutter Best Practices Checklist* has been updated from the original version published in 2018 [1]. These checklists have been created to assist emergency physicians in Canada and elsewhere manage patients who present to the emergency department (ED) with acute/recent-onset atrial fibrillation (AF) or flutter (AFL). The checklist focuses on symptomatic patients with acute AF or AFL, i.e. those with recent-onset episodes (either first detected, recurrent paroxysmal or recurrent persistent episodes) where the onset is generally less than 48 h but may be as much as seven days. These are the most common acute arrhythmia cases requiring care in the ED. Canadian emergency physicians are known for publishing widely on this topic and for managing these patients quickly and efficiently in the ED [2, 3, 4].

The 2018 Checklist project was funded by a research grant from the Cardiac Arrhythmia Network and the resultant guidelines were formally endorsed by the Canadian Association of Emergency Physicians (CAEP). We chose to adapt, for use by emergency physicians, existing high-quality clinical practice guidelines (CPG) previously developed by the Canadian Cardiovascular Society (CCS) [5-7]. These CPGs were developed and revised using a rigorous process that is based on the GRADE (Grading of Recommendations Assessment, Development and Evaluation) system of evaluation [8]. With the assistance of our PhD methodologist (IG), we used the recently developed Canadian CAN-IMPLEMENT© process adapted from the ADAPTE Collaboration [9, 10]. We created an Advisory Committee consisting of ten academic emergency physicians (one also expert in thrombosis medicine), four community emergency physicians, three cardiologists, one PhD methodologist, and two patients. Our focus was four key elements of ED care: assessment and risk stratification, rhythm and rate control, short-term and long-term stroke prevention, and disposition and follow-up. The advisory committee communicated by face-to-face meetings, teleconferences, and email. The checklist was prepared and revised through a process of feedback and discussion on all issues by all panel members. These revisions went through ten iterations until consensus was achieved. We then circulated the draft checklist for comment to approximately 300 emergency medicine and cardiology colleagues. Finally, the CAEP Standards Committee posted the Checklist online for all CAEP members to provide feedback (Fig. 1).

Early in 2021 the same Checklist Advisory Committee reconvened (with one additional academic cardiologist) to discuss updates based upon new evidence [3, 4, 11], the 2018 and 2020 CCS guidelines [12, 13], and several commentaries that had expressed the concern of the Canadian ED community [14, 15]. The Advisory Committee met twice virtually and reached consensus on updates through repeated email exchanges. The panelists then sought further feedback from their own colleagues in emergency medicine and cardiology. Finally, the 2021 Checklist was posted by CAEP for further member feedback prior to final approval. The panel continues to believe that, overall, a strategy of ED cardioversion and discharge home from the ED is preferable from both the patient and the healthcare system perspective, for most patients. Many notable revisions were incorporated, including:

1. The safety of urgent cardioversion for acute AF/AFL depends upon anticoagulation status, prior stroke, valvular heart disease, time since onset, and CHADS criteria. Patients presenting between 12 and 48 h may only be cardioverted if they have 0 or 1 of the CHADS-65 crite-

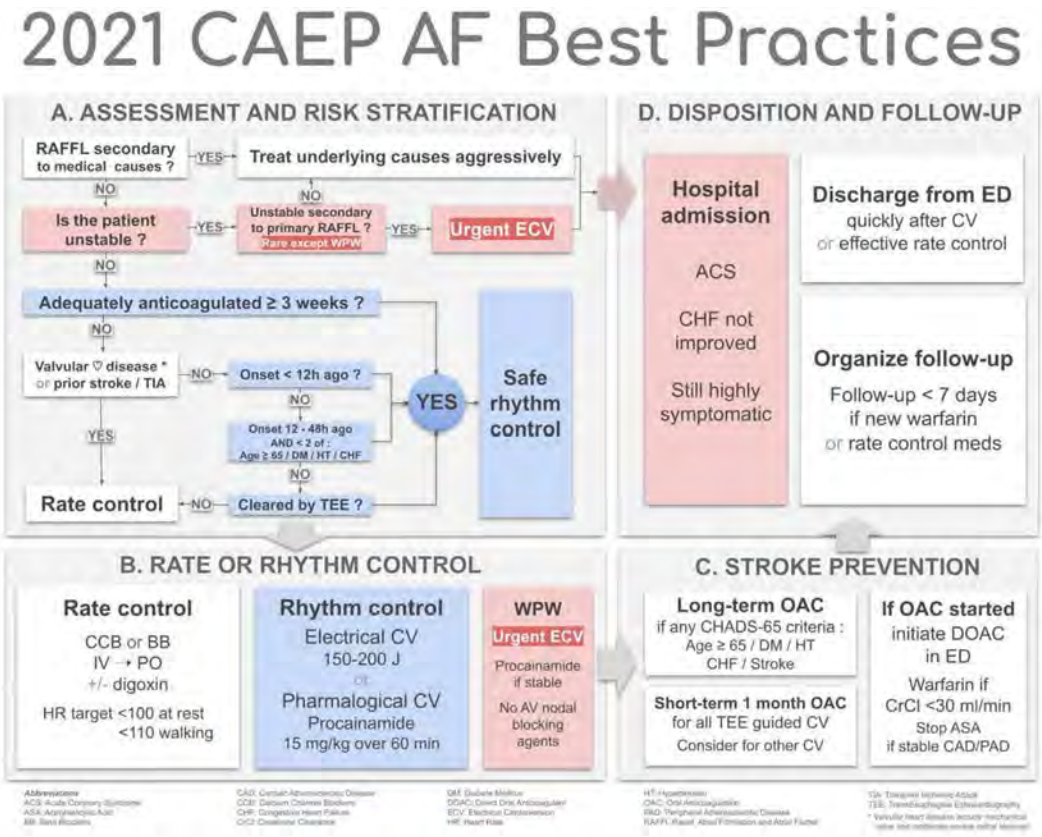


Fig. 1 Overview of 2021 CAEP AF/AFL best practices checklist

ria. We found that the CCS reference to $CHADS_2$ Scale problematic as most ED physicians no longer use that scale.

2. Anticoagulation for CHADS-65 positive patients should be initiated in the ED unless there are contradictions as per the McMaster Checklist created by Dr. de Wit.
3. We disagree with the CCS suggestion of 4 weeks of anticoagulation for patients who are CHADS-65 negative as this was a weak recommendation per the GRADE system, based upon low quality evidence. We suggest that oral anticoagulation might be considered for a 4-week period after careful consideration of risks and benefits and a shared decision-making process with the patient.

Our hope is that the *2021 CAEP Acute Atrial Fibrillation/Flutter Best Practices Checklist* will standardize and improve care of AF and AFL in large and small EDs alike. We believe that these patients can be managed rapidly and safely, with early ED discharge and return to normal activities.

Acknowledgements Funding for this guideline was supported by the Cardiac Arrhythmia Network of Canada (CANet) as part of the Networks of Centres of Excellence (NCE). Dr. Stiell has received unrestricted research support from InCarda Therapeutics and Cipher Pharmaceuticals. Dr. Angaran has received research funding and/or honoraria from BMS-Pfizer Alliance and Servier, Dr. DeWit has received research funding from Bayer. Dr. Deyell has received honoraria and research funding from Biosense Webster, Bayer, Bristol-Myers-Squibb, Abbott, and Servier. Dr. Skanes has received honoraria from Boehringer Ingelheim, Bayer, Pfizer, and Servier. Dr. Tebbenham has received honoraria from Cardiome Pharma Corp. We thank the hundreds of Canadian emergency physicians and cardiologists who reviewed the draft guidelines and who provided very helpful feedback.

References

1. Stiell IG, Scheuermeyer FX, Vadeboncoeur A, et al. CAEP acute atrial fibrillation/flutter best practices checklist. Can J Emerg Med. 2018;20(3):334–42.
2. Atzema CL, Jackevicius CA, Chong A, Dorian P, Ivers NM, Parkash R, Austin PC. Prescribing of oral anticoagulants in the emergency department and subsequent long-term use by older adults with atrial fibrillation. CMAJ. 2020;191(49):E1345–54.
3. Scheuermeyer FX, Andolfatto G, Christenson J, et al. A mulit-center randomized trial to evaluate a chemical-first or electrical-first cardioversion strategy for patients with uncomplicated acute atrial fibrillation. Acad Emerg Med. 2019;26:969–81.
4. Stiell IG, Sivilotti MLA, Taljaard M, et al. Electrical versus pharmacological cardioversion for emergency department patients with acute atrial fibrillation (RAFF2): a partial factorial randomised trial. Lancet. 2020;395(10221):339–49. https://doi.org/10.1016/s0140-6736(19)32994-0.
5. Stiell IG, Macle L. 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.
6. Verma A, Cairns JA, Mitchell LB, et al. 2014 focused update of the canadian cardiovascular society guidelines for the management of atrial fibrillation. Can J Cardiol. 2014;30(10):1114–30.
7. Macle L, Cairns J, Leblanc K, et al. 2016 Focused update of the Canadian Cardiovascular Society Guidelines for the management of atrial fibrillation. Can J Cardiol. 2016;32(10):1170–85. https://doi.org/10.1016/j.cjca.2016.07.591.
8. Guyatt GH, Oxman AD, Vist GE, et al. GRADE: an emerging consensus on rating quality of evidence and strength of recommendations. BMJ. 2008;336(7650):924–6.
9. Collaboration TA. The ADAPTE process: resource toolkit for guideline adaptation, 2009:1–95.
10. Harrison MB, van den Hoek J, Graham ID. CAN-IMPLEMENT: planning for best-practice implementation. Philadelphia, PA, 2014:1–148.
11. Pluymaekers NAHA, Dudink EAMP, Luermans JGLM, et al. Early or delayed cardioversion in recent-onset atrial fibrillation. N Engl J Med. 2019.
12. Andrade JG, Verma A, Mitchell LB, et al. 2018 Focused update of the canadian cardiovascular society guidelines for the management of atrial fibrillation. Can J Cardiol. 2018;34(11):1371–92.
13. Andrade JG, Aguilar M, Atzema C, et al. The 2020 Canadian Cardiovascular Society/Canadian Heart Rhythm Society Comprehensive Guidelines for the management of atrial fibrillation. Can J Cardiol. 2020;36(12):1847–948. https://doi.org/10.1016/j.cjca.2020.09.001.
14. Stiell IG, McMurtry MS, McRae A, et al. Safe cardioversion for patients with acute-onset atrial fibrillation and flutter: practical concerns and considerations. Can J Cardiol. 2019;35(10):1296–300. https://doi.org/10.1016/j.cjca.2019.06.007.
15. Stiell IG, McMurtry MS, McRae A, et al. The Canadian Cardiovascular Society 2018 guideline update for atrial fibrillation—a different perspective. CJEM. 2019;21(5):572–5. https://doi.org/10.1017/cem.2019.399.