Comparing Guidelines for Atrial Fibrillation: Focus on Emergency Medicine

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The European Society of Cardiology and the American College of Cardiology/American Heart Association/American College of Clinical Pharmacy/Heart Rhythm Society both recently updated their guidelines on the management of atrial fibrillation, whereas the Canadian Cardiovascular Society/Canadian Heart Rhythm Society published their most recent guidelines in 2020. Compared with previous iterations, all three guidelines are more specific in their recommendations with respect to emergency department (ED) care. Although the principles that underpin each group's recommendations are similar, some of the details vary, which could lead to clinician confusion. In addition, no publication has compared all 3 on the care that is specific to emergency medicine, nor contextualized them with the recommendations made by 2 national emergency medicine groups. In this Concepts paper, we compare and contrast the different guidelines as they apply to the practice of emergency medicine, highlighting differences as well as the underlying rationale provided by each group. We also provide practical insights for implementation in the ED setting. [Ann Emerg Med. 2026;87:435-450.]

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Two major guidelines were recently published on the management of atrial fibrillation: the 2024 European Society of Cardiology (ESC) Guidelines for the management of atrial fibrillation developed in collaboration with the European Association for Cardio-Thoracic Surgery (EACTS), and the 2023 American College of Cardiology/American Heart Association/American College of Clinical Pharmacy/Heart Rhythm Society (ACC/AHA/ACCP/HRS) Guideline for the Diagnosis and Management of Atrial Fibrillation.[1,2] These reference the 2020 Canadian Cardiovascular Society/Canadian Heart Rhythm Society (CCS/CHRS) Comprehensive Guidelines for the Management of Atrial Fibrillation.[3] All 3 documents now specifically address the care of patients with atrial fibrillation (and atrial flutter) in the ED setting. Only the CCS/CHRS guidelines included a committee member who is a practicing emergency physician (Box 1).

In 2018 and 2021, the Canadian Association of Emergency Physicians (CAEP) published an acute atrial fibrillation and atrial flutter Best Practices Checklist,[4,5] and in 2023 the Spanish Society of Emergency Medicine (SEMES), in conjunction with the Spanish Society of Cardiology (SEC) and the Spanish Society of Thrombosis and Hemostasis (SETH), published a consensus statement that makes recommendations adapted from the ESC guidelines.[6] The ESC, ACC/AHA/ACCP/HRS, and CCS/CHRS guidelines have been compared,[7] but not specifically with respect to care in the ED. Furthermore, none of these guidelines have had recommendations that are relevant to emergency medicine compared with those of the Canadian and Spanish atrial fibrillation emergency medicine guidelines, which were written primarily by emergency physicians.

The first difference between guidelines that readers may notice is how the recommendations are presented. Both the ACC/AHA/ACCP/HRS and the ESC use the ACC Foundation/AHA methodology to provide a "class of recommendation" (COR), which indicates the strength of the recommendation (ranging from 1 [Benefit>>>Risk] to 3 [No benefit, or Harm]) as well as a "level of evidence" (LOE) supporting it (ranging from A [higher] to C [lower]).[8] Both of those guidelines are explicit that the wording "is recommended" is reserved for a COR 1, whereas for COR 2 the preferred wording includes "is reasonable" and "should be considered" (COR 2a) and "may be considered" (COR 2b), a convention that we attempt to adhere to in this paper. The CCS/CHRS and CAEP use the Grading of Recommendation Assessment Development and Evaluation (GRADE) process, which provides a strength of the recommendation (Strong or

Box 1. Summary of guideline documents used for this "Concepts" paper

Serial No.	Country/ Region Flag	Publication Year	Title	Link / DOI	Emergency Physician Representation on Committee	Disclosures
1	ACC/AHA/ ACCP/HRS	2024	2023 ACC/AHA/ACCP/ HRS Guideline for the Diagnosis and Management of Atrial Fibrillation	10.1161/CIR.0000000000001193	No	Contributors' declarations of interest are addressed at start of paper, where readers are directed to an appendix of the authors and their relationships with industry and other entities (shown online following references).
2	CCS/CHRS	2020	The 2020 Canadian Cardiovascular Society / Canadian Heart Rhythm Society Comprehensive Guidelines for the Management of Atrial Fibrillation	10.1016/j.cjca.2020.09.001	Yes	Full listing of primary and secondary panelists, and their affiliations, is provided in a supplement; however, no conflicts of interest are provided in that supplement.
3	CAEP	2021	2021 CAEP Acute Atrial Fibrillation/Flutter Best Practices Checklist	10.1007/s43678-021-00167-y	Yes	A funding statement with conflicts of interest is provided at the end of the paper.
4	ESC	2024	2024 ESC Guidelines for the management of atrial fibrillation developed in collaboration with the European Association for Cardio-Thoracic Surgery (EACTS)	10.1093/eurheartj/ehae176	No	Contributors' submitted declarations of interest are addressed at start of paper, along with a link to a supplement that provides details of relationship, by year. Funding statement is made in the introduction of main text.
5	SEMES/SEC/ SETH	2023	Emergency department management of atrial fibrillation: 2023 consensus from the Spanish Society of Emergency Medicine (SEMES), the Spanish Society of Cardiology (SEC),and the Spanish Society of Thrombosis and Hemostasis (SETH)	10.55633/s3me/E027.2023	Yes	A conflicts of interest and funding statement is provided at the end of the paper: The authors declare that they have no conflicts of interest with respect to this article and state that there was no funding related to the article.

Weak recommendation) and a rating of the quality of the evidence supporting it (high to very low quality).[9] The use of 2 different methodologies creates variation in how different guideline "recommendations" can be summarized (ie, when comparing guideline recommendations, we cannot say that all groups "recommend X" if the ESC "recommendation" is a COR 2a instead of a COR 1). It is also important to note that guidelines must sometimes sacrifice nuance in the interests of simplicity. Thus, although their manner of presenting and grading recommendations might differ, all of these documents are intended to guide clinicians as opposed to dictate their practice. In what follows, we highlight the similarities and differences between guidelines for 5 areas of atrial fibrillation/atrial flutter management in the ED: prevention of stroke and systemic embolism, rhythm

control, rate control, post-ED referrals, and sex considerations.

PREVENTION OF STROKE AND SYSTEMIC EMBOLISM

Take-home points:

- Use a validated risk tool endorsed by your country's/region's guidelines (see Table 1).
- DOACs are now the first line for most atrial fibrillation/atrial flutter patients; warfarin is reserved for specific small groups.
- Aspirin is not recommended for prevention of stroke and systemic embolism (Class 3: Harm).
- Specific guidance on DOAC prescribing is shown in Table 2.

Risk assessment tools: CHA_2DS_2-VASc, CHA_2DS_2-VA, and CHADS-65

Atrial fibrillation increases the risk of ischemic stroke approximately fivefold,[10] and atrial fibrillation-mediated strokes are often disabling and have a high associated mortality.[11] All 3 cardiovascular group guidelines are similar in their recommendations around medications to prevent atrial fibrillation-related stroke and systemic embolism, but all endorse different acronyms for determining who is eligible for stroke prevention.

In their previous guideline iterations, the ESC, SEMES/SEC/SETH, and ACC/AHA/ACCP/HRS used the "CHA_2DS_2-VASc" score (Table 1). In contrast, since 2014, the CCS/CHRS has used an algorithm (ie, no points assigned, so not a risk calculator at all) called "CHADS-65" (also endorsed by CAEP). The CCS/CHRS switched to this algorithm when evidence became available indicating that female sex was not an independent predictor of stroke risk (rather, it is an effect modifier).[12] Therefore, the CHADS-65 algorithm does not include patient sex, unlike the CHA_2DS_2-VASc score.

The ACC/AHA/ACCP/HRS have come to the same conclusion as the CCS/CHRS did around patient sex (as a risk modifier rather than an independent risk factor), but to account for this change while not altering the well-known "CHA_2DS_2-VASc" acronym, they assigned higher cut-offs for anticoagulating females versus males (3 points for females versus 2 for males) (Table 1). Anticoagulation "is reasonable" (COR 2a) for a score of 2 points for females and 1 point for males. The 3 different levels for each sex ("does not qualify," "is reasonable" [COR 2a], and "qualifies for anticoagulation") results in 6 options for a clinician to recall and consider when addressing stroke prevention for a patient, which could arguably be confusing, particularly for clinicians who use CHA_2DS_2-VASc infrequently in their daily practice (such as emergency physicians). In addition, the current ACC/AHA/ACCP/HRS guidelines have moved away from specifically endorsing *only* CHA_2DS_2-VASc, as its performance metrics are modest. Rather, they recommend using "a validated clinical risk score," such as CHA_2DS_2-VASc *or* other scores (eg, ATRIA and GARFIELD-AF, for which online calculators are available).[13,14]

The ESC has addressed the issue of patient sex in CHA_2DS_2-VASc by simply removing the "Sc" from the acronym, making the new acronym "CHA_2DS_2-VA"; this results in the same cut-offs for males and females (Table 1). Thus, with respect to female sex and risk of stroke, the underlying principle is similar, but the 3 guideline committees have elected to address it in different ways, resulting in endorsement of different acronyms/stroke prevention decision tools.

When to Prescribe an Anticoagulant

The principle underpinning who should be receiving stroke prevention therapy with anticoagulation differs slightly between guidelines. The CCS/CHRS CHADS-65 algorithm is intended to make the decision as simple as possible, using a single risk threshold (approximately 1.5% annual risk of ischemic stroke per year) to justify long-term anticoagulation. The ACC/AHA/ACCP/HRS characterizes the annual risk as "low" (less than 1% per year), "intermediate" (1 to less than 2% per year), and "high" (2% or more per year), and recommends that those at high risk should receive anticoagulation. In patients with intermediate risk (ie, CHA_2DS_2-VASc score 2 for females, 1 for males), anticoagulation "is reasonable" (COR 2a). They go on to suggest that for these patients, the clinician might look to other risk factors (which are not included in CHA_2DS_2-VASc, or whatever validated clinical risk score is being used) and potentially other clinical risk scores to help inform the anticoagulation decision, in conjunction with shared decisionmaking with the patient. For example, if the patient is intermediate risk through CHA_2DS_2-VASc, risk factors including poor blood pressure control, higher atrial fibrillation burden, obesity, etc, might sway the (shared) decision in favor of taking anticoagulation. For emergency physicians, who may not always have access to a patient's complete medical history, this could make the decision to initiate an atrial fibrillation/atrial flutter patient on anticoagulation more challenging and potentially deter them from initiating anticoagulation on their eligible atrial fibrillation patients.

In sum, the final result will be similar but not exactly the same, depending on the tool used, with more room for nuance using the ACC/AHA/ACCP/HRS approach, at the expense of simplicity and usability.

Table 1. Quick reference table of key points from the 5 sections: stroke prevention, rhythm control, rate control, post-ED referrals, and sex considerations

Serial No.		Sub-Topic	ACC/AHA/ACCP/HRS	CCS/CHRS	CAEP	ESC	SEMES/SEC/SETH
1	Prevention of stroke and systemic embolism	Stroke risk assessment tools	A validated clinical risk score Eg, CHA_2DS_2-VASc, ATRIA, GARFIELD	CHADS-65	CHADS-65	In the absence of other locally validated alternatives: CHA_2DS_2-VA	CHA_2DS_2-VA
		Tool criteria for anticoagulation	Eg, CHA_2DS_2-VASc Males ♂: – 0 pt: does not qualify – 1 pt: consider – 2 pt: qualifies Females ♀: – 0-1 pt: does not qualify – 2 pt: consider – 3 pt: qualifies	If any factor in the algorithm is present (save solely vascular disease): qualifies		– 0 pt: does not qualify – 1 pt: consider – 2 pt: qualifies	
		How committee determined eligibility for an anticoagulant	- Low risk: <1%/y - Intermediate: 1 - <2%/y - High: ≥2%/y – High risk: Yes – Intermediate risk: "Reasonable" to give, consider other RFs (eg, CRF, obesity, etc) in decision – Low risk: No	<1.5%/y risk: No ≥1.5%/y risk: Yes		*Similar to ACC/AHA/ACCP/HRS	
		Choosing a DOAC vs warfarin	- DOACs first line - Warfarin only if: – moderate-severe MS, or mechanical heart valve				
		Aspirin	- Not recommended for stroke prevention - Only used for patients with established vascular disease as their sole RF, if they would receive it for their vascular disease				
		Stroke prevention for new AF during acute illness (eg, sepsis), or "secondary AF"	- Uncertain benefit.*Unless patient is in ED for many days, doesn't need to be immediately addressed by the emergency physician - Subsequent outpatient follow-up for thromboembolic risk stratification				

Table 1. Continued.

Serial No.		Sub-Topic	ACC/AHA/ACCP/HRS	CCS/CHRS	CAEP	ESC	SEMES/SEC/SETH
2	Rhythm control	Eligibility	See Table 3				
		Anticoagulation and cardioversion	Not explicitly addressed. Benefit of pericardioversion anticoagulation in lowest risk patients (ie, CHA_2DS_2-VASc 0-1 and atrial fibrillation<12 h) is noted to be uncertain	Immediate DOAC administration, continue × 4 wk. Thereafter as per CHADS-65	For patients who don't qualify for DOAC per CHADS65, shared decisionmaking	Immediate DOAC administration, continue × 4 wk.† Thereafter per CHA_2DS_2-VA	For patients who do not qualify for DOAC per CHA_2DS_2-VA, shared decisionmaking
		Electrical cardioversion	Biphasic defibrillator, synchronized				
			Start 200J	Start 150J	Start 150-200J	-	-
		Pharmacologic cardioversion *Physician experience, atrial fibrillation vs flutter, duration of atrial fibrillation as well as patient presentation, will affect medication choice	- Intravenous ibutilide reasonable if left ventricular ejection fraction≥40% * Risk prolonged QT and Torsades de pointes * More effective for aflutter than atrial fibrillation - Intravenous amiodarone can be used but can have delayed conversion, by 8-12 h (ie, may require admission or short-stay unit in monitored bed) - Intravenous procainamide is a second line agent	- Intravenous procainamide, ibutilide, or vernakalant based on patient profile - PO flecainide or propafenone (after premedication with β-blocker or nondihydropyridine calcium channel blocker)	- Intravenous procainamide or other antiarrhythmic, as appropriate for patient profile	- No structural heart disease or recent ACS: intravenous flecainide or propafenone (after premedication with β-blocker or nondihydropyridine calcium channel blocker), or vernakalant	- No structural heart disease or CAD: PO flecainide or propafenone (after premedication with β-blocker or nondihydropyridine calcium channel blocker), or intravenous vernakalant
				Amiodarone for patients with HFrEF, particularly if hypotensive			

Table 1. Continued.

Serial No.	Sub-Topic	ACC/AHA/ACCP/HRS	CCS/CHRS	CAEP	ESC	SEMES/SEC/SETH
3	Rate control	First line: nondihydropyridine calcium channel blocker or β-blocker				
		- Target resting HR: <100-110 beats/min	- Target resting HR:<100 beats/min - If intravenous agent is used initially, coadministration with the oral version should be done promptly, to avoid rebound tachycardia when the intravenous formulation wears off	- Target HR: resting<100 beats/min, walking<110 beats/min - If intravenous agent is used initially, give oral version within 30 minutes of effective rate control by the intravenous formulation	- Target resting HR: <110 beats/min	- As per ESC
4	Post-ED referrals	Refer to an outpatient cardiologist (or electrophysiologist, if available), or to patient's longitudinal care providers to make the referral - Goal: electrophysiologist can discuss a rhythm control strategy within 12 months of atrial fibrillation diagnosis				
5	Sex considerations	Pregnancy-related: *Obtain obstetrics and cardiology consultations - DCCV safe, use as you would in a nonpregnant patient - Intravenous procainamide may be considered for rhythm control - β-Blockers propranolol or metoprolol may be considered, $\pm$ digoxin, for rate control - Teratogenicity considerations for medications (eg, warfarin, DOACs)	Competitive endurance sports are a RF for atrial fibrillation in men	Pregnancy-related: Avoid DOACs and warfarin	Pregnancy-related: *Obtain obstetrics and cardiology consultation - Immediate DCCV if hemodynamic instability, or pre-excitation - Teratogenicity considerations for medications (eg, warfarin, DOACs)	-

pt: Point; *RF*: risk factor; *CRF*: chronic renal failure; *MS*: mitral stenosis; *ED*: emergency department; *J*: joules; *AF*: atrial fibrillation; *ACS*: acute coronary syndrome; *CAD*: coronary artery disease; *DCCV*: direct current cardioversion.
*Not explicitly stated: interpretation by authorship team.
†See text for nuances.

Table 2. Emergency physician prescribing of DOACs to emergency department patients with atrial fibrillation/flutter

After determining the patient is eligible for anticoagulation for stroke prevention using your country's/region's validated clinical risk prediction tool, ask these 3 questions:		
1. *Does the patient have a history of major bleeding*[*]*?* 2. *Is the patient on an antiplatelet medication (eg, aspirin, clopidogrel, dipyridamole, prasugrel, or ticagrelor)?* 3. *Are platelets* $<100\times10^9$*/L or hemoglobin<8 g/dL (80 g/L)?*	Yes? →	*Obtain consultation or arrange timely follow-up with the appropriate service for consideration of anticoagulation*

If 'No' to all 3 questions, proceed with a prescription for 14-30 days based on the information below:

DOAC	Category of Prescribing Considerations	AVOID	Caution[†]		Standard Use
			Shared Decisionmaking	Adjust Dose	
All DOACs[‡]	Diseases	1) Mechanical valve 2) Moderate-severe mitral stenosis 3) Antiphospholipid syndrome 4) Severe liver disease 5) ESRD			CrCl should be calculated using the Cockroft-Gault formula[§] (other formulas may give substantively different results)
	Drug-Drug Interactions Note: All DOACs are P-gp substrates[‖]	Enzyme inducers carbamazepine phenobarbital phenytoin primidone rifampin St. John's wort			
Apixaban	Diseases	AHA[¶]: no renal limit CCS[¶]/ESC: CrCl <15[Δ]	Moderate liver disease	If 2 of 3: 1) SCr ≥133 mmol/L (1.5 mg/dL) [SEMES: Also if CrCl<30] 2) Weight ≤60kg 3) Age ≥80 years → 2.5 mg bid	5mg bid

Table 2. Continued.

If 'No' to all 3 questions, proceed with a prescription for 14-30 days based on the information below:

DOAC	Category of Prescribing Considerations	AVOID	Caution†		Standard Use
			Shared Decisionmaking	Adjust Dose	
	Drug-Drug Interactions Note: Apixaban is also a CYP-3A4 substrate	US PI: On 2.5mg bid PLUS P-gp + strong 3A4 inhibitor, eg, itraconazole, ketoconazole, or ritonavir ESC/Cdn PI: itraconazole, ketoconazole, posaconazole, ritonavir, voriconazole		US PI: On 5mg bid PLUS P-gp + strong 3A4 inhibitor, eg, itraconazole, ketoconazole, or ritonavir → 2.5mg bid ESC: enzalutamide tyrosine kinase inhibitors → AVOID/reduce dose	
Dabigatran	Diseases	AHA: CrCl <15Δ CCS/ESC: CrCl<30 *CrCl should be calculated using the Cockroft-Gault formula*§	GI bleeding history Moderate liver disease	AHA: CrCl 15-30Δ → 75mg bid CCS/ESC: CrCl 30-50 → 110mg bid SEMES: age>80 or high hemorrhagic risk	150mg bid
	Drug-Drug Interactions	US PI: P-gp inhibitors, eg, ketoconazole or dronedarone PLUS CrCl<30: ESC/Cdn PI: dronedarone, glecoprevir/piprentasvir, ketoconazole ESC: cyclosporine, itraconazole, tacrolimus		US PI: ketoconazole or dronedarone PLUS CrCl 30-50 → 75mg bid ESC/SEMES/Cdn PI: verapamil, quinidine → separate dose by 2+ hours ESC: amiodarone, clarithromycin, posaconazole → Adjust dose/timing	
Edoxaban	Diseases	AHA: CrCl <15Δ CCS: CrCl<30 *CrCl should be calculated using the Cockroft-Gault formula*§	Moderate liver disease	AHA/ESC: CrCl 15-50Δ → 30mg daily CCS/Cdn PI/SEMES: CrCl 30-50 or ≤60 kg → 30mg daily	60mg daily
	Drug-Drug Interactions			ESC/Cdn PI: cyclosporine, dronedarone, erythromycin, itraconazole (ESC only), ketoconazole, quinidine (Cdn only) → 30mg daily	

Table 2. Continued.

		If 'No' to all 3 questions, proceed with a prescription for 14-30 days based on the information below:			
			Caution†		
DOAC	**Category of Prescribing Considerations**	**AVOID** STOP	**Shared Decisionmaking**	**Adjust Dose**	**Standard Use**
Rivaroxaban	Diseases	CrCl <15[Δ] *CrCl should be calculated using the Cockroft-Gault formula*[§] Moderate liver disease	GI bleeding history	AHA/ESC: CrCl 15-50[Δ] →15mg daily CCS: CrCl 30-49 → 15mg daily	20mg daily
	Drug-Drug Interactions Note: Rivaroxaban is also a CYP-3A4 substrate	P-pg + strong CYP3A4 inhibitors: itraconazole, ketoconazole, posaconazole, or ritonavir ESC/Cdn PI: dronedarone Cdn PI: cobicistat	US: CrCl 15-80[Δ] PLUS P-gp inhibitor +moderate CYP3A4 inhibitor (eg, erythromycin): use if benefit>risk ESC/Cdn PI: erythromycin PLUS decreased renal function: use with caution ESC: If decreased renal function PLUS: clarithromycin, cyclosporin, erythromycin, fluconazole, verapamil Or protease or tyrosine kinase inhibitor → Use with caution		

CrCl: Creatinine clearance; *DDI*: drug-drug interaction; *PI*: product information; *P-gp*: P-glycoprotein; *SCr*: serum creatinine; *Cdn*: Canadian; *bid*: bis in die; *PO*: per os.
Canadian product monograph for Eliquis (apixaban): CrCl 15-24 mL/min: no dosing recommendation due to limited clinical data.
*We do not include bleeding risk scores (eg, HASBLED) because these are not intended to alter the decision to provide anticoagulation. Rather they are meant to highlight for *longitudinal care providers* how to reduce the risk of bleeding (eg, for hypertension in HASBLED, to check BP and aggressively get it under control, to stop NSAID use for the 'D' in HASBLED, etc).
†If there is a need for shared decisionmaking or an adjusted dose, it is reasonable for an emergency physician to defer the decision to another provider who has more time to gather information and for shared decisionmaking, and who can follow the patient in future, to ensure the DOAC prescription does not need to be changed over time: consider asking for consult or referring the patient to an outpatient clinic.
‡Always advise the patient to obtain the medication from their usual pharmacy, where the pharmacist will check for drug-drug interactions when dispensing a medication.
§The Cockroft-Gault formula is used because it is what the product monographs use (which is based on the formula used in the relevant DOAC studies).
‖Comprehensive list of P-gp inhibitors, for those interested: [https://www.fda.gov/drugs/drug-interactions-labeling/healthcare-professionals-fdas-examples-drugs-interact-cyp-enzymes-and-transporter-systems; https://acforum.org/web/resource_files/1742403529-1600.pdf].
¶AHA: Used in the table in place of ACC/AHA/ACCP/HRS; CCS: Used in the table in place of CCS/CHRS.
ΔThe CAEP guideline recommends that emergency physicians *not* prescribe to patients with a CrCl less than 30 ml/min, as these patients are higher risk of bleeding, and may require ongoing care and testing to ensure that bleeding risk is controlled; because emergency physicians by definition never provide ongoing care, the CAEP guideline recommends consultation with the appropriate specialty service (eg, cardiology and thromboembolism) is these scenarios.
Some medications are underlined for emphasis: these are relatively common medications seen in the ED.

When to Use Direct Oral Anticoagulants (DOACs) Versus Warfarin

All the guidelines now recommend DOACs over warfarin for most patients with atrial fibrillation/atrial flutter who qualify for stroke prevention (see Table 2 for DOAC prescribing considerations). Exceptions include those with valvular atrial fibrillation (a term that both the ACC/AHA/ACCP/HRS and ESC guidelines eschew, stating it should be considered obsolete, yet both still use it in some places in their documents). All guidelines recommend warfarin explicitly for patients with moderate-severe mitral stenosis (rheumatic or otherwise) or a mechanical heart valve. A bioprosthetic valve is treated as nonvalvular atrial fibrillation/atrial flutter (and is therefore suitable for DOAC treatment).

Thus, for an emergency physician, if echocardiographic information is not available, for the purpose of starting a DOAC, the presence of valvular disease would be determined from patient history or by the presence of a diastolic murmur or mechanical clicking sound on physical examination.

Aspirin

Aspirin is recommended only in the CCS/CHRS guidelines (and CAEP, because it uses CHADS-65), and that is solely for patients whose only stroke risk factor is vascular disease. Thus, atrial fibrillation patients under age 65 years whose only risk factor is vascular disease are not eligible for anticoagulation, and they are treated instead as any patient with established vascular disease (but without atrial fibrillation) would be. This is consistent with the other 2 guidelines, in terms of stipulating that there is no role for aspirin in stroke prevention (Class 3: Harm). Aspirin may be used in the short-term with anticoagulation in the setting of atrial fibrillation and high-risk acute coronary syndrome, but that is beyond the scope of an emergency physician's practice.

Stroke Prevention in Acute Illness

The 3 cardiovascular group guidelines address anticoagulation if atrial fibrillation is identified in the setting of acute critical conditions ("secondary atrial fibrillation"), such as sepsis. The CCS/CHRS suggests that patients with secondary atrial fibrillation that has resolved should *not* be routinely anticoagulated in the absence of recurrence. The ACC/AHA/ACCP/HRS makes a COR 2b suggestion that the risks and benefits of anticoagulation be considered, because the benefits of anticoagulation in that scenario are uncertain. The ESC guidelines make similar statements in their text. For the emergency physician, it is unlikely that they would be the managing physician long enough to need to make that determination. All guidelines endorse subsequent outpatient follow-up for thromboembolic risk stratification and anticoagulation decisionmaking at that time.

An exception is made by the CCS/CHRS and ACC/AHA/ACCP/HRS for thyrotoxicosis. The CCS/CHRS recognizes it as an independent risk factor for thromboembolic events (through induced hypercoagulability) and makes a weak recommendation for anticoagulation until a euthyroid state is restored. The ACC/AHA/ACCP/HRS recommends anticoagulation if the patient also has an elevated risk of stroke based on a validated clinical risk score. The ESC recognizes the increased risk of stroke during thyrotoxicosis but makes no specific suggestions around anticoagulation.

RHYTHM CONTROL IN THE EMERGENCY DEPARTMENT

Take-home points:

- If a patient in rapid atrial fibrillation/atrial flutter is truly hemodynamically unstable, urgent electrical cardioversion should be provided regardless of anticoagulation status.
- Most guidelines recommendations are aimed at patients with nonvalvular atrial fibrillation/atrial flutter, and may not apply to patients with valvular atrial fibrillation.
- The recommended window for cardioverting a stable patient with acute onset of atrial fibrillation/atrial flutter who has not had 3 or more weeks of antecedent anticoagulation is no longer simply within 48 hours, and it varies by guideline (see Table 3).
- Several guidelines suggest that once the decision is made to cardiovert an acute patient with atrial fibrillation/atrial flutter, a DOAC should be administered, regardless of eligibility for anticoagulation using a validated stroke risk tool.
  - The 2 emergency medicine groups suggest shared decisionmaking with patients who do not qualify using their respective stroke risk tools.
- For pharmacologic cardioversion, a variety of antiarrhythmic medications can be used, except in the setting of heart failure with reduced ejection fraction (HFrEF): for those patients, use intravenous amiodarone.

Table 3. Criteria for cardioversion of nonvalvular* atrial fibrillation or flutter, in stable patients without anticoagulation for at least 3 weeks prior to presentation

Guideline Group	Atrial Fibrillation Duration	Inclusion Criteria	COR/LOE or GRADE
ACC/AHA/ACCP/HRS	<12 h and	CHA_2DS_2-VASc score 0-1 or equivalent (ie, if female, score 1-2)‡	2b/C-LD
	OR	Cardiac imaging with either transesophageal echocardiography or cardiac CT† has ruled out intracardiac thrombus	2b/C-LD
CAEP	<12 h and	No history of stroke/TIA	-
	12-48 h and	No history of stroke/TIA and<2 variables in CHADS-65 algorithm	-
	OR	Transesophageal echocardiography has ruled out intracardiac thrombus	-
CCS/CHRS	<12 h	No recent (<6 mo) history of stroke/TIA	Weak recommendation; low-quality evidence
	12-48 h and	$CHADS_2$ score 0-1	Weak recommendation; low-quality evidence
	OR	Transesophageal echocardiography has ruled out intracardiac thrombus	Weak recommendation; moderate quality evidence
ESC	<24 h		Text only and Figure 12 of the ESC guideline
	>24 h and	Transesophageal echocardiography has ruled out intracardiac thrombus	1/B
SEMES/SEC/SETH	<24 h and	CHA_2DS_2-VASc score=0 if male, 1 if female [or CHA_2DS_2-VA score=0]	-
Optional§:	<24 h and	CHA_2DS_2-VA≤2	
	24-48 h and	CHA_2DS_2-VA≤1	
		Transesophageal echocardiography has ruled out intracardiac thrombus	-

CHA_2DS_2-VASc: Congestive heart failure, Hypertension, Age more than or equal to 75 (2 points), Diabetes mellitus, Stroke/TIA/embolism (2 points), Vascular disease, Age 65 to 74 years, Sex category; *CT*: computed tomography; *CHADS-65*: Congestive heart failure, Hypertension, Age more than or equal to 75, Diabetes mellitus, Stroke/TIA; *CHADS2*: Congestive heart failure, Hypertension, Age more than or equal to 75, Diabetes mellitus, Stroke/TIA [2 points]; *TIA*: transient ischemic attack.

*Valvular atrial fibrillation includes patients with moderate to severe mitral stenosis or any mechanical valve.

‡Patients with left atrial appendage occlusion (LAAO) that are not on anticoagulation have additional considerations including assessment of LAAO adequacy and residual leak, and may require pericardioversion anticoagulation.

†Cardiac CT with delayed contrast-enhanced image acquisition protocol.

§Added in an Erratum: risk score used is CHA_2DS_2-VASc, but the ESC guidelines came out afterward and use CHA_2DS_2-VA.

Who Is Eligible for Cardioversion in the ED

All of the guidelines agree that a patient with atrial fibrillation/atrial flutter and hemodynamic instability that is thought to be attributable to atrial fibrillation/atrial flutter should receive urgent electrical cardioversion, regardless of whether they have had pretreatment with 3 or more weeks of anticoagulation. The CCS/CHRS defines "hemodynamic instability" as hypotension, acute coronary syndrome, or pulmonary edema. The CAEP guideline is even more explicit, defining it as hypotension (systolic blood pressure less than 90 mmHg, or signs of shock such as altered mental status), cardiac ischemia (ongoing severe chest pain or marked ST depression [greater than 2 mm] on ECG despite therapy), or pulmonary edema (significant dyspnea, crackles, and hypoxia). SEMES/SEC/SETH defines it as associated with life-threatening organ dysfunction. Neither the ESC nor the ACC/AHA/ACCP/HRS guidelines explicitly define hemodynamic instability.

In practice, some patients may meet the definition of hypotension, but their clinical presentation does not justify the risks associated with immediate cardioversion. For example, a patient with a systolic blood pressure of 88 mmHg, who has the head of the bed raised and is conversing with the emergency physician without

difficulty, or has mild pulmonary edema; in those scenarios, the risk of causing a stroke may not be warranted. The clinician should use their clinical judgment in specific scenarios, as guidelines cannot address every possible presentation.

If there is no hemodynamic instability, the CCS/CHRS, CAEP, and SEMES/SEC/SETH (the latter in an erratum) state that patients with valvular atrial fibrillation/atrial flutter (ie, those with moderate-severe mitral stenosis or a mechanical heart value) should not be cardioverted if there has not been therapeutic anticoagulation for 3 or more weeks prior, regardless of the duration of the presenting atrial fibrillation/atrial flutter episode.[15] Instead, most recommendations around ED cardioversion of acute atrial fibrillation apply to patients with nonvalvular atrial fibrillation/atrial flutter. The ESC and ACC/AHA/ACCP/HRS guidelines do not explicitly address mitral stenosis or mechanical heart valves and cardioversion.

Again, excluding patients with hemodynamic instability, all guidelines otherwise recommend that patients with an episode of atrial fibrillation/atrial flutter of more than 48 hours who have not been on therapeutic anticoagulation for at least 3 weeks should not be cardioverted. In addition, unless the patient has been on therapeutic anticoagulation for more than or equal to 3 weeks, the CCS/CHRS guideline states that patients with a recent (less than 6 months ago) history of transient ischemic attack or stroke not be cardioverted, whereas the CAEP guideline includes *any* history (not just recent) of transient ischemic attack or stroke, regardless of atrial fibrillation/atrial flutter duration (again, unless hemodynamic instability is present).

Based on data from primarily European studies, all guidelines have revised their most recent recommendations for cardioverting stable patients with nonvalvular atrial fibrillation who have been in atrial fibrillation for less than 48 hours and who have not been on anticoagulation for 3 or more weeks prior to presentation. All the guidelines classify the LOE as poor and carry an associated "weak recommendation" or COR 2b. The new suggested criteria are shown in Table 3. Currently, the majority of atrial fibrillation/atrial flutter patients who are cardioverted in EDs are those with a duration of arrhythmia of less than 24 hours, so these changes are unlikely to have a large effect on practice.[16,17] However, the ESC now suggests practitioners consider a "wait and see" approach (COR 2a), which entails discharging patients with recent-onset (less than 48 hours) of atrial fibrillation without providing cardioversion, to see if they spontaneously convert. If this is pursued, some patients who presented early after atrial fibrillation onset (with no prior anticoagulation) may return a day later for a second visit when they are no longer eligible for cardioversion.[18]

For patients without adequate anticoagulation (ie, 3 or more weeks prior) who do not meet their suggested criteria for early cardioversion, the guidelines either recommend (ESC) or suggest (ACC/AHA/ACCP/HRS and CCS/CHRS) that cardiac imaging can be used to exclude intracardiac thrombus first, if cardioversion is desired. For the emergency physician, attempting to obtain transesophageal echocardiography during a busy ED shift is prohibitive in most centers; however, the ACC/AHA/ACCP/HRS guideline now states in the text that a cardiac computed tomography (CT), particularly with delayed contrast-enhanced image acquisition protocol, is an alternate imaging modality to exclude intracardiac thrombus prior to cardioversion (COR 2b). In contrast, the CCS/CHRS guideline states that for cardioversion, only transesophageal echocardiography has been subjected to a randomized controlled trial, and the ESC guideline mentions cardiac CT only prior to ablation. Obtaining cardiac-gated CT is likely to be far more feasible than a transesophageal echocardiography in most EDs, although it is important to ensure that local/institutional radiologists have imaging protocols for this assessment.

Anticoagulation and Cardioversion

When cardioversion proceeds in eligible patients, the CCS/CHRS and the ESC suggest giving a DOAC as soon as the decision is made to cardiovert. The rationale is that DOACs have an onset within a few hours, and the risk of stroke with cardioversion is typically not immediate, being instead predominantly increased in the days to week(s) following the procedure.[19] If procedural sedation is used, however, the DOAC should not be rivaroxaban, because it must be taken with food in order to be absorbed (and procedural sedation should not occur on a full stomach).

Given the increased risk of stroke in the days following cardioversion, the CCS/CHRS and ESC suggest that *all* of these patients receive 4 weeks of a DOAC following the cardioversion, with subsequent anticoagulation provided based on eligibility using their recommended risk tool. The ESC text (and Figure 12 in that guideline), however, includes the following nuance: "Most patients should continue OAC for at least 4 weeks postcardioversion. Only for those without thromboembolic risk factors and with sinus rhythm restoration within 24 hours of atrial fibrillation onset, is postcardioversion OAC optional." CAEP and SEMES/SEC/SETH suggest shared decisionmaking with the lowest risk patients (ie, those who

do not qualify for anticoagulation using their recommended risk tool).

The ACC/AHA/ACCP/HRS guideline does not explicitly comment on whether all atrial fibrillation patients who were not already on anticoagulation for at least 3 weeks prior to cardioversion should be given a DOAC for a minimum of 4 weeks afterward. They recommend continuing at least 4 weeks of anticoagulation after cardioversion for atrial fibrillation patients who had therapeutic anticoagulation 3 or more weeks prior to cardioversion, but that constitutes the minority of atrial fibrillation/atrial flutter patients who currently present to the ED for cardioversion. In a COR 2b statement, they note that in patients with low risk (CHA_2DS_2-VASc score of 0 to 1 or equivalent) and atrial fibrillation of less than 12 hours, the benefit of pericardioversion anticoagulation is uncertain, given the low incidence of pericardioversion thromboembolic events in this population.

Electrical Cardioversion

All guidelines recommend synchronized energy using a biphasic defibrillator for electrical cardioversion. The ACC/AHA/ACCP/HRS guideline suggests starting at 200J (COR 2a), whereas the CCS/CHRS, CAEP, and SEMES/SEC/SETH guidelines recommend starting at a minimum of 150J.

All of the guidelines now discuss applying active compression to the defibrillation pads, or using paddles and applying force, to reduce transthoracic impedance and improve success rates during electrical cardioversion, particularly in the setting of morbid obesity.[20] The ACC/AHA/ACCP/HRS guideline also mentions the use of 2 defibrillators simultaneously to increase the energy in refractory cases of the morbidly obese patient. All agree that no specific pad placement (anterolateral or anteroposterior) is preferable over the other for cardioversion of acute atrial fibrillation/atrial flutter.

Pharmacological Cardioversion

Pharmacological cardioversion can be used in the absence of preexcitation in patients who do not have other contraindications. Selection of the specific medication should be based on the presence of concomitant heart disease, arrhythmia duration, whether the arrhythmia is atrial fibrillation or atrial flutter, and physician comfort with the medications (see Table 1).

All guidelines save for CAEP (which does not discuss it) note that all of these antiarrhythmics, except amiodarone, are contraindicated in the setting of left ventricular ejection fraction of less than 40%, as they can exacerbate this condition. For those patients, all guidelines recommend using intravenous amiodarone, acknowledging the delay to conversion and potential for hypotension. Thus, for the practicing emergency physician, intravenous amiodarone is an option (in addition to electrical cardioversion) for rhythm control in patients with HFrEF, particularly if presenting with hypotension.

RATE CONTROL IN THE EMERGENCY DEPARTMENT

Take-home points:

- The target resting pulse rate ranges from less than 100 to 110 beats/min.
- β-Blockers and nondihydropyridine calcium channel blockers remain first-line therapy for hemodynamically stable patients with a normal ejection fraction, with digoxin as a second-line agent.
- In patients with decompensated heart failure or hypotension, use intravenous digoxin or amiodarone.

Most of the guidelines address rate control for an atrial fibrillation patient with a rapid ventricular response due to an underlying cause (ie, "secondary atrial fibrillation"), such as acute illness; the latter should always be targeted first. This might include giving blood to a patient with a gastrointestinal hemorrhage or antibiotics and fluids to a patient with sepsis. Care must be taken when trying to lower the pulse rate in these patients: the usual targets (below) do not necessarily apply.

For patients without secondary atrial fibrillation, the guidelines have changed relatively little with respect to rate control in the ED. The target resting pulse rate across guidelines ranges from less than 100 to 110 beats/min (see Table 1). In all guidelines, β-blockers (preferably β-1 selective blockers) and nondihydropyridine calcium channel blockers remain first-line therapy for hemodynamically stable acute atrial fibrillation patients with a normal ejection fraction, with digoxin as a second-line option. β-Blockers are also reasonable therapy for patients with a reduced left ventricular ejection fraction (ie, 40% or less) who are hemodynamically stable. However, in the setting of reduced left ventricular ejection fraction with decompensated heart failure or hypotension, the ACC/AHA/ACCP/HRS and CCS/CHRS suggest intravenous amiodarone, or digoxin (CCS/CHRS), if the patient does not qualify for immediate electrical cardioversion. They also point out the possibility of hypotension and potential conversion to sinus rhythm (with associated risk of stroke in underanticoagulated patients) with amiodarone. The ESC guideline mentions amiodarone or digoxin in this scenario, as well as landiolol (which was approved by the FDA in November 2024).

In unstable patients and those with moderate-severe left ventricular systolic dysfunction with or without decompensated heart failure, the ACC/AHA/ACCP/HRS guideline states that nondihydropyridine calcium channel blockers should be avoided (COR 3 [harm]). In an accompanying flow chart, β-blockers are also not recommended if there is decompensated heart failure. A table on rate-control agents in the ESC guideline also explicitly states that β-blockers are contraindicated in acute heart failure, which is consistent with the SEMES/SEC/SETH document.

The CCS/CHRS and CAEP both address how to give intravenous and oral rate-control medications in the acute setting (Table 1). The CCS/CHRS also suggests that oral medications might be preferred over intravenous formulations in the hemodynamically stable patient.

Intravenous magnesium is suggested by the ACC/AHA/ACCP/HRS as a possible addition to standard rate-control measures (COR 2a). This approach is often used in the intensive care unit setting to rate-control atrial fibrillation. The CCS/CHRS and ESC guidelines mention magnesium use only in the setting of postoperative atrial fibrillation.

POST-EMERGENCY DEPARTMENT REFERRALS

Take-home points:

- Refer discharged patients with a new (less than 1 year) diagnosis of atrial fibrillation/atrial flutter either directly to an outpatient electrophysiologist, or to someone who can make that referral for them (eg, community cardiologist, family physician, etc).
- If the patient qualifies for stroke prevention, write a DOAC prescription for 14 to 30 days (see Table 2).
- If a new DOAC or rate-control prescription was provided, instruct the patient to follow up with a primary care provider (or make a referral to an appropriate clinic) within 1 week.

Pursuing a rhythm-control strategy (with either antiarrhythmic medications or ablation) early after diagnosis has been promoted in all of the cardiovascular guidelines, due to a randomized controlled trial that found that early rhythm control improves outcomes (hospitalizations, strokes, and mortality) in patients with a "new" diagnosis of atrial fibrillation (defined as within one year of diagnosis).[21] Only the ACC/AHA/ACCP/HRS guideline document explicitly recognizes that a rhythm-control strategy may lead to an increased number of ED visits.

Improved outcomes with a rhythm-control strategy over rate control may appear to contradict the findings of landmark randomized controlled trials published in the early 2000s, which found no difference (and increased hospitalizations) with a rhythm-control strategy.[22,23] Possible explanations for the variation in outcomes are that more recent studies may have included more patients with early atrial fibrillation, more patients receiving catheter ablation for rhythm control (as opposed to antiarrhythmic medications), more effective anticoagulation,[21] or secular trends in management of risk factors or improvements in ablation.

Catheter ablation has itself been promoted in all guideline documents, and a trial of ablation should generally be considered in highly symptomatic patients with atrial fibrillation, recurrent atrial fibrillation after a trial of antiarrhythmics, or in selected groups (ie, younger patients, fewer comorbidities, more symptoms, or those with left ventricular systolic dysfunction).

What these changes mean for emergency physicians is that they should refer the patient to a cardiologist (or electrophysiologist, if they have access to one), or to one of the patient's longitudinal care providers (such as their family physician) to make the referral, so that the cardiologist and/or electrophysiologist can discuss a rhythm-control strategy within 12 months of the atrial fibrillation diagnosis. Alternatively, the emergency physician can cardiovert the patient in the ED if they meet the criteria shown in Table 1 and the physician is comfortable managing the procedure and potential complications.[24]

Prior to ED discharge, patients should be provided with appropriate anticoagulation, which, for an emergency physician, would be a DOAC prescription for a suggested 14-30 days (Table 2).[25] CAEP and CCS/CHRS suggest that outpatient follow-up with a primary care provider should ideally occur within 1 week, for further discussion of the anticoagulant prescription and to address modifiable bleeding risks (eg, aggressive blood pressure control). Rate control should be rechecked at that time if a rate-control prescription was provided.

SEX CONSIDERATIONS

Apart from pregnancy and adjustments for medications that could be teratogenic (see Table 1), there are no sex-specific recommendations that apply to practice in the ED setting. The CCS/CHRS guideline comprehensively addresses overall sex differences in atrial fibrillation in a dedicated chapter, and the ESC guideline acknowledges many of these sex differences in a subchapter. Similar to the ACC/AHA/ACCP/HRS, they make a recommendation around avoiding inequalities in health care provision regardless of gender and several other factors.

Regarding athletes, the CCS/CHRS guidelines recognize that competitive endurance sports are a proven risk factor for atrial fibrillation in men. The recommendation to reduce exercise intensity, however, does not differentiate between sexes.

Although there are differences in the major atrial fibrillation guidelines, the principles that underpin them are similar; when they do differ, it is primarily due to low-quality evidence in that area, committee choices on how simple to keep the recommendations, and what drugs are available on national formularies. Most importantly, all guidelines now recommend DOACs instead of vitamin K antagonists for most ED atrial fibrillation patients who qualify for stroke prophylaxis, albeit using similar but slightly different stroke risk prediction tools/acronyms. For hemodynamically stable atrial fibrillation patients not on anticoagulation, the duration of atrial fibrillation that makes the risk associated with cardioversion low enough to consider it has decreased from the previous cutoff of 48 hours, particularly for those with higher periprocedural stroke risk. For patients with known atrial fibrillation of less than 12 months, the pendulum has swung from rate control to rhythm control, which may include ablation: emergency physicians should make the appropriate outpatient referrals for these patients when discharging them from the ED.

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