REVIEW ARTICLE / PREGLEDNI ČLANAK

CURRENT MANAGEMENT OF ATRIAL FIBRILLATION IN THE EMERGENCY DEPARTMENT

ZBRINJAVANJE ATRIJSKE FIBRILACIJE U HITNOM BOLNIČKOM PRIJEMU

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Abstract

Atrial fibrillation is the most common type of arrhythmia diagnosed in the emergency department. Many patients are diagnosed with new-onset atrial fibrillation in the emergency department. The 2024 European Society of Cardiology guidelines (ESC) introduce a new approach for management of atrial fibrillation called as AF-CARE.

While atrial fibrillation with rapid ventricular response disrupts the hemodynamic status of the patient or rate control is an important problem to be solved acutely in emergency departments, also early and accurate diagnosis, selection of appropriate rate and rhythm control agents and identification of patients in need of anticoagulation will be important milestones for the management of atrial fibrillation in the emergency departments to better prevent important complications such as stroke and heart failure. Nowadays, emergency physicians also play an important role not only in the proper management of atrial fibrillation in the emergency department but also in initiating a teamwork based management as recommended in the AF-CARE approach.

Keywords: atrial fibrillation (AF); emergency department (ED); acute care; rhythm control; anticoagulation

Sažetak

Atrijska fibrilacija najčešća je vrsta aritmije dijagnosticirana u hitnom bolničkom prijemu. Mnogi bolesnici prvi put budu dijagnosticirani s novonastalom atrijskom fibrilacijom upravo u hitnom prijemu. Smjernice europskog društva za kardiologiju (engl. *European Society of Cardiology guidelines, ESC)* iz 2024. godine uvode novi pristup u zbrinjavanju atrijske fibrilacije, nazvan **AF-CARE**.

Atrijska fibrilacija s brzim ventrikularnim odgovorom može narušiti hemodinamsku stabilnost bolesnika, a kontrola frekvencije često je hitan terapijski izazov u hitnoj službi. Rana i točna dijagnoza, odabir odgovarajućih lijekova za kontrolu frekvencije i ritma, te pravovremena identifikacija bolesnika kojima je potrebna antikoagulacijska terapija predstavljaju ključne korake u zbrinjavanju atrijske fibrilacije u hitnoj službi s ciljem prevencije ozbiljnih komplikacija poput moždanog udara i srčanog zatajenja. Danas liječnici hitne medicine imaju važnu ulogu ne samo u pravilnom zbrinjavanju atrijske fibrilacije, već i u pokretanju timskog pristupa liječenju, kao što preporučuje pristup **AF-CARE**.

Ključne riječi: atrijska fibrilacija (AF); hitna služba (ED); akutna skrb; kontrola ritma; antikoagulacija

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Introduction

Atrial fibrillation (AF), is the most diagnosed arrythmia in the emergency departments EDs. It affects an estimated 60 million people worldwide and significantly contributes morbidity and mortality (1–3). The prevalence of atrial fibrillation is expected to increase in future due to aging population, rising number of comorbidities, greater awareness, and advances in detection technologies. In 2060, the prevalence of AF is expected to double compared to 2010. The lifetime risk of developing AF will increase from 1 in 5 to 1 in 3, and health expenditures related to AF will rise from 1 % to 2 % of total healthcare spending (4). Due to the anticipated increase in patient visits, a rise in the burden on emergency departments is expected.

Many patients visit EDs as a first point of care with acute symptoms. These symptoms may even minor symptoms, including palpitations, dizziness, which makes it challenging to establish a diagnostic correlation with atrial fibrillation initially. Some patients are referred to the ED with more severe complaints, like chest pain or complications, such as thromboembolism or exacerbation of heart failure (5,6).

Atrial fibrillation increases the risk of stroke, heart failure, and death, with around 70% of cases requiring hospitalization.

AF raises stroke risk five-fold, heart failure three-fold, and mortality two-fold, placing a substantial burden on healthcare systems, especially EDs (7,8). About 70 % of ED visits for AF is resulting with hospitalization (9). Atrial fibrillation is often linked to ischemic or valvular heart disease, while less common causes include congestive cardiomyopathy, myocardytis, binge drinking ("holiday heart"), thyrotoxicosis, and blunt chest trauma (10,11). Admissions due to atrial fibrillation are quite common in the emergency department. Approximately 1–2 % of the ED visits are due to AF (12). Emergency physicians should keep in mind that more then 50 % percent of paroxysmal AF spontaneously revert to sinus rhythm with in 8-16 hours, only about a 1/3 of the patients seek for ED care after onset. (13,14).

Emergency physicians, play a pivotal role in early management, to detect and recognise atrial fibrillation, manage its complications, and plan the anticoagulation therapy. Their aprroaches may effect both acute and long-term prognosis of the patient, yet AF management approaches vary widely, influenced by resources, cardiology access, and patient characteristics (15). Effective management efforts made in the ED's in every step from early detection to proper treatment will help reduce the risk of future complications. Early diagnosis of symptomatic and asymptomatic AF is important to improve the patient's prognosis in the future, also initiation of early treatment can reduce the occurrence of heart failure and stroke (16). In this review, we would like to discuss the management of patients presenting with atrial fibrillation or atrial fibrillation with other complaints in the ED.

Definition and Classification of atrial fibrillation

Atrial fibrillation is a type of supraventricular arrhythmia characterized by uncoordinated activation of the atria, leading to a loss of effective atrial contraction. On an electrocardiogram (ECG), AF is indicated by the absence of distinct and regular P waves, along with irregular ventricular activation. This results in no specific pattern in the RR intervals, provided there is no atrioventricular block present (4).

It is important to recognize that various types of AF can be observed during visits to the emergency department according to their temporal pattern (Table 1). Note that these categories reflect observed episodes of AF and do not imply the underlying pathophysiological process. Additionally, there are cases where the patient is not experiencing atrial fibrillation at the time of the ED visit, including paroxysmal AF or permanent AF. First diagnosed atrial fibrillation is a form of AF that has not previously been diagnosed, regardless of symptoms, temporal pattern, or duration.(4)

Table 1. Definitions and classifications for the temporal pattern of atrial fibrilation

Temporal Classification	Definition
First-diagnosed AF	AF that has not been diagnosed before, regardless of symptom status, temporal pattern, or duration.
Paroxysmal AF	AF which terminates spontaneously within 7 days or with the assistance of an intervention. Evidence suggests that most self-terminating paroxysms last <48 h.
Persistent AF	AF episodes which are not self-terminating. Many intervention trials have used 7 days as a cut-off for defining persistent AF. Long-standing persistent AF is arbitrarily defined as continuous AF of at least 12 months' duration but where rhythm control is still a treatment option in selected patients, distinguishing it from permanent AF.
Permanent AF	AF for which no further attempts at restoration of sinus rhythm are planned, after a shared decision between the patient and physician.

AF - atrial fibrillation

Table 2. Other clinical concepts relevant to atrial fibrillation

Clinical Concept	Definiton
Clinical AF	Symptomatic or asymptomatic AF that is clearly documented by an ECG (12-lead ECG or other ECG devices). The minimum duration to establish the diagnosis of clinical AF for ambulatory ECG is not clear and depends on the clinical context. Periods of 30 s or more may indicate clinical concern, and trigger further monitoring or risk stratification for thromboembolism.
Device-detected subclinical AF	Device-detected subclinical AF refers to asymptomatic episodes of AF detected on continuous monitoring devices. Confirmation is needed by a competent professional reviewing intracardiac electrograms or an ECG-recorded rhythm. Device-detected subclinical AF is a predictor of future clinical AF.
AF burden	The overall time spent in AF during a clearly specified and reported period of monitoring, expressed as a percentage of time.
Recent-onset AF	There is accumulating data on the value of the term recent-onset AF in decision-making for acute pharmacological or electrical cardioversion of AF. The cut-off time interval to define this entity has not yet been established.
Trigger-induced AF	New AF episode in close proximity to a precipitating and potentially reversible factor.
Self-terminating AF	Paroxysmal AF which terminates spontaneously. This definition may be of value for decisions on acute rhythm control taken jointly by the patient and healthcare provider.

AF- atrial fibrillation; ECG - electrogadiogram

In first-diagnosed atrial fibrillation, it is crucial to assess whether the condition is reversible and to implement the necessary protocols for suitable patients. Additionally, it is advisable to initiate anticoagulation early for patients with a CHA_2DS_2-VASc score above the recommended threshold after newly diagnosed atrial fibrillation is identified in the emergency department (4). It is important to note that these categories reflect observed episodes of AF and do not imply the underlying pathophysiological process.

There are another terms and definitions of the AF related to the type and the way it is presented. On Table 2. is examples of current terminology given.

Also AF may classified by the way it presents, the term "valvular atrial fibrillation" refers to patients with valvular pathologies, such as severe or moderate mitral stenosis (17). AF can also be classified according to its presentation. For instance, if it is mostly asymptomatic and only becomes apparent when a thromboembolic event is diagnosed through a routine ECG conducted for other purposes, it is defined as subclinical or occult AF (18).

Conversion to sinus rhythm increases the risk of thromboembolic events, especially within the first 10 days, requiring anticoagulation in high-risk patients.

Another term that has fallen out of favor is "lone AF". This term referred to the first episode of AF diagnosed in younger patients (under 60 years) with paroxysmal, persistent, or permanent AF who do not have structural heart disease or significant cardiovascular risk factors. These patients are classified with "0" points on the CHA_2DS_2-VAS score, indicating the lowest risk for thromboembolic events associated with AF (18,19).

The conversion to sinus rhythm, whether achieved electrically, pharmacologically, or spontaneously, is associated with an incremental increase in the risk of thromboembolic events for patients due to more depressed atrial function. Most of the thromboembolic events occur within 10 days after conversion to the sinus rhythm (20). Therefore for high risk patients according to the CHA_2DS_2-VA score should be anticoagulated.

Clinical Presentation

Symptoms

AF patients may experience a range of symptoms, including palpitations, shortness of breath, fatigue, chest pain, dizziness, poor exercise capacity, fainting, anxiety, depression, and disrupted sleep (4). The key issue is early recognition an awareness of the atrial fibrilation-associated symptoms in patients who have no knowledge of existing atrial fibrillation. It is crucial for emergency physicians to consider atrial fibrillation in the differential diagnosis when evaluating patients presenting to the ED with symptoms potentially related to AF, and to obtain an electrocardiogram promptly.

Another key consideration ascertain any underlying cause of a newly detected AF and conduct a complete review of the patient's past medical history and current medication regimen. This approach will provide a critical information to assist in determining the most appropriate therapeutic strategy for treating the patient in the ED and the subsequent need for hospital admission (9). These

underlying conditions may be heart failure, pulmonary embolism, or volume overload. Symptoms associated with AF are not only typical palipatitons, they are variable and broad (Table 3). More importantly, many episodes of AF even among symptomatic patients, may present asymptomaticaly (21). However, the presence or absence of symptoms does not correlate with the incidence of stroke, systemic embolism, or mortality (21), but symptoms decrease the quality of life of a patient (22,23).

Emergency physicians must promptly recognize AF symptoms and perform an ECG to accurately diagnose AF and identify underlying causes for appropriate treatment.

Table 3. Patient symptoms associated with atrial fibrilation

Palpitations	Chest pain
Shortness of breath	Dizziness
Fatigue	Poor exercise capacity
Fainting (syncope)	Anxiety
Depressed mood	Disordered sleep

Complications of atrial fibrilation

AF increases the risk of heart failure 4-5 fold (24,25), stroke 2-3 fold ischemic heart diseases about a 2 fold as well (25–27). AF is also linked to cognitive impairment and vascular dementia, depression, increased hospitalization recurrence, thromboembolic events, impaired quality of life and increased risk of death (4).

The primary cause of death is heart failure (26) compared to sinus rhythm, also bleeding risk increases in AF patients who are on oral anticoagulants (OACs) therapy (4).

Diagnostic Evaluation of atrial fibrilation in the Emergency department

A detailed medical history should be obtained from all patients with AF in the ED and, also comphrensive diagnostic work-up should be applied. Medical history helps to determine the pattern of AF, comorbidities, relevant family history and assess the risk factors for thromboembolism and bleeding (4).

For patients with newly diagnosed AF or suspected arrhythmia, initial evaluation should include assessment of comorbidities and risk factors, along with 12-lead ECG monitoring. The ECG should confirm the rhythm, determine ventricular rate, and detect any conduction abnormalities (28).

Additionally, liver and kidney functions, electrolyte levels, and risks of stroke, coronary artery disease, and bleeding risk should be assessed using N-terminal pro-brain natriuretic peptide (NT-proBNP), troponin, complete blood count, blood glucose, and—if possible—thyroid function tests. HbA1c should be requested for further evaluation (29,30). According to the multidisciplinary AF management principles summarized under AF-CARE, transthoracic echocardiography (TTE) is recommended in the emergency department to guide treatment planning. However, in settings with limited access to TTE, initiation of oral anticoagulation and adherence to guideline-recommended strategies should not be delayed (4).

AF – CARE Approach to the atrial fibrilation management

The ESC 2024 Guidelines place the AF-CARE principles at the core of atrial fibrillation management (Table 4). This patient-centered, multidisciplinary approach to AF management is a care model that respects patients' experiences, values, needs, and preferences in the planning, coordination, and delivery of care. It integrates all aspects of management, including symptom control, comorbidity management, psychosocial support, lifestyle recommendations, and the selection of optimal medical treatment options. The restructuring into AF-CARE reflects recent developments in new approaches and technologies, particularly concerning rhythm control. Evidence increasingly shows that managing AF is more effective when comorbidities and risk factors are considered (4).

AF-CARE offers multidisciplinary, patient-centered care combining symptom control, comorbidity management, psychosocial support, lifestyle changes, and optimal treatment to enhance atrial fibrillation management.

A careful search for comorbidities and risk factors [C] is essential for all patients diagnosed with atrial fibrillation. The next step is to focus on preventing stroke and thromboembolism [A] in patients with identified risk factors, which involves the appropriate use of anticoagulant therapy. Following this, efforts should be directed toward reducing AF-related symptoms and morbidity through effective heart rate and rhythm control [R]. In selected patients, this approach may also lead to decreased hospitalization rates and improved prognosis. The potential benefits of rhythm control should be carefully evaluated for all patients during each healthcare interaction, considering all associated risks. Since AF and its related comorbidities can change over time, it is important to employ various levels of evaluation [E] and re-evaluation for each patient, ensuring that these approaches remain dynamic and adaptable (4).

Table 4. Patient-centered AF – CARE management

Components of Patient-Centered AF Management	How To Implement Patient-Centered AF Management
Optimal treatment according to the AF-CARE pathway, which includes:	Shared decision-making
° [C] Comorbidity and risk factor management	Multidisciplinary team approach
° [A] Avoid stroke and thromboembolism	Patient education and empowerment, with emphasis on self-care
° [R] Reduce symptoms by rate and rhythm control	Structured educational programmes for healthcare professionals
° [E] Evaluation and dynamic reassessment	Technology support (e-Health, m-Health, telemedicine)*
Lifestyle recommendations	
Psychosocial support	
Education and awareness for patients, family members, and caregivers	
Seamless co-ordination between primary care and specialized AF care	

* e-Health refers to healthcare services provided using electronic methods; m-Health refers to healthcare services supported by mobile devices; and telemedicine refers to remote diagnosis or treatment supported by telecommunications technology.

Patient Management
The Unstable Patient

Assessing the stability of patients with atrial fibrillation is a fundamental aspect of AF management in the ED. For patients with recent-onset AF and a rapid ventricular response that is producing hypotension, myocardial ischemia, or pulmonary edema, treat with urgent electrical cardioversion (31,32).

However, instability may not be the only factor caused due to rapid ventricular response tachycardia or hypotension. Various underlying causes can lead to this condition, including sepsis, myocardial infarction, gastrointestinal bleeding, alcohol withdrawal, pulmonary embolism, and metabolic disorders (such as hyperthyroidism or diabetic emergencies). Effective management requires addressing these underlying factors, which may involve interventions aimed at controlling the heart rate or rhythm (33).

Patients with hemodynamic instability due to rapid AF that does not respond to medication, or those contraindicated, such as patients with Wolff-Parkinson-White syndrome, may require immediate restoration of sinus rhythm. In these cases, restoration of sinus rhythm takes precedence over preventing thromboembolic complications. Electrical cardioversion is generally a safe and effective procedure, often with fewer side effects, and it is appropriate also for patients who have structural or functional heart disease (31). However, there are risks associated with the procedure, including complications related to sedation, such as hypotension and respiratory depression. Additionally, patients often experience significant anxiety before the procedure due to concerns about the electrical shock involved (24,25).

Of course, the main risk in the case of an urgent cardioversion is thromboembolic advers events. To reduce the risks associated with left atrial appendage stunning, emergency cardioversion should be preceded as soon as possible by anticoagulation, which can include low-molecular-weight heparin (LMWH) or a bolus of unfractionated heparin. Unless contraindicated, anticoagulation should continue for four weeks following cardioversion (31,34). Cardioversion with using defibrillators that deliver biphasic waveforms are recommended. Their efficacy is higher than monophasic defibrillators, in terms of sinus rhythm restoration (94 vs 84 %) and total energy needed was lower to restore the sinus rhythm (35,36). The use of biphasic waveforms may be of particular benefit in patients who fail to revert with the use of monophasic waveforms (37).

The 2014 American Heart Association (AHA) guidelines do not provide a clear recommendation for a specific energy level for cardioversion and defibrillation in the management of atrial fibrillation. Therefore, it may be advisable to follow the recommendations from the 2010 AHA guidelines. According to these guidelines, the initial energy level for cardioversion of AF should be at least 120 joules when using biphasic defibrillators. This energy level can be increased to a maximum of 200 joules. For atrial flutter, the guidelines recommend lower energy levels, typically between 50 to 100 joules (18,38).

Electrical cardioversion with anticoagulation is essential for unstable AF patients to restore sinus rhythm safely and reduce thromboembolic risk.

In the ED, patients at an increased risk of stroke who require electrical or pharmacological cardioversion should receive anticoagulation either before or immediately after the procedure. This can be accomplished with intravenous heparin, low molecular weight heparin (LMWH), oral factor Xa inhibitors (such as rivaroxaban or apixaban), or oral direct thrombin inhibitors (DOAC) (like dabigatran). Furthermore, high-risk stroke patients should continue long-term anticoagulation for at least four weeks after normal sinus rhythm is restored (39).

According to the recommendation of the UpToDate, if a cardioversion needs to be applied in 3 hours, physicians may begin the anticoagulation with starting intravenous unfractionated heparin (bolus and continuous drip goal partial thromboplastin time 1.5 to 2.0 times control) or a low molecular weight heparin (1 mg/kg subcutaneously every 12 hours). To give heparin and DOAC together is not recommended, if warfarin is selected for anticoagulation, the therapy will continued with both warfarin and heparin until the were the INR exceed 2.0. (34).

Rhythm versus Rate control current recommendations

After ensuring the patient's hemodynamic stability and symptom control, the second step should be the decision for choosing the rate or rhythm control strategy, and thereafter protection of the patient from the thromboembolic events (4). To choose the rate or rhythm control-based strategy some factors should be assessed. Another issue is to clear the AF initiation time, is this a recent-onset (within 24 hours) or persistent (over 24 hours) AF.

The latest 2024 ESC Guidelines suggest that electrical cardioversion (ECV) is generally feasible and highly effective, especially for patients who present within the "safe window" of less than 24 hours after the onset of atrial fibrillation in the emergency department. In this patient group, it is important to have trained personnel and sedation anesthesia support for the effective application of electrical cardioversion. For patients with AF lasting longer than 24 hours or when the onset time is unknown, adequate anticoagulation or transesophageal echocardiography may be necessary to rule out the presence of a left atrial thrombus, which could delay the procedure (4).

Rate vs. rhythm control depends on AF duration, stability, and risks; electrical cardioversion is preferred within 24 hours or for unstable patients.

Some studies suggest that rate control may be a safer initial option for stable AF patients, while others advocate for rhythm control as a means of potentially improving long-term outcomes, particularly in younger, symptomatic patients (4,16,39).

In the ED, in patients with hemodynamic instability or suffering from severe symptoms, in younger patients, and in cases of recent-onset AF (within 24 hours) to choose the rhythm control strategy may be reasonable. In older patients, patients with heart failure or previously experienced thromboembolic events, the rate control strategy has to be chosen (15).

Electrical cardioversion also should be considered, as urgent in pre-excitation syndromes, such as AF with Wolff-Parkinson-White syndrome, where irregular conduction through accessory pathways can lead to ventricular fibrillation. Additionally, ECV is often the next therapeutic option for patients with severe symptomatic AF that is unresponsive to pharmacological treatments (15).

Rate control

Rate control is traditionally preferred in the ED for stable AF patients, as it involves straightforward and low-risk management with medications (40,41). These medications are used to manage heart rate, which is crucial for reducing symptoms and preventing complications associated with atrial fibrillation.

The AFFIRM trial (42) suggested a target heart rate of less than 110 beats per minute (bpm) for patients with persistent or permanent AF, as this was associated with satisfactory outcomes without an increase in adverse events. However, there is no clear consensus on the optimal target heart rate during acute presentations in the emergency department (ED). This underscores the need for further research, particularly to assess how heart rate management impacts long-term outcomes for patients in this group (43,44).

Before initiating rate or rhythm control therapy, underlying causes should be evaluated, which include treatment of reversible causes such as sepsis, volume overload and cardiogenic shock. The treatment strategy should be designed according to the patient's characteristics, presence of heart failure and LVEF, and haemodynamic profile (4).

For acute rate control in AF, beta-blockers are generally recommended across all levels of left ventricular ejection fraction (LVEF), while non-dihydropyridine calcium channel blockers such as diltiazem and verapamil are preferred in patients with LVEF >40 %. These agents are favored over digoxin due to their more rapid onset of action and dose-dependent pharmacodynamics (45–47). Selective beta-1 adrenergic receptor blockers have greater efficacy and a better safety profile than non-selective beta-blockers (48). In certain acute situations, combination therapy with digoxin may be necessary; however, the concurrent use of beta-blockers alongside diltiazem or verapamil should be avoided unless under strict clinical supervision due to the potential for adverse hemodynamic interactions (49,50). In patients who are hemodynamically unstable or have a severely reduced LVEF, intravenous agents such

as amiodarone, landiolol, or digoxin may be considered appropriate therapeutic alternatives (4).

Rhythm control

In the ED, electrical conversion of rhythm is generally feasible and highly effective, especially for patients presenting within the "safe window" of less than 24 hours from the onset of atrial fibrillation, where the risk of thromboembolism is relatively low, as indicated by the 2024 ESC guidelines (4).

The time limit for any thromboembolic event may called as "safe window", decrased from 48 to 24 hours in 2024 ESC guidelines. However, the exact onset of AF is often unknown, and observational studies indicate that the risk of stroke or thromboembolism is lowest within a much shorter timeframe (51–53).

Rhythm control is a viable option for patients who have a longer life expectancy and those whose atrial fibrillation onset occurred less than 24 hours before presentation. This approach is suitable for patients who have been anticoagulated for 3 to 4 weeks or who undergo transesophageal echocardiography that shows no intracardiac thrombus. Direct oral anticoagulants are considered a safe and reliable choice for anticoagulation (33).

For the hemodynamically stable patients with recent-onset AF, a wait-and-see approach may be a viable alternative to immediate cardioversion. The Rate Control versus Electrical Cardioversion Trial 7—Acute Cardioversion versus Wait-and-See (RACE 7 ACWAS) studied patients with recent-onset symptomatic atrial fibrillation who did not have hemodynamic compromise. The trial found that allowing time for spontaneous conversion up to 48 hours after the onset of AF symptoms was non-inferior to immediate cardioversion when assessed at a 4-week follow-up (4,54).

Also, cardioversion is generally not recommended if AF has persisted for more than 24 hours, unless the patient has received at least 3 weeks of therapeutic anticoagulation or a transoesophageal echocardiogram (TOE) performed, which confirms the absence of intracardiac thrombus (4,54–56).

Following cardioversion, oral anticoagulation should be continued for a minimum of 4 weeks in most cases. OAC may be omitted only in patients without thromboembolic risk factors and with sinus rhythm restored within 24 hours of AF onset. However, if any thromboembolic risk factors are present, long-term OAC is indicated regardless of rhythm outcome (4).

Another challenging question to answer about AF management in the ED is the decision about rhythm control after admission to the ED. Most current guidelines provide more cautious recommendations to reduce the risk of a possible thromboembolic event. Even in older studies it have shown to institute when compared with rate control strategies, rhythm control strategy using anti-arrhythmic drugs does not reduce the mortality and morbidity, in contrast to findings of recent strategies have shown that rhythm control strategy increase quality of life once sinus rhythm is maintained (57,58).

At that point, evidence specific to the emergency department setting is still insufficient to determine how atrial fibrillation impacts patient outcomes. It remains unclear in which patients AF management may lead to decreased readmission rates, improved quality of life, and better long-term recurrence rates. These aspects are still unclear in the management of ED patients with AF (15).

Pharmacologic cardioversion

Pharmacological cardioversion to restore sinus rhythm is an elective procedure for haemodynamically stable patients. It is less effective than ECV for restoring sinus rhythm, with the timing of the cardioversion being a significant factor in its success (59,60). The data is limited on the true efficacy of this procedure, which are likely biased by the spontaneous restoration of sinus rhythm in 76 % – 83 % of patients with recent-onset AF (4).

Within 4 hours, intravenous (IV) vernakalant and flecainide have the highest conversion rates. This may allow to discharge of patients from the ED with sinus conversion to sinus rhythm and decrease the rate of hospitalization. Class IC antiarrhythmics in both IV and oral forms of vernakalant and flecainide superior conversion rates within 12 hours, with flecainide outperforming propafenone. In contrast, amiodarone's efficacy is demonstrated more slowly, typically within 24 hours (61).

The adventage of pharmacological cardioversion is that this treatment does not require fasting, sedation, or anaesthesia. But, anticoagulation should be started or continued according to a formal (re-)assessment of thromboembolic risk. However in all types of pharmacological cardioversion, the drug selection should be made as tailor fit, based on the patients type and severity of concomitant heart disease (4).

Pharmacological cardioversion with vernakalant or flecainide is effective and safer for stable recent-onset AF patients, enabling fast rhythm restoration without sedation but needs careful selection.

In the use of cardioversion of recent-onset AF cases, flecainide and propafenone should be chosen, excluding patients with severe left ventricular hypertrophy, heart failure with reduced ejection fraction (HFrEF), or coronary artery disease. When to use vernakalant for the same procedure, patients with recent ACS, HFrEF, or severe aortic stenosis should be excluded. Cardioversion of AF with IV amiodarone is recommended in patients with severe left ventricular hypertrophy, HFrEF, or coronary artery disease, a delay should be acceptted.

A single self-administered oral dose of flecainide or propafenone (commonly referred to as the "pill-in-the-pocket" approach) is effective for symptomatic patients who experience infrequent and recent-onset paroxysmal atrial fibrillation. To safely implement this strategy, it is essential to screen patients to rule out any conditions such as sinus node dysfunction, atrioventricular conduction defects, or Brugada syndrome. Additionally, prior in-hospital validation of the efficacy and safety of this treatment is necessary (62). An atrioventricular node-blocking drug should be instituted in patients treated with Class IC AADs to avoid 1:1 conduction if the rhythm transforms to atrial flutter (AFL) (63).

Pharmacological cardioversion is not recommended for patients with sinus node dysfunction, atrioventricular conduction disturbances, or prolonged QTc (>500 ms), unless risks for proarrhythmia and bradycardia have been considered (4).

Especially, in cases of recent-onset AF, newer antiarrhythmic drugs, such as vernakalant and dronedarone, offer potential advantages over traditional antiarrhythmics by promoting faster cardioversion with a lower incidence of adverse effects. Vernakalant, for instance, has demonstrated higher efficacy in achieving sinus rhythm compared to ibutilide, as shown in studies like that by Simon et al (64,65).

This rapid, actionable safety profile makes vernakalant a promising choice for ED-based cardioversion, particularly in patients who require urgent rhythm control (66). Despite these benefits, the use of novel antiarrhythmics in the ED remains limited. Concerns about real-world efficacy, cost, and the potential for side effects in high-risk populations contribute to reluctance in their routine adoption (15).

Direct oral anticoagulant initiation and anticoagulation planning

DOACs have significantly improved stroke prevention in atrial fibrillation. They offer a safer bleeding risk profile and eliminate the need for INR monitoring (67). The updated ESC 2024 guidelines now recommend initiating DOAC therapy as early as the ED phase for eligible atrial fibrillation patients, especially those at high risk of stroke (4). However, initiating anticoagulation remains complex for many emergency physicians, who must balance the risk of a thromboembolic event against the risk of bleeding, especially in the absence of guaranteed outpatient follow-up (15). Emergency physicians hesitate, to initiate DOAC therapy due to concerns about continuity of care and anticoagulation monitoring after discharge, particularly for patients with inconsistent access to outpatient follow-up (4,15).

Lack of universally standardized protocols for DOAC initiation in the ED setting contributes to variability in practice (15). Personalized medicine approaches and a multidisciplinary model for care are promising changes in the ED's are being applied now, such as mulidisciplinary teams and AF observation units (31,41,68).

Every patient with atrial fibrillation should be assessed to determine the necessity of antithrombotic therapy for preventing systemic embolization, even during their first episode of AF. Patients diagnosed with AF in the ED, who are not on appropriate anticoagulant medication, should be assessed using the CHA_2DS_2-VA score, as recommended by the latest 2024 guidelines of ESC. This scoring system is a widely used version of the CHA_2DS_2-VAc score, excluding the gender parameter (Table 6) (ESC 2024). A score of 2 or higher is an indication of an increased risk of thromboembolism, which informs the decision to initiate oral anticoagulation therapy (4).

The ESC 2024 guidelines emphasize this approach, particularly for patients presenting with AF within 24 hours, where immediate anticoagulation can significantly reduce the risk of thromboembolic events. Cardioversion is not recommended if AF has persisted for more than 24 hours, unless the patient has received at least 3 weeks of therapeutic anticoagulation (adherence DOAC or INR ≥2.0 for VKA) or a transoesohageal echocardiography has been performed to rule out intracardiac thrombus. After cardioversion, most patients should continue an OAC for at least 4 weeks post-cardioversion (55,56,69).

Also, most patients should continue OAC for at least 4 weeks post-cardioversion, even if CHA_2DS_2-VA = 0, only for those without thromboembolic risk factors and sinus rhythm restoration within 24 h of AF onset is post-cardioversion OAC optional. In patients with thromboembolic risk factor(s) irrespective of whether sinus rhythm is achieved after cardioversion, the OAC should be continued at least 4 weeks to prevent thromboembolism (42,55,56,70).

A CHA_2DS_2-VA score ≥ 2 is recommended as an indicator of elevated thromboembolic risk for decisions on initiating oral anticoagulation(4). In previous guidelines of AHA/ACC 2014, in patients with score of 1, the choice was left to the patients choice based on the clinicians recommends to choose anticoagulation, aspirin, or no anticoagulation. Also ESC was in recommendation for anticoagulation of any patient with a CHA_2DS_2-VASc score of ≥1 for men and ≥2 for women. Now according to latest guidelines of ESC 2024, A CHA_2DS_2-VA score of 1 should be considered an indicator of elevated thromboembolic risk for decisions on initiating oral anticoagulation, with following a patient-centred and shared care approach (4).

Also, oral anticoagulation is recommended in all patients with AF and hypertrophic cardiomyopathy or cardiac amyloidosis, regardless of CHA_2DS_2-VA score, to prevent ischaemic stroke and thromboembolism (4).

In ESC 2024 guidelines, stated that data are lacking on how to treat patients with low risk of stroke (with a CHA_2DS_2-VA score of 0 or 1), as these patients were excluded from large RCTs, and there is no recommendation for patients

Table 6. Updated definitions for the CHA_2DS_2-VA Score

CHA_2DS_2-VA component	Definition and comments	Points awarded
C Chronic heart failure	Symptoms and signs of heart failure (irrespective of LVEF, thus including HFpEF, HFmrEF, and HFrEF), or the presence of asymptomatic LVEF ≤40%.	1
H Hypertension	Resting blood pressure >140/90 mmHg on at least two occasions, or current antihypertensive treatment. The optimal BP target associated with lowest risk of major cardiovascular events is 120–129/70–79 mmHg (or keep as low as reasonably achievable).	1
A Age 75 years or above	Age is an independent determinant of ischaemic stroke risk. Age-related risk is a continuum, but for reasons of practicality, two points are given for age ≥75 years.	2
D Diabetes mellitus	Diabetes mellitus (type 1 or type 2), as defined by currently accepted criteria, or treatment with glucose lowering therapy.	1
S Prior stroke, TIA, or arterial thromboembolism	Previous thromboembolism is associated with highly elevated risk of recurrence and therefore weighted 2 points.	2
V Vascular disease	Coronary artery disease, including prior myocardial infarction, angina, history of coronary revascularization (surgical or percutaneous), and significant CAD on angiography or cardiac imaging. OR Peripheral vascular disease, including: intermittent claudication, previous revascularization for PVD, percutaneous or surgical intervention on the abdominal aorta, and complex aortic plaque on imaging (defined as features of mobility, ulceration, pedunculation, or thickness ≥4 mm).	1
A Age 65–74 years	1 point is given for age between 65 and 74 years.	1

LVEF - left ventricular ejection fraction; HFpEF - Heart Failure with preserved Ejection Fraction; HFmrEF-Heart Failure with mildly reduced Ejection Fraction; HFrEF- Heart Failure with reduced Ejection Fraction; BP – blood pressure; CAD - Coronary Artery Disease; PVD - Peripheral Vascular Disease.

with a zero (0) score of CHA_2DS_2-VA. But, antiplatelet therapy is no more recommended, as an alternative to anticoagulation in patients with AF to prevent ischaemic stroke and thromboembolism (4).

When initiating antithrombotic therapy, modifiable bleeding risk factors should be managed to improve safety. This includes strict control of hypertension, advice to reduce excess alcohol intake, avoidance of unnecessary antiplatelet or anti-inflammatory agents, and attention to OAC therapy (adherence, control of time in therapeutic range if on VKAs, and review of interacting medications). When starting antithrombotic treatment, it's crucial to manage modifiable bleeding risks—such as high blood pressure, excessive alcohol intake, and unnecessary use of antiplatelet or anti-inflammatory drugs. Proper adherence to oral anticoagulant (OAC) therapy review of interacting medications are also important for safety.

DOACs improve stroke prevention in AF and should be started early in the ED for eligible patients, considering bleeding risks and continued for at least four weeks after cardioversion.

Physicians must continuously assess the balance between stroke and bleeding risks, as both can change over time and vary by patient. Bleeding risks rarely justify stopping anticoagulation in eligible patients, since the risk of stroke without treatment usually outweighs bleeding concerns. Patients with non-modifiable risk factors (age, renal impairment, previous bleeding, maliganancy, genetic factor, previous stroke, dementia or intracerebral pathology) should be monitored more closely, ideally within a multidisciplinary care framework. (4) Yet many ED clinicians hesitate due to bleeding risks and limited follow-up after the discharge. (71) Weant et al. highlight the gap between guidelines and real-world practice, as many AF patients are discharged without stroke prevention therapy from the ED. (9) Additionally, some trials designed in low-risk patients recommend considering to use OAC's in those with a CHA_2DS_2-VA score of 1, following a patient-centred and shared care approach (72,73).

There are many gaps for managing AF in the ED, one of which is planning for anticoagulation. Also, it is a challenge for emergency physicians to start anticoagulation in patients with atrial fibrillation (AF) of unknown onset or duration longer than 24 hours. In such cases, selecting an appropriate anticoagulant or performing a transoesophageal echocardiogram to rule out left atrial thrombus may be necessary. However, in unstable patients, this approach

carries the risk of delaying urgent procedures. In unstable AF patients with a duration longer than 24 hours, it may be necessary to determine the anticoagulation strategy based on the patient's clinical condition and risk factors. Although the ESC provides a robust scoring system that offers significant decision support for clinicians, in patients with varying clinical scenarios, the recommendations are not as clearly defined for emergency physicians (15).

Disposition management

For patients who are successfully rate-controlled or cardioverted and stable for discharge, a rate control agent (e.g., metoprolol, diltiazem) should be prescribed (9). If already taking a rate control agent, providers should consider increasing the patient's home dose to prevent recurrence of AF.

In addition, in new-onset AF cases, if the CHA_2DS_2-VA score is elevated, patients should be prescribed an direct acting oral anticoagulant (e.g., apixaban, rivaroxaban) (4). Prior to discharge, appropriate counseling on medication adverse effects is critical, especially bleeding risk (9).

Based on AF-CARE model, this counseling should also focus on patient comorbidities and risk factor management, it involves, hypertension and diabetic control, appropriate heart failure therapy, weight loose, management of obstructive sleep apnea, reducing of alcohol use and a tailored exercise. Emergency physicians should counsel their patient and organize an outpatient appointment for monitoring the patients process. Also, emerging evidence underscores the safety and efficacy of DOAC initiation in the ED for eligible patients, with studies showing reduced stroke risk without significantly increasing bleeding complications when DOACs are started early in high-risk patients (15,74).

Conclusion

Atrial fibrillation is a significant health issue in our modern age, primarily stemming from longer life expectancy, obesity, and sedentary lifestyles. As a result, emergency departments are expected to care for a growing number of new atrial fibrillation patients in the near future. Emergency physicians play a crucial role in detecting and providing early treatment for this condition, as well as initiating the necessary steps for long-term monitoring in other healthcare facilities. Therefore, emergency physicians and emergency departments should be integrated into the atrial fibrillation care (AF-CARE) framework, which includes staff education and appropriate healthcare organization.

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