REUE | Original Article

Management of atrial fibrillation in a hospital Emergency Department: Does routine clinical practice follow European guidelines?

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BACKGROUND AND OBJECTIVE. Atrial fibrillation (AF) must often be managed in emergency services. We aimed to study how acute AF is managed in terms of treatment strategies (rate control, rhythm control, and thromboprophylaxis) used under routine conditions in an emergency department and whether practice follows European guidelines.

METHODS. Observational, cross-sectional, single-center study in the emergency department of Hospital Universitario Araba in Spain between October 2019 and May 2020. We studied all patients whose electrocardiograms detected AF.

RESULTS. A total of 386 patients were included; 280 (72.5%) had previously known AF and 106 (27.5%) had newly diagnosed AF. The mean (SD) age was 76.0 (11.5) years, 44% were aged 80 years or older, and 56% were men. The rates of adherence to protocol were 80.4% for rhythm control, 77.9% for rate control, and 65.2% for thromboprophylaxis. The management approaches used most often were antiarrhythmic drugs (rhythm control); for rate control beta-blockers were usually used, and acenocoumarol was most often chosen as the initial anticoagulant treatment. The main departures from guidelines involved the choice of the best treatment for rhythm control, the optimization of beta-blocker dosages for tachycardia and anticoagulant dosages, and the use of direct-action anticoagulants and antiplatelet treatment interruption in patients without indications for combined therapy.

CONCLUSIONS. Adherence to guidelines for the treatment of rhythm and rate control is high, although there is room for improvement in the management of thromboprophylaxis.

Keywords: Atrial fibrillation. Heart rate. Rhythm control. Thromboembolism. Clinical practice guidelines. Emergency department.

Manejo de la fibrilación auricular en un servicio de urgencias. Concordancia de la práctica clínica habitual con las Guías Europeas

OBJETIVO. La fibrilación auricular (FA) es una arritmia cuyo manejo se realiza frecuentemente en urgencias. Este trabajo estudia su manejo agudo en vida real en un servicio de urgencias según las principales estrategias terapéuticas (control de frecuencia, ritmo y profilaxis tromboembólica), y la adherencia a las guías europeas.

MATERIAL Y MÉTODO. Estudio observacional, transversal, unicéntrico, realizado en el servicio de urgencias del Hospital Universitario Araba (Spain), entre octubre 2019 y mayo 2020, incluyendo pacientes que presentaban FA en el electrocardiograma.

RESULTADOS. Se incluyeron 386 pacientes, de los que 280 (72,5%) tenían FA conocida y 106 (27,5%) un primer episodio. El 56,0% de los pacientes eran varones, una edad media de 76,0 (11,5) años (44%, ≥ 80 años). La adherencia al protocolo fue del 80,4% en estrategia de control de ritmo, 77,9% en control de frecuencia y 65,2% en profilaxis tromboembólica. La estrategia más utilizada para control de ritmo fue farmacológica, el control de frecuencia con beta-bloqueantes y el anticoagulante inicial más utilizado fue acenocumarol. Las principales discrepancias respecto a las guías fueron: la elección de la mejor estrategia terapéutica para el control del ritmo, la optimización de dosis de beta-bloqueante (FA taquicárdica), la dosificación de anticoagulantes, el uso de anticoagulantes de acción directa y la interrupción del tratamiento antiplaquetario en pacientes sin indicación de terapia combinada.

CONCLUSIONES. Existe una elevada adherencia a las guías en estrategia de control de ritmo y frecuencia cardiaca, aunque con margen de mejora en cuanto a profilaxis tromboembólica.

Palabras clave: Fibrilación auricular. Control de frecuencia cardiaca. Control de ritmo. Tromboembolismo. Guías de Práctica Clínica. Urgencias.

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Introduction

Atrial fibrillation (AF) is the most common cardiac rhythm disorder worldwide, with a major impact on health.[1] Its high prevalence and substantial healthcare costs require the establishment of management strategies that are appropriate, effective, and efficient across all care settings.[1]

Implementing guideline-recommended management, as outlined in Clinical Practice Guidelines (CPG), aims to improve the quality of patient care and reduce medical care costs;[1,2] however, adherence in routine clinical practice appears to remain modest.[3]

There is limited literature specifically focused on real-world AF management in emergency departments (ED),[4,5] making it difficult to analyze potential areas for improvement and optimize patient management according to current CPG recommendations on AF.[2] Recent studies indicate that more than one-third of AF patients receive clinical care that diverges in some aspect from guideline recommendations,[6] with variability depending on the procedure (e.g., rhythm control through cardioversion and/or pharmacologic therapy, thromboprophylaxis management) or the clinical service involved.[7,8]

The most relevant studies highlight the need to implement initiatives aimed at increasing both the performance of heart rate (HR) control and the effectiveness and speed of rhythm control in recent-onset AF episodes.[4,5] They also identify the need for improvements in the initial prescription of anticoagulation from the ED.[4,5]

In our setting, no recent evidence analyzing AF management in emergency care has been identified, particularly studies comparing routine processes with guideline recommendations. Additionally, available evidence is not recent and is based on outdated guidelines, limiting the applicability of previous findings to current practice in Spain.

In this context, and taking advantage of the introduction of a new antiarrhythmic drug (vernakalant), the increasingly widespread use of direct oral anticoagulants (DOACs), and a perception of suboptimal AF management in our ED, a multidisciplinary internal protocol for AF management was developed in the hospital, based on ESC Clinical Practice Guideline recommendations.[2,9] The primary aim of this protocol was to optimize AF management uniformly across all levels of care involved and to correct potential deviations from established recommendations.

The main objective of this study was to evaluate the therapeutic adherence of our ED to the internal protocol for AF management—based on CPG recommendations[2,9]—regarding rhythm control strategy, HR control, and thromboembolic prophylaxis, with the goal of identifying discordant practices and developing corrective and improvement actions.

Material and methods

Study design and population

We conducted an observational, cross-sectional study based on a cohort of patients aged ≥ 18 years who presented to the Emergency Department of Hospital Universitario Araba (Txagorritxu campus, Vitoria-Gasteiz, Spain) for any reason and had AF documented on electrocardiogram (ECG) at the time of recruitment, regardless of whether it was their first episode. To be included, patients were required to have an adequate level of consciousness upon arrival to the ED to allow proper information and written informed consent.

Patients were consecutively recruited over a 7-month period (October 28th 2019–May 27th 2020).

The study setting comprised the hospital ED care received from the moment of patient arrival with AF until discharge. All ED physicians participated, managing their patients according to standard clinical practice.

Data were extracted from electronic health records, including ECG recordings, and reviewed by the research team to compare the actions taken in each case with those recommended in the internal hospital protocol, aligned with European guidelines.[2]

Following the protocol was not mandatory, so clinician practice depended on individual clinical judgment and patient needs.

Study variables

Collected variables included demographic data (age, sex), AF type (valvular/non-valvular) and pattern (first episode, paroxysmal, persistent, or permanent), duration of arrhythmia (< 48 hours, > 48 hours, uncertain chronology, or permanent), baseline treatments, presence of structural heart disease, thromboembolic risk factors (CHA_2DS_2-VASc), bleeding risk (HAS-BLED), and reason for consultation.

Specific variables used to evaluate adherence to the protocol (Figure 1) were:

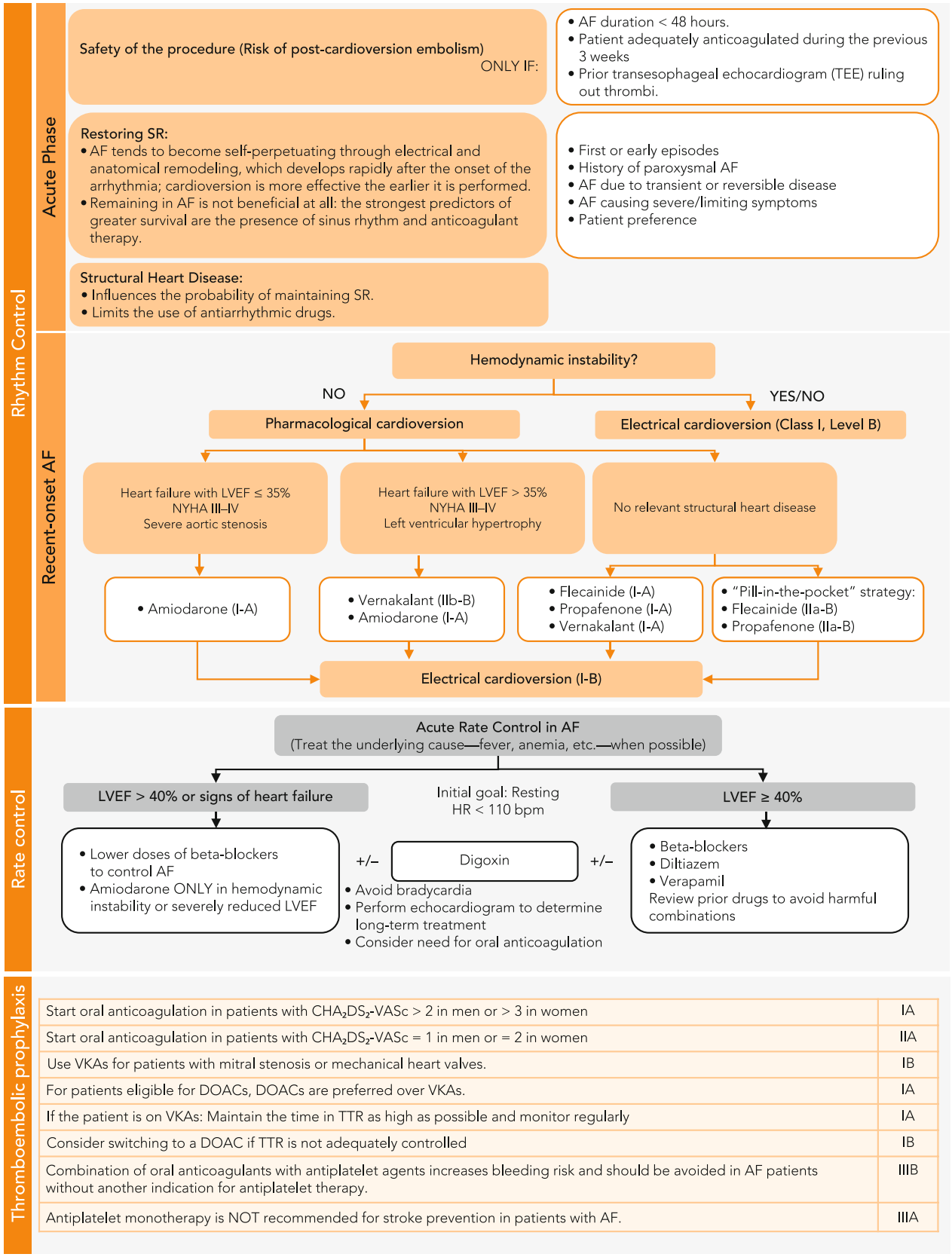
a) Rhythm-control strategy:10 identification of candidates for cardioversion (AF < 48 hours in non-anticoagulated patients, or > 48 hours with adequate anticoagulation for the previous 3 weeks and history of paroxysmal AF; Figure 1). Treatment received (yes/no) and type. Reason for non-treatment. Effectiveness (restoration of sinus rhythm), and adverse events of treatments used.

b) Heart-rate (HR) control strategy:[11] identification of candidates for rate control, defined as HR < 40 bpm (bradycardic AF) or HR > 110 bpm (tachycardic AF) (Figure 1). In candidates: type of treatment used, effectiveness or reason for non-treatment, achievement of target HR (defined as HR > 40 and < 110 bpm), and treatment-related adverse events.

c) Thromboembolism Prevention Strategy,[12] including:

1. Initiation of anticoagulants [indefinitely in patients with thromboembolic risk factors (CHA_2DS_2-VASc ≥ 1 in men or ≥ 2 in women; Figure 1), or temporarily in patients undergoing cardioversion and without thromboembolic risk factors].

2. Anticoagulation management in previously treated patients [dose adjustment in patients on vitamin K antagonists (VKA) with an out-of-range International Normalized Ratio (INR), or dose adjustment in patients receiving an incorrect dose of direct oral anticoagulants (DOACs)].



Start oral anticoagulation in patients with CHA_2DS_2-VASc > 2 in men or > 3 in women	IA
Start oral anticoagulation in patients with CHA_2DS_2-VASc = 1 in men or = 2 in women	IIA
Use VKAs for patients with mitral stenosis or mechanical heart valves.	IB
For patients eligible for DOACs, DOACs are preferred over VKAs.	IA
If the patient is on VKAs: Maintain the time in TTR as high as possible and monitor regularly	IA
Consider switching to a DOAC if TTR is not adequately controlled	IB
Combination of oral anticoagulants with antiplatelet agents increases bleeding risk and should be avoided in AF patients without another indication for antiplatelet therapy.	IIIB
Antiplatelet monotherapy is NOT recommended for stroke prevention in patients with AF.	IIIA

Figure 1. Hospital protocol for the management of acute atrial fibrillation (*Hospital Txagorritxu*, Spain).
ACOD: direct oral anticoagulant; VKA: vitamin K antagonist; CV: cardioversion; TOE: transesophageal echocardiography; AF: atrial fibrillation; HR: heart rate; LVEF: left ventricular ejection fraction; NYHA: New York Heart Association; SR: sinus rhythm; TTR: time in therapeutic range.

3. Change of anticoagulant treatment (from VKA to DOAC if time in therapeutic range [TTR] ≤ 65%, or from DOAC to VKA in patients with valvular AF).

4. Withdrawal of antiplatelet therapy in anticoagulated patients without an indication for combination therapy.

5. Discontinuation of anticoagulant treatment in patients with clinically relevant acute bleeding.

6. Reversal of anticoagulant effect in cases of critical hemorrhage.

For patients treated with VKA, a TTR > 65% (Rosendaal method) was considered appropriate, as this is the threshold established in the Spanish Therapeutic Positioning Report (IPT) for public reimbursement.[13]

Management of AF was analyzed according to each clinician's routine practice and compared with the management that should have been carried out according to the hospital protocol. In cases with clear deviations, clinicians were asked about the reasons for the discrepancy.

For statistical analysis, variables were presented descriptively, including mean, standard deviation (SD), cases/patients (n), and percentage (%).

The study was conducted in accordance with the principles of the Declaration of Helsinki and the standards outlined in Order SAS/3470/2009 of the Spanish Agency of Medicines and Medical Devices (AEMPS) regarding studies involving human data. The study was approved by the Basque Country Research Ethics Committee for Medicinal Products (Spain), protocol reference EPA2019048 (EPA-SP).

Results

Sample characteristics

Data from 399 patients were collected; 13 were excluded due to absence of ECG (n = 1) or a cardiac rhythm other than AF (n = 12). Of the 386 patients included, 195 presented with symptoms attributable to AF or with side effects of their treatment. The majority (96.8%) had non-valvular AF, were male (56%), and had a mean (SD) age of 76 (11.5) years (Table 1).

Restoration of sinus rhythm

A total of 97 patients met criteria for acute rhythm control, of whom 66 were treated (68%).

Reasons provided by clinicians for not treating (n = 31; 32%) were: spontaneous reversion to sinus rhythm (n = 19), patient refusal (n = 1), clinician consideration of poor candidacy (advanced age, severe left atrial dilation, previous strategy failure) (n = 4), and no justifiable reason (n = 7).

Among the 66 treated patients, the therapeutic goal (sinus rhythm restoration) was achieved in 55 (83.3%). The treatments administered, their effectiveness, and adverse events are shown in Table 2. Antiarrhythmic drugs (AADs) were the preferred approach, mainly vernakalant (75% effectiveness), with a median time to conversion of 10 minutes in responders. Amiodarone was used with a 33.3% effectiveness rate. Electrical cardioversion (ECV) with biphasic shocks was also used, either as first-line therapy or combined with AADs (13.6%) (Table 2).

Adherence to guidelines was 80.4% (n = 78). The main causes of non-adherence (n = 19; 19.6%) were: failure to follow the recommended rhythm-restoration strategy [use of non–first-line AADs (n = 5), no ECV after AAD failure (n = 7)], and failure to treat despite indication and eligibility (n = 7).

Heart rate control

Patients eligible for HR control represented 44.6% of the study population (n = 172): 15 with bradycardic AF and 157 with tachycardic AF. Of these, 120 received treatment (69.8%): 102 with atrioventricular node (AVN) blockers, 7 with etiologic treatment, and 11 with anti-bradycardia interventions (atropine n = 1, isoproterenol n = 1, suspension of AVN-blocking drugs n = 9).

Heart-rate control target (≥ 40 bpm and ≤ 110 bpm) was achieved in 137 patients (79.6%), including 38 who did not receive any HR-control treatment: spontaneous cardioversion to sinus rhythm (n = 9), rhythm-control medication administered instead (n = 23), well-tolerated bradycardia requiring observation or possible delayed pacemaker evaluation (n = 4), and spontaneous HR decrease without treatment (n = 2).

Table 3 shows the drugs used for controlling tachycardic AF, their effectiveness, and adverse events. The most frequently used drug class was beta-blockers (mainly bisoprolol) and digoxin.

Adherence to guidelines for HR control was 77.9% (n = 134). Reasons for non-adherence (n = 38) included: 14 patients received no treatment despite HR > 110 bpm, 17 received only a single drug without achieving HR control, 5 received an inappropriate drug choice, 1 was discharged in AF without an AVN blocker, and 1 was treated with flecainide without a concurrent AVN-blocking drug, risking 1:1 atrial flutter conversion, contrary to guidelines.

Thromboembolism prophylaxis

At the emergency department visit, AF was previously known in 280 patients (72.5%), of whom 248 (88.6%) were receiving thromboembolic prophylaxis (7 with acetylsalicylic acid and the remainder with anticoagulants). Among the 32 patients without prophylaxis (11.4%), the reasons were: no justification (n = 14), CHA_2DS_2-VASc = 0 or 1 in women (n = 14), patient refusal (n = 1), and unfavorable risk/benefit profile (n = 3). Baseline treatment and anticoagulation quality are shown in Table 4. Among patients anticoagulated with VKAs, 56.1% had an out-of-range INR on the day of the emergency visit, and 43.2% had a TTR ≤ 65% over the previous 6 months. Additionally, 22% of DOAC-treated patients were receiving an inappropriate dose.

Of the 386 patients, 300 (77.7%) were eligible for intervention regarding some aspect of thromboembolic prophylaxis, and 82 (27.3% of these) required more than one intervention. A total of 382 procedures were analyzed (Table 5). Of these, 63 procedures (16.7%) were directed at assessing the need for combined anticoagulation–antiplatelet therapy, which was performed appropriately in 34 cases (54%). No antiplatelet agent was discontinued in any patient who was

Table 1. Baseline sociodemographic and clinical profile of patients with atrial fibrillation

	Non-valvular AF (n = 374)					Valvular AF (n = 12)			
	Index episode n = 106 (28.3%)	Paroxysmal n = 81 (21.7%)	Persistent n = 17 (4.5%)	Permanent n = 170 (45.5%)	Total n = 374 (100%)	Paroxysmal n = 3 (25.0%)	Persistent n = 1 (8.3%)	Permanent n = 8 (66.7%)	Total n = 12 (100%)
Age (years); n (%)									
< 65 years	24 (22.6)	19 (23.5)	6 (35.3)	8 (4.7)	57 (15.2)	2 (66.7)	-	3 (37.5)	5 (41.7)
65–74 years	28 (26.4)	24 (29.6)	2 (11.8)	24 (14.1)	78 (20.9)	1 (33.3)	1 (100)	2 (25.0)	4 (33.3)
75–79 years	23 (21.7)	12 (14.8)	2 (11.8)	34 (20.0)	71 (19.0)	-	-	1 (12.5)	1 (8.3)
≥ 80 years	31 (29.2)	26 (32.5)	7 (41.8)	104 (61.2)	168 (44.9)	-	-	2 (25.0)	2 (16.7)
Sex (male); n (%)	57 (53.8)	43 (53.1)	11 (64.7)	102 (60.0)	213 (57.0)	1 (33.3)	-	2 (25.0)	3 (25.0)
Structural heart disease; n (%)									
Ischemic	13 (12.3)	8 (9.9)	2 (11.8)	20 (11.8)	43 (11.5)	-	-	-	-
Valvular heart disease	13 (12.3)	7 (8.6)	4 (23.5)	34 (20.0)	58 (15.5)	3 (100)	1 (100)	8 (100)	12 (100)
Cardiomyopathy	11 (10.4)	6 (7.4)	4 (23.5)	26 (15.3)	47 (12.6)	-	-	-	-
CHF ± reduced LVEF	10 (9.4)	6 (7.4)	1 (5.9)	42 (24.7)	59 (15.8)	-	-	-	-
No heart disease	45 (42.5)	49 (60.5)	6 (35.3)	40 (23.5)	140 (37.4)	-	-	-	-
Unknown	14 (13.2)	5 (6.2)	-	8 (4.7)	27 (7.2)	-	-	-	-
CHA_2DS_2-VASc; n (%)									
0 or 1 (female)	15 (14.2)	13 (16.0)	2 (11.8)	3 (1.8)	33 (8.8)	1 (33.3)	-	1 (12.5)	2 (16.7)
1 (male) or 2 (female)	17 (16.0)	11 (13.6)	3 (17.6)	3 (1.8)	34 (9.1)	1 (33.3)	-	1 (12.5)	2 (16.7)
≥ 2 (male) or ≥ 3 (female)	74 (69.8)	57 (70.4)	12 (70.6)	164 (96.5)	307 (82.1)	1 (33.3)	1 (100)	6 (75.0)	8 (66.7)
HAS-BLED ≥ 3; n (%)	31 (29.2)	26 (32.1)	5 (29.4)	97 (57.1)	159 (42.5)	1 (33.3)	-	2 (25.0)	3 (25.0)
Baseline rhythm-control therapy; n (%)									
Flecainide	-	15 (18.5)	4 (23.5)	1 (0.6)	20 (5.3)	-	-	-	-
Amiodarone	-	8 (9.9)	-	1 (0.6)	9 (2.4)	-	-	-	-
Dronedarone	-	1 (1.2)	-	-	1 (0.3)	-	-	-	-
Sotalol	-	-	-	1 (0.6)	1 (0.3)	-	-	-	-
Baseline rate-control therapy; n (%)									
Beta-blockers	20 (18.9)	40 (49.4)	9 (52.9)	68 (40.0)	137 (36.6)	1 (33.3)	1 (100)	3 (37.5)	5 (41.7)
Calcium-channel blockers	2 (1.9)	1 (1.2)	-	13 (7.6)	16 (4.3)	-	-	-	-
Digoxin	-	-	-	7 (4.1)	7 (1.9)	-	-	1 (12.5)	1 (8.3)
Combinations	-	-	1 (5.9)	22 (12.9)	2 (0.5)	2 (66.7)	-	3 (37.5)	5 (41.7)
Pacemaker	-	-	-	5 (2.9)	5 (1.3)	-	-	-	-
Pacemaker + AV-nodal blockers	-	-	1 (5.9)	5 (2.9)	6 (1.6)	-	-	-	-
Anticoagulant therapy; n (%)									
Vitamin K antagonists	2 (1.9)	32 (39.5)	6 (35.3)	105 (61.8)	145 (38.8)	3 (100)	1 (100)	6 (75.0)	10 (83.3)
LMWH	1 (0.9)	-	1 (5.9)	5 (2.9)	7 (1.9)	-	-	-	-
DOACs	-	19 (23.5)	8 (47.1)	53 (31.2)	80 (21.4)	-	-	2 (25.0)	2 (16.7)
Antiplatelet therapy; n (%)									
ASA	23 (21.7)	10 (12.3)	1 (5.9)	16 (9.4)	50 (13.4)	1 (33.3)	-	1 (12.5)	2 (16.7)
Clopidogrel	3 (2.8)	1 (1.2)	-	3 (1.8)	7 (1.9)	-	-	-	-
Dual antiplatelet therapy	2 (1.9)	2 (2.5)	-	1 (0.6)	5 (1.3)	-	-	-	-
Visit related to AF; n (%)	70 (66.0)	65 (80.2)	13 (76.5)	41 (24.1)	189 (50.5)	3 (100)	1 (100)	2 (25.0)	6 (50.0)

ASA: acetylsalicylic acid; DOAC: direct oral anticoagulant; AF: atrial fibrillation; HR: heart rate; LVEF: left ventricular ejection fraction; LMWH: low–molecular-weight heparin; CHF: congestive heart failure; AV: atrioventricular node.
Total sample size = 386 patients. Values express absolute numbers and percentages.

taking both drugs at baseline, even when monotherapy anticoagulation was indicated. Likewise, antiplatelet withdrawal was performed in only 65% of patients who were on baseline antiplatelet therapy when anticoagulation was started in the ED. Regarding initiation of indefinite anticoagulation, 116 patients were candidates (including the 7 patients with known AF treated with antiplatelet therapy for embolic prevention). Management was correct in 108 (93.1%), and 103 (95.4%) received anticoagulation. In 5 patients (4.6%), anticoagulation was not initiated due to an unfavorable risk/benefit profile. The anticoagulants used were: acenocoumarol (n = 64; 62.1%), DOACs (n = 31; 30.1%), low-molecular-weight heparins (LMWH) (n = 8; 7.8%).

Adherence to the protocol in this therapeutic strategy was 65.2% (n = 249).

Discussion

Clinical Practice Guidelines (CPGs) form the foundation for standardized and consistent management of AF patients.[2,6] Based on available evidence and developed by multidisciplinary teams, CPGs should serve as a key reference for clinicians managing these patients. Nonetheless, healthcare context, clinical experience, and specific patient or institutional factors may produce variability in practice, though this should always occur within the boundaries of clinical coherence and preservation of care quality. In this regard, our hospital created an initiative to reinforce AF-management recommendations through a dedicated protocol based on European guidelines. Importantly, the protocol was not mandatory, allowing room for individual clinical judgment.

Table 2. Strategies used for restoration of sinus rhythm in patients with atrial fibrillation

	Patients Treated n (%)	Achievement of Rhythm Control n (%)	A dverse Events
Clinical response to the full strategy received by the patients			
Strategy; n (%)			
Oral amiodarone	1 (1.5)	0 (0.0)	
IV amiodarone	11 (16.7)	5 (45.5)	
IV amiodarone + ECV	3 (4.5)	3 (100)	Bradycardia + hypotension after ECV (n = 1)
Oral flecainide	8 (12.1)	8 (100)	Symptomatic hypotension (n = 1)
IV flecainide	4 (6.1)	3 (75.0)	Symptomatic hypotension (n = 1)
Oral flecainide + ECV	2 (3.0)	2 (100)	Asymptomatic bradycardia (n = 1)
Vernakalant	22 (33.3)	21 (95.5)	Self-limited wide-QRS tachycardia (n = 1); symptomatic hypotension (n = 1)
Vernakalant + ECV	5 (7.6)	5 (100)	Asymptomatic 10-second sinus pause after ECV (n = 1)
Vernakalant + ECV + IV amiodarone	1 (1.5)	0 (0.0)	
ECV alone	8 (12.1)	8 (100)	
ECV + IV amiodarone + oral flecainide	1 (1.5)	0 (0.0)	
Total	66 (100)	55 (83.3)	
Clinical response of each drug and/or ECV separately			
Antiarrhythmic drugs and/or ECV; n (%)			
Amiodarone	15 (22.7)	5 (33.3)	
Flecainide	14 (21.2)	11 (78.6)	
Vernakalant	28 (42.4)	21 (75.0)	
ECV	9 (13.6)	8 (88.9)	
Antiarrhythmic drug + ECV*	11 (16.7)*	10 (90.9)	
Total	66 (100)	55 (83.3)	

*n = 11 patients received additional ECV to the drug, due to lack of therapeutic response to it.
ECV: electrical cardioversion.

Table 3. Pharmacological treatment used for the control of tachycardic atrial fibrillation

Heart Rate Control; n (%)	Patients Treated	Achievement of Control	Adverse Events
Beta-blockers	55 (53.9)	49 (89.1)	Hypotension (n = 2)
Digoxin	26 (25.5)	16 (61.5)	
Digoxin + Bisoprolol	15 (14.7)	14 (93.3)	Hypotension (n = 1)
Digoxin + Calcium channel blockers	2 (2.0)	1 (50.0)	
Digoxin + Amiodarone	3 (2.9)	2 (66.7)	
Digoxin + Bisoprolol + Amiodarone	1 (1.0)	0 (0.0)	
Total	102 (100)	82 (80.4)	

Overall, adherence to the protocol/guidelines in our emergency department was high for rhythm and rate control goals (80.4% and 77.9%, respectively), and somewhat lower for thromboembolic prophylaxis (65.2%). These results are an improvement compared with previous studies reporting CPG adherence rates between 60–67%,[3] although those refer to different health care contexts and older guideline recommendations. In any case, both our data and the limited literature available[3,7,8] suggest substantial room for improvement, particularly in areas with greater discrepancies between clinical practice and CPG recommendations.

The rhythm-control strategy appears to be well integrated by emergency physicians. However, areas for improvement were identified, such as the preference for AADs over ECV, despite AADs being less effective. This contrasts with practices in other countries, where ECV is used in up to 45% of AF patients.[8,14,15] Possible explanations include the fact that AADs do not require fasting or sedation and that both therapies are complementary rather than mutually exclusive. Vernakalant was the most frequently used AAD. Previously unused in our ED, its introduction through the protocol has made it a standard option, supported by evidence showing its efficacy, rapid onset, and safety in recent-onset AF episodes[16,17]—positioning it as an excellent therapy at the emergency setting. Furthermore, we observed frequent use of amiodarone in patients without significant structural heart disease, despite the availability of more effective alternatives—such as flecainide or vernakalant—and evidence suggesting that amiodarone is associated with longer lengths of stay.[18]

Rate control is always a therapeutic objective in AF, aimed at relieving symptoms, preventing hemodynamic deterioration, and avoiding the development of tachycardia-induced cardiomyopathy and heart failure.[2,6] It should not be considered an exclusive alternative to rhythm control, as both strategies may be applied simultaneously.[1,2] In this strategy, although adherence to the protocol was high, several relevant deviations were identified, such as failure to use AV-nodal blocking agents in some cases of tachycardic AF or using them at low doses or in monotherapy without achieving the target. A high use of digoxin was also observed, despite it being a second-line drug in this context. This was likely influenced by the preference for an IV agent in more symptomatic patients, or by the tendency to add digoxin to beta-blockers instead of up-titrating the beta-blocker dose, especially when blood pressure does not allow further escalation. Regardless, the most widely prescribed discharge drug was bisoprolol.

Finally, the greatest need for standardization was identified in the area of thromboembolic prophylaxis—both in our center and likely in other centers—since our data are consistent with former studies.[7] The rate of anticoagulation initiation was very high (93.1%), higher than that observed in other studies (75–82% at hospital discharge).[19,20] Acenocoumarol was the most frequently used agent, with limited use of DOACs, as also reported elsewhere.[19-21] However, evidence and CPGs[2] position DOACs as first-line therapy in non-valvular AF, given their non-inferior stroke prevention and lower risk of major bleeding, particularly intracranial hemorrhage.[22,23] The low use of DOACs may have multiple causes,[20] though the reimbursement restrictions of the Spanish National Health System appear particularly influential.[13] Indeed, nearly one-fourth of patients initiated a DOAC only because its reimbursement was temporarily authorized dur-

Table 4. Baseline treatment and quality of anticoagulant therapy in patients with previously diagnosed atrial fibrillation

Tthromboembolic prophylaxis in patients with known AF; n (%)	Patients with af receiving anticoagulation n = 248 (88.6%)
VKA	153 (61.7)
DOAC	82 (33.1)
Low-molecular-weight heparins	6 (2.4)
Acetylsalicylic acid	7 (2.8)
Quality of anticoagulant treatment; n (%)	**Patients treated with VKA n = 155 (62.5%)***
INR 2–3	65 (41.9)
INR out of range (< 2)	24 (15.5)
INR out of range (> 3)	63 (40.6)
TTR > 65%	47 (30.3)
TTR ≤ 65%	67 (43.2)
TTR not available	17 (11.0)
TTR not applicable**	24 (15.5)
Quality of anticoagulant treatment (DOAC); n (%)	**Patients treated with DOAC n = 82 (21.2%)**
Dose according to the product's Summary of Characteristics	64 (78.0)
Dose different from that recommended	18 (22.0)
Lower than recommended	6 (7.3)
Higher than recommended	12 (14.6)

*2 patients with a first episode of AF were anticoagulated with VKA for another reason. Their data are included in the analysis.
**TTR was not applicable in 24 patients: treatment < 6 months (Therapeutic Positioning Report; n = 14), or patients with valvular AF (n = 10).
DOAC: direct oral anticoagulants; VKA: vitamin K antagonists; AF: atrial fibrillation; INR: International Normalized Ratio; TTR: time in therapeutic range.

ing the SARS-CoV-2 pandemic. Despite this, patients anticoagulated with VKA and TTR ≤ 65% were mostly discharged on VKA, even though DOACs are reimbursed in that specific context.[13] Additionally, almost 25% of DOAC-treated patients were receiving an incorrect dose according to their drug label, and none had their dose corrected. Regular reassessment of anticoagulation quality—including in the ED—is essential to avoid therapeutic inertia that perpetuates suboptimal practice, and to safely and effectively prevent cardioembolic stroke and bleeding, regardless of patient age.[2,9,24,25] Another frequently observed error was inadequate evaluation of the need for combined antiplatelet–anticoagulant therapy, a regimen with high hemorrhagic risk and limited benefit when not specifically indicated.

The analysis performed at our center highlights the need for similar studies elsewhere, as there are significant

Table 5. Management and guideline adherence in thromboembolic prophylaxis

Thromboembolic prophylaxis procedures; n (%)	Procedures	Concordant	Not concordant
Anticoagulation for cardioversion	25 (6.5)	18 (72.0)	7 (28.0)
VKA dose adjustment	81 (21.2)	63 (77.8)	18 (22.2)
DOAC dose adjustment	17 (4.5)	0 (0.0)	17 (100)
Combined therapy	63 (16.7)	34 (54.0)	29 (46.0)
Change of anticoagulant	64 (16.8)	11 (17.2)	53 (82.8)
Initiation of anticoagulation	116 (30.4)	108 (93.1)	8 (6.9)
Reversal of anticoagulant effect	3 (0.8)	2 (66.7)	1 (33.3)
Discontinuation of anticoagulation	13 (3.4)	13 (100)	0 (0.0)
Total	382 (100)	249 (65.2)	133 (34.8)

DOAC: direct oral anticoagulants; VKA: vitamin K antagonists.

opportunities to improve AF care in EDs—often the first point of contact for these patients, whether due to AF itself or decompensation by other causes or comorbidities.[19] EDs receive highly heterogeneous patient populations; therefore, having clear and standardized protocols is essential to ensure efficient and effective management for each patient.[23] Regular reassessment and adjustment of baseline therapy is particularly important, given changes in renal function, need to modify anticoagulation, or other evolving clinical factors.[19,26] Likewise, it is critical that all ED clinicians remain up-to-date with AF management standards.[10,27]

This study has a few limitations, as it was conducted in a single center, which may limit generalizability to other hospitals. Additionally, patient inclusion did not depend on the research team but on all clinicians caring for AF cases in the ED, and recruitment was affected by the SARS-CoV-2 pandemic, likely resulting in missed cases and selection bias. Nonetheless, despite these limitations, the study provides a practical framework that could serve as a model for other EDs and emergency medical systems to perform internal audits and drive continuous improvement in clinical processes. CPGs provide a reference standard for AF management, but real-world clinical practice may diverge for multiple reasons. In our case, for example, a large proportion of patients were very elderly, which could justify certain protocol deviations—though in some cases, such as thromboembolic prophylaxis, such deviations would not be justified.[25]

In conclusion, this study identifies the main areas for improving AF care in an emergency department.

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