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A prospective survey in European Society of Cardiology member countries of atrial fibrillation management: baseline results of EURObservational Research Programme Atrial Fibrillation (EORP-AF) Pilot General Registry

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Aims Given the advances in atrial fibrillation (AF) management and the availability of new European Society of Cardiology (ESC) guidelines, there is a need for the systematic collection of contemporary data regarding the management and treatment of AF in ESC member countries.

Methods and results We conducted a registry of consecutive in- and outpatients with AF presenting to cardiologists in nine participating ESC countries. All patients with an ECG-documented diagnosis of AF confirmed in the year prior to enrolment were eligible. We enroled a total of 3119 patients from February 2012 to March 2013, with full data on clinical subtype available for 3049 patients (40.4% female; mean age 68.8 years). Common comorbidities were hypertension, coronary disease, and heart failure. Lone AF was present in only 3.9% (122 patients). Asymptomatic AF was common, particularly among those with permanent AF. Amiodarone was the most common antiarrhythmic agent used (~20%), while beta-blockers and digoxin were the most used rate control drugs. Oral anticoagulants (OACs) were used in 80% overall, most often vitamin K antagonists (71.6%), with novel OACs being used in 8.4%. Other antithrombotics (mostly antiplatelet therapy, especially aspirin) were still used in one-third of the patients, and no antithrombotic treatment in only 4.8%. Oral anticoagulants were used in 56.4% of CHA_2DS_2-VASc = 0, with 26.3% having no antithrombotic therapy. A high HAS-BLED score was not used to exclude OAC use, but there was a trend towards more aspirin use in the presence of a high HAS-BLED score.

Conclusion The EURObservational Research Programme Atrial Fibrillation (EORP-AF) Pilot Registry has provided systematic collection of contemporary data regarding the management and treatment of AF by cardiologists in ESC member countries. Oral anticoagulant use has increased, but novel OAC use was still low. Compliance with the treatment guidelines for patients with the lowest and higher stroke risk scores remains suboptimal.

Keywords Atrial fibrillation • Risk scores • Registry • Anticoagulation

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What's new?

- Given the advances in atrial fibrillation (AF) management and the availability of new European Society of Cardiology (ESC) guidelines, there is a need for the systematic collection of contemporary data regarding the management and treatment of AF in ESC member countries.
- The EURObservational Research Programme Atrial Fibrillation (EORP-AF) Pilot Registry has provided systematic collection of contemporary data regarding the management and treatment of AF by cardiologists in ESC member countries. Oral anticoagulant (OAC) use has increased, but novel OAC use was still low. Compliance with treatment guidelines for patients with the lowest and higher stroke risk scores remains suboptimal.

Introduction

Atrial fibrillation (AF) is the commonest sustained cardiac rhythm disorder, and recent projections estimate that from 2010 to 2060, the number of adults 55 years and over with AF in the European Union will be more than double.[1] Given the increasing prevalence and since AF is associated with significant morbidities and mortality, this increase would have major public health implications.

Considering the many advances in AF management and the availability of new European Society of Cardiology (ESC) guidelines,[2] there is a need for the systematic collection of contemporary data regarding the management and treatment of AF in ESC member countries. It has been >10 years since the last pan-European survey of AF management which was undertaken as part of the EuroHeart survey programme,[3] and therefore, a new registry providing information on contemporary clinical practice among European cardiologists is needed.

The EuroHeart survey previously showed great heterogeneity in the management of patients with AF, with major implications for outcomes, especially stroke prevention.[3,4] Many other analyses from the EuroHeart survey on AF have been published (including the initial validations of the CHA_2DS_2-VASc and HAS-BLED scores), making important contributions to our knowledge and understanding of this common arrhythmia.[5,6]

New guidelines on the management of AF have recently been published by the ESC,[2] but it remains unclear how often clinicians adhere to them. Thus, a registry on AF under the EORP programme would enable first a timely assessment of the clinical scenario and management of AF in the Pilot phase of the registry, reported herein, and then, by the subsequent long-term phase, the uptake process of the new ESC guidelines could be explored. This should allow us to monitor implementation and uptake of catheter ablation, new antithrombotic drugs, and new antiarrhythmic agents, and would inform about outcomes related to guideline-adherent management of AF, cost and health economics, and quality of life.

The overall main objectives of the EURObservational Research Programme Atrial Fibrillation (EORP-AF) Registry programme have been previously stated.[7] In brief, our aim was to describe the implementation of the current guidance for stroke prevention in AF; and to collect data on the use of rhythm control options such as catheter ablation and newly available antiarrhythmic drugs (AADs). Following the availability of follow-up data, additional objectives of the EORP-AF would be to evaluate the mortality and morbidity in relation to therapeutic decisions, including adherence to guidelines in the EORP AF cohort at 1 year and subsequent follow-up. The present paper reports the *baseline data* from the EORP-AF Pilot Registry only.

Methods

The registry population comprised of consecutive in- and outpatients with AF presenting to cardiologists in the participating ESC countries. Consecutive patients were screened for eligibility at the time of their presentation to a cardiologist (hospital or medical centre). All the patients provided written informed consent. Patients with the primary or secondary recorded diagnosis of AF were included.

Patients were officially enroled in the EORP-AF only if an ECG diagnosis (12-lead ECG, 24 h Holter, or other electrocardiographic documentation) confirming AF was made. The qualifying episode of AF should have occurred within the last year, and patients did not need to be in AF at the time of enrolment.

For the pilot phase, 12 countries were invited to participate, taking into account the geographical distribution of the countries, to achieve a reasonably representative European picture, and 9 countries formally participated. A minimum of 20 consecutive patients per centre were to be enroled, with a target of 3000 patients for the EORP-AF Pilot.

While it was anticipated that most investigators were hospital-based cardiologists, recruitment by office-based cardiologists was allowed, given the different healthcare systems in the participating countries, if follow-up of patients was deemed feasible. Furthermore, all patients admitted for catheter ablation, initiation of drug therapy, or cardioversion (electrical or pharmacological) were to be included. Chosen investigator sites were a broad mix of tertiary, secondary, and general hospitals, with and without interventional cardiology, electrophysiology, or cardiac surgery services. Obviously, the period of inclusion could vary between centres, and therefore, data collection in each separate centre continues at least until the target number of patients has been achieved.

The plan was to have one baseline visit and one visit per year over a 3-year period. Enrolment into the registry started in February 2012, and the end of enrolment was March 2013. Individual centres commenced at different timepoints just after their institutional review board approvals. The number of patients per centre, and the number of centres involved in each country, were agreed upon in advance, in consultation with the national coordinators who had knowledge of the clinical practices specific to each country. A follow-up survey will allow evaluation of morbidity/mortality over time and will also allow comparison between outcomes in European regions with different patterns of practice. Follow-up data will form the basis of subsequent reports.

Statistical analyses

Univariate analysis was applied to both continuous and categorical variables. Continuous variables were reported as mean ± SD or as median and interquartile range (IQR). Among-group comparisons were made by using a non-parametric test (Kruskal–Wallis test). Categorical variables were reported as percentages. Among-group comparisons were made by using a χ^2 test or a Fisher's exact test if any expected cell count was <5. Multivariate analysis was used to explore the relationship between oral anticoagulant (OAC) use and baseline covariates. Only significant variables were included in the model. Multiple logistic regression

was performed by using a multiple imputation procedure to overcome the limitation caused by the presence of missing data. Instead of filling in a single value for each missing value, Rubin's (1987) multiple imputation procedure replaces each missing value with a set of plausible values that represent the uncertainty about the right value to impute. These multiplied imputed datasets are then analysed by using standard procedures for complete data and combining the results from these analyses. This procedure was performed by using the programme R (http://www.R-project.org/) and the package Hmisc (http://CRAN.R-project.org/package=Hmisc).

Results

We enroled a total of 3119 patients, although full data on clinical subtype of AF was available for 3049 patients (40.4% female; mean age 68.8 years), with the distribution between subtypes of AF, type of centre, and site of inclusion shown in *Table 1*. As expected, patients with paroxysmal AF were more commonly seen in specialized electrophysiology centres. The contribution of different participating countries is shown in Supplementary material online, *Table S1*.

There were no significant sex differences in the AF subtypes, but paroxysmal AF patients were younger (mean age 66.6 vs. 73.0, $P < 0.001$), compared with those in permanent AF.

Associated comorbidities and prior interventions

The commonest associated comorbidities were hypertension (70.9%), heart failure (47.5%), and (any) valvular heart disease (63.5%), although the latter included even mild valvular abnormalities detected on echocardiography. Previous stroke was reported in 6.4% of the whole cohort. Chronic kidney disease was reported in 13.2%. Stroke and chronic kidney disease were slightly more prevalent in older patients and in those with permanent AF. Of note, lone AF (cardiologist-defined) was evident in only a minority of patients (3.9%) (*Table 2*).

As expected, previous cardioversion (either pharmacological and/or electrical) was most often attempted in paroxysmal and persistent and long-standing persistent AF (*Table 2*). Catheter ablation had only been attempted 7.6% overall, most often in those with paroxysmal AF (15.6%). Pacemaker implantation was performed in 7.0% of the whole cohort. Surgery for AF was only performed in a small minority (0.9%).

Main reason for admission

Atrial fibrillation was cited as the main reason for admission in most of the patients (60.5%), otherwise heart failure was the next commonest reason (15.9%), especially among permanent AF patients (31.0%) (*Table 3*). Of the whole cohort, 39.4% of patients were asymptomatic, particularly those with permanent AF (65.8%).

Investigations

Transthoracic echocardiography has been performed in most patients (92.0%), while recent thyroid function tests were previously performed in 33.9%, during current episode in 22.5% or planned in 7.3% (*Table 4*). Electrophysiological studies were performed in a minority (4.2%), most often in those with paroxysmal AF (8.3%).

Management

Among inpatients ($n = 1994$), pharmacological (29.8%) or electrical (20.5%) cardioversion was performed most often among paroxysmal, long-standing, persistent, and persistent AF (*Table 4*). The antithrombotic strategies are summarized in *Table 5*—OACs were used in ~80% overall, most often vitamin K antagonists (71.6%), with novel OACs being used in a minority (dabigatran 6.8%, rivaroxaban 1.6%, and apixaban 0%). Aspirin was used in 30.7%, and the combination of an OAC plus at least one antiplatelet in 20.1%. Of the latter, OAC plus a single antiplatelet drug was used in 16.4%, and an OAC with two antiplatelets in 3.7%.

The AADs most often prescribed were amiodarone (21.5%), flecainide (5%), and propafenone (5.3%) (*Table 5*). Dronedarone

Table 1 Distribution of participation and patient enrolment per clinical type of AF

	Whole cohort	First detected	Paroxysmal	Persistent AF	Long-standing persistent	Permanent	*P* value
N = 3049 patients	3049	923	808	647	145	526	
%	100.0	30.3	26.5	21.2	4.8	17.3	
Type of centre (%)							
Specialized	64.6	67.5	73.4	63.4	23.1	58.5	<0.001
Non-specialized	35.4	32.5	26.6	36.6	76.9	41.5	
Site of inclusion (%)							
Outpatient clinic	25.0	25.2	24.6	22.0	12.4	32.5	<0.001
Cardiology ward	62.6	60.8	63.0	66.3	82.1	55.5	
Cardiac surgery ward	0.2	0.2	0.3	0.2	0.0	0.0	
First heart aid	1.1	1.4	1.9	0.8	0.0	0.0	
Private cardiology practice	4.9	4.9	5.5	4.0	0.7	6.5	
Others	6.2	7.5	4.8	6.8	4.8	5.5	

Data are presented as observed number (%) within the type of AF.

Table 2 Patient characteristics

	Whole cohort	First detected	Paroxysmal	Persistent AF	Long-standing persistent	Permanent	*P* value*
N = 3049 patients	3049	923	808	647	145	526	
Demographics							
Age in years (mean)	68.8	68.5	66.6	67.9	70.9	73.0	<0.001
Female gender (%)	40.4	37.2	43.4	40.3	42.1	40.9	0.119
Concomitant disease							
Hypertension (%)	70.9	71.9	67.9	77.8	70.6	77.8	0.112
Coronary artery disease (%)	36.4 (*N* = 2642)	36.2 (*N* = 291)	34.2 (*N* = 235)	38.5 (*N* = 47)	40.3 (*N* = 188)	38.5 (*N* = 47)	0.285
Myocardial infarction (%)	44.8	50.2	43.0	25.5	49.5	25.5	0.004
PTCA/CABG (%)	47.0	56.7	45.5	17.0	54.8	17.0	<0.001
Stable angina (%)	37.7	32.3	38.3	46.8	38.3	46.8	0.141
Lone atrial fibrillation[a]	3.9	4.1	6.9	0.0	0.2	0.0	<.0001
Chronic heart failure (%)	47.5 (*N* = 1382)	47.4 (*N* = 418)	30.8 (*N* = 229)	72.9 (*N* = 105)	64.0 (*N* = 332)	72.9 (*N* = 105)	<0.001
Heart failure NYHA class III/IV (%)	41.2	40.9	27.5	49.5	50.0	49.5	<0.001
Valvular disease (%)	63.5	66.3	47.3	68.2	77.2	68.2	<0.001
Dilated cardiomyopathy (%)	11.4	10.7	4.1	31.9	17.8	31.9	<0.001
Cardiomyopathy hypertrophic (%)	3.9	2.8	3.4	11.9	3.5	11.9	<0.001
Cardiomyopathy restrictive (%)	0.5	0.6	0.0	1.4	1.0	1.4	0.028
Cardiomyopathy hypertensive (%)	19.5	15.3	18.1	38.9	17.4	38.9	<0.001
Other cardiac disease (%)	8.1	7.4	7.2	8.8	9.3	8.8	0.507
Chronic obstructive pulmonary disease (COPD) (%)	11.1	12.3	7.4	19.6	13.6	19.6	<0.001
Hyperthyroidism (%)	3.0	1.8	3.4	5.7	4.0	5.7	0.048
Hypothyroidism (%)	7.2	8.0	6.7	4.9	6.3	4.9	0.548
Cardiovascular risk factors							
Diabetes mellitus (%)	20.6	20.8	16.8	23.8	25.8	20.2	0.002
Hypercholesterolaemia (%)	48.6	48.9	46.7	65.3	47.8	47.3	0.002
Current smoker (%)	11.3	12.2	12.0	11.9	7.9	11.5	0.155
No regular exercise (%)	39.3	41.4	33.0	28.0	51.8	36.1	<0.001
Co-morbidities							
Previous TIA (%)	4.1	3.3	3.8	5.3	5.6	4.0	0.260
Previous stroke (%)	6.4	6.4	4.7	12.5	9.5	4.5	<0.001
Ischaemic thrombo-embolic complications (%)	13.1	12.8	10.9	18.1	16.9	12.1	0.008
Haemorrhagic events (%)	5.9	5.9	4.9	4.4	9.2	4.7	0.007
Malignancy (%)	5.3	6.1	5.3	2.5	4.2	5.7	0.344

Table 2 *Continued*

	Whole cohort	First detected	Paroxysmal	Persistent AF	Long-standing persistent	Permanent	*P* value*
Peripheral vascular disease (%)	11.2	11.9	7.7	17.7	11.5	12.6	0.002
Chronic kidney disease (%)	13.2	15.5	7.9	11.9	18.9	12.3	<0.001
Previous interventions							
Pharmacological conversion (%)	36.6	21.7	52.1	65.2	17.6	48.0	<0.001
Electrical cardioversion (%)	20.6	16.8	29.9	27.0	25.2	47.6	<0.001
Catheter ablation (%)	7.6	1.5	15.6	6.4	3.9	9.7	<0.001
Pacemaker implantation	7.0	3.8	6.7	2.1	15.8	5.7	<0.001
ICD implantation (%)	1.4	0.5	0.9	0.0	4.0	1.7	<0.001
Surgery for AF (%)	0.9	0.8	0.6	2.1	0.8	1.2	0.387

Data are presented as mean (standard deviation) or observed number (%) within the type of AF.
*Difference among the four AF types.
[a]None of the reported concomitant diseases.
PCI, percutaneous coronary intervention; CABG, coronary artery bypass grafting; CAD, coronary artery disease; TIA, transient ischaemic attack; ICD, implantable cardioverter-defibrillator.

was only used in a small minority (0.3%). Of the rate control agents, beta-blockers (69.2%) and digoxin (19.4%) were more often used than non-dihydropyridine calcium-channel blockers (6.2%). Beta-blocker and digoxin combination therapy was used in 15%, while combination therapy of a non-dihydropyridine calcium-channel blocker and digoxin was used in only 1.1%.

Stroke risk factors

Table 6 summarizes the commonest stroke and bleeding risk factors, as well as the stroke and bleeding risk profile of our population. Of the whole cohort, the mean CHA_2DS_2-VASc score was 3.2 ± 1.8 and the mean HAS-BLED was 1.4 ± 1.1, with the highest risk seen among those with long-standing persistent and permanent AF.

The proportions of OAC use by CHA_2DS_2-VASc score are shown in *Figure 1*, which shows OAC use in >78%, with each score pointed between CHA_2DS_2-VASc 2 and 8. Oral anticoagulant use was only 66.7% in CHA_2DS_2-VASc score 9, with 33% using other antithrombotic drugs (mostly antiplatelet therapy) in this high-risk category. Oral anticoagulant was still used in 56.4% of CHA_2DS_2-VASc score = 0, with 16.8% receiving other antithrombotic drugs (mostly antiplatelet therapy) and 26.3% having no antithrombotic therapy. Of the 101 patients who used OAC and have CHA_2DS_2-VASc score = 0, 52 known patients were scheduled for cardioversion (51.5%).

Figure 2 shows OAC use according to HAS-BLED score, with OAC being used in >65% of all score points. However, there was a trend towards more use of other antithrombotics (mostly antiplatelet therapy) with higher HAS-BLED score.

Independent predictors of increasing OAC use are shown in *Table 7*, and were younger age (per decade below age 70), higher body mass index (BMI, per increase by 5 kg/m^2), hyperthyroidism, prior stroke, and high CHA_2DS_2-VASc score—while OAC was less used in females, patients with higher systolic blood pressures (per increase by 20 mmHg), high HAS-BLED score, and chronic kidney disease patients.

Discussion

The EORP-AF Pilot Registry provides an important and contemporary 'snapshot' of AF epidemiology and management in nine participating ESC member countries.

First, we show that hypertension, coronary disease, and heart failure remain common comorbidities in our AF registry, but lone AF was only evident in 3.9% overall. Secondly, asymptomatic AF is common, particularly among those with permanent AF. Thirdly, amiodarone is the commonest AAD used (~20%), while regarding rate control drugs, beta-blockers and digoxin were more often used than non-dihydropyridine calcium-channel blockers. Fourthly, OAC was used in ~80% overall, most often vitamin K antagonists (71.6%), with novel OAC being still used in a minority; however, other antithrombotics (mostly antiplatelet therapy, especially aspirin) were still used in one-third of the patients, with no antithrombotic treatment in only a minority (1.7% of permanent AF). Of note, OAC were still used in 56.4% of CHA_2DS_2-VASc score = 0, with 26.3% having no antithrombotic therapy. However, half of the OAC users in this group were scheduled for a cardioversion. Finally, a high HAS-BLED score was not used to exclude OAC use

Table 3 Admission/consultation information

	Whole cohort	First detected	Paroxysmal	Persistent AF	Long-standing persistent	Permanent	*P* value*
N = 3049 patients	3049	923	808	647	145	526	
Main reason admission/consultation (%)							
Atrial fibrillation	60.5	58.7	75.7	68.5	44.8	34.6	<0.001
Acute myocardial infarction	4.2	6.4	3.8	3.3	2.1	2.9	
Valvular heart disease	3.5	3.5	0.5	2.8	6.2	8.6	
Hypertension	1.4	1.4	1.1	2.5	2.1	0.6	
Heart failure	15.9	15.9	6.9	11.9	28.3	31.0	
Other coronary artery disease	4.5	4.9	3.6	3.4	4.8	6.5	
Other cardiac diseases	7.5	6.8	7.2	5.6	10.3	10.7	
Symptoms[a]							
Current AF symptoms attributable to AF[a]	60.6	59.1	65.1	73.0	84.8	34.2	<0.001
No current AF symptoms	39.4 (*N* = 1202)	40.9 (*N* = 377)	34.9 (*N* = 282)	27.0 (*N* = 175)	15.2 (*N* = 22)	65.8 (*N* = 346)	
If no current, AF symptoms in the past (%)	58.1	45.1	78.7	62.3	63.6	52.9	<0.001
Physical examination (mean)							
BMI (kg/m^2)	28.0	28.1	27.6	28.2	28.5	27.6	0.034
Systolic BP (mmHg)	131.9	130.5	132.7	132.7	140.7	129.9	<0.001
Diastolic BP (mmHg)	78.9	78.1	78.9	80.1	84.3	77.0	<0.001
ECG							
Atrial fibrillation (%)	68.4	71.2	40.9	75.2	88.0	92.1	<0.001
Left BBB (mean)	53.8	50.0	50.7	53.5	69.0	55.4	0.464
Right BBB (mean)	46.2	50.0	49.3	46.5	31.0	44.6	
Heart rate (b.p.m.) (mean) subgroup SR, AF	90.1	92.9	85.9	94.1	94.4	84.6	<0.001
QRS duration (ms)	102.4	100.6	101.3	99.8	107.7	108.7	<0.001
TTE[b]							
TTE performed (%)	92.0 *(N = 2780)*	94.8 *(N = 870)*	88.8 *(N = 706)*	90.6 *(N = 582)*	94.4 *(N = 136)*	92.9 *(N = 486)*	<.0001
LA (size of left atrium) diameter (mm) (mean)	45.5	45.9	41.5	45.2	45.9	50.6	<0.001
LVEF (%) (available for 2384 patients)	52.3 ± 13.5	51.8 ± 14.2	56.2 ± 10.6	53.1 ± 13.4	45.1 ± 12.4	48.8 ± 14.4	<0.001
LVH (%)	31.4	32.0	26.4	35.3	31.8	32.5	0.015

Data are presented as mean (standard deviation) or observed number (%) within the type of AF.
BMI, body mass index; BP, blood pressure; LVH, left ventricular hypertrophy; BBB, bundle branch block; TTE, transthoracic echocardiography; LA, left atrium; LVEF, left ventricular ejection fraction.
*Difference among the four AF types.
[a]Includes palpitations, syncope, dyspnoea, chest pain, dizziness, fatigue, and non-specified symptoms.
[b]Performed during qualifying admission/visit or maximally 1 year prior to inclusion.

Table 4 Diagnostics and interventions[a]

	Whole cohort	First detected	Paroxysmal	Persistent AF	Long-standing persistent	Permanent	*P* value*
N = 3049 patients	3049	923	808	647	145	526	
Diagnostics							
TTE (%)	92.0	94.8	88.8	90.7	94.4	92.9	<0.001
Holter monitoring (%)	17.0	16.7	23.6	11.2	9.2	16.4	<0.001
Exercise test (%)	8.0	8.5	10.7	5.8	2.8	7.1	0.001
Coronary angiography (%)	14.4	17.1	11.7	12.1	11.9	17.6	0.001
CT scan (%)	5.6	7.3	5.7	2.8	4.9	6.1	0.005
MRI scan (%)	1.2	1.5	1.6	1.1	0.0	0.4	0.146
Other procedures (%)	6.6	7.4	3.4	6.8	14.0	7.8	<0.001
TEE (%)	11.1	7.3	15.5	15.2	10.6	6.3	<0.001
Electrophysiology (%)	4.2	2.2	8.3	5.0	3.5	0.8	<0.001
Thyroid hormone levels measurement							
Performed before (%)	33.9	25.6	46.0	35.3	23.7	30.9	<0.001
Performed now (%)	22.5	24.0	21.2	26.1	11.6	20.4	0.002
Planned (%)	7.3	8.1	9.1	7.4	3.4	4.0	0.015
Interventions							
N (on inpatients only)	1994	576	526	435	119	292	
Pharmacological conversion (%)	29.8	24.6	37.0	34.6	64.4	5.6	<0.001
Electrical cardioversion (%)	20.5	17.9	21.1	36.3	17.1	2.1	<0.001
Catheter ablation (%)	7.8	0.9	19.3	8.3	6.0	0.7	<0.001
Pacemaker implantation (%)	3.9	3.8	4.2	2.3	0.0	7.2	<0.001
ICD implantation (%)	0.6	0.4	1.0	0.7	0.0	0.7	0.820
Surgical therapy (%)	0.3	0.4	0.2	0.5	0.0	0.0	0.835

Data are presented as observed number (%) within the type of AF.
TEE, transoesophageal echocardiography; ICD, implantable cardioverter–defibrillator; MRI, magnetic resonance imaging; CT, computed tomography.
*Difference among the four AF types.
[a]Prior to or during qualifying admission/consultation.

(still >65%), but there was a trend towards more use of other antithrombotics (mostly antiplatelet therapy, especially aspirin) at a high HAS-BLED score.

The close relationship of AF to hypertension, coronary disease, and heart failure is also evident, especially since patients in this registry were included by cardiologists. This was also seen in the EuroHeart survey nearly a decade ago,[3] and confirmed in the AFNET registry[8] and in other European registries.[9,10]

It is worth noting that cardiologist-defined 'lone AF' was only evident in 3.9%, perhaps reflecting the increasing recognition that such patients are rare, especially if we comprehensively look for associated comorbidities, including sleep apnoea, etc.[11] In the EuroHeart survey, lone AF was reported in 15% of patients with paroxysmal AF (compared with 6.9% in the present survey).[3] A closer attention to collecting concomitant diseases and a changing definition of 'lone AF', excluding patients with subtle manifestations of concomitant cardiovascular diseases, which may explain this numerical trend to less 'lone AF' over time.[2,12]

Drug prescription patterns showed interesting changes over the last decade. In the present survey, amiodarone was the most commonly used AAD (21.5%), followed by sodium-channel blockers. In the EuroHeart survey, Class Ic agents were used in ~30%, while Class III agents were used in 35%.[3] A similar pattern has been found in the AFNET registry, collected at the time of the EuroHeart survey, and is also reflected in the PREFER in AF dataset.[8,9,13]

Adherence to recommendations for OAC use has improved somewhat since the EuroHeart and AFNET survey.[3,4,13] In the present registry, OAC was used in ~80% overall, with higher adherence to evidence-based recommendations for OAC (compared with 70% in the AFNET and the EuroHeart survey, and >80% in PREFER in AF). Consistent with all prior registry datasets, OAC were prescribed even in some patients with a low stroke risk (CHA_2DS_2-VASc score = 0, presumed overtreatment), and its use was also slightly lower in patients with highest risk (CHA_2DS_2-VASc score 8–9). The ESC guidelines recommend no antithrombotic therapy at CHA_2DS_2-VASc score = 0,[2,14] yet 56.4% were receiving OAC (although some were because of cardioversion), while 16.8% received other antithrombotics (mostly antiplatelet therapy, especially aspirin). In contrast, those with CHA_2DS_2-VASc = 9 are at highest stroke risk, yet only 66.7% received OAC, and 33.3% were treated with other antithrombotic drugs (mostly antiplatelet therapy, especially

Table 5 Drug therapy at discharge/after consultation

	Whole cohort	First detected	Paroxysmal	Persistent AF	Long-standing persistent	Permanent	*P* value*
N = 3049 patients	3044	923	808	647	145	526	
Antithrombotic treatment (%)							
Antithrombotic, yes	95.2	94.6	93.3	96.6	93.1	98.3	<0.001
Vitamin K antagonists	71.6	66.5	66.9	76.2	73.8	81.4	<0.001
ASA	30.7	31.7	31.6	28.2	49.0	25.7	<0.001
Indobufen	0.4	0.5	0.3	0.5	0.0	0.2	0.816
Clopidogrel	9.9	11.5	8.3	9.9	6.9	10.3	0.158
Prasugrel	0.2	0.2	0.3	0.2	0.0	0.0	0.903
Ticagrelor	0.2	0.3	0.3	0.2	0.7	0.0	0.462
Ticlopidine	0.3	0.5	0.0	0.5	0.0	0.2	0.215
Dabigatran	6.8	7.7	6.3	7.8	3.5	5.7	0.198
Rivaroxaban	1.6	1.6	2.4	1.6	0.7	1.0	0.295
Apixaban	0.0	0.0	0.0	0.0	0.0	0.0	–
UF heparin	0.3	0.4	0.0	0.3	0.0	0.6	0.249
LMW heparin	4.8	5.0	4.1	5.6	4.1	4.6	0.728
Fondaparinux	0.1	0.0	0.0	0.2	0.0	0.2	0.313
Other antithrombotic agents	0.3	0.4	0.3	0.2	0.0	0.6	0.741
None	4.8	5.4	6.7	3.4	6.9	1.7	<0.001
Antiarrhythmic treatment (%)							
Antiarrhythmic, yes	36.0	32.2	49.6	50.2	34.0	5.1	<0.001
Amiodarone	21.5	21.2	23.4	32.2	27.8	4.0	<0.001
Dronedarone	0.3	0.0	0.7	0.3	0.7	0.0	0.014
Propafenone	5.3	4.7	9.9	5.7	0.7	0.2	<0.001
Disopyramide	0.0	0.0	0.1	0.0	0.0	0.0	0.695
Flecainide	5.0	2.6	8.4	8.0	3.5	0.4	<0.001
Quinidine	0.0	0.0	0.0	0.0	0.0	0.0	–
Sotalol	4.4	4.1	7.6	4.8	1.4	0.4	<0.001
None	64.0	67.8	50.4	49.8	66.0	94.9	<0.001
Other treatments (%)							
Other treatments, yes	100.0	100.0	100.0	100.0	100.0	100.0	–
ACE inhibitors	43.1	42.9	37.9	45.3	46.2	47.9	0.004
ARBs	21.8	20.2	23.6	22.1	25.5	20.3	0.314
DRI. aliskiren	0.3	0.1	0.4	0.2	2.1	0.0	0.007
Beta-blockers	69.2	71.2	67.7	65.6	63.5	73.9	0.007
Digoxin	19.4	15.9	5.3	19.8	44.8	39.7	<0.001
Beta-blockers and digoxin	15.0	12.5	3.7	15.0	31.0	30.7	<0.001
Diuretics	50.8	53.3	34.5	50.5	66.2	66.9	<0.001
Aldosterone blockers, e.g. spironolactone, eplerenone	24.6	27.1	11.5	23.1	29.7	40.7	<0.001
DHP calcium-channel blockers	13.3	12.6	13.7	13.2	14.5	13.9	0.938
Non-DHP calcium-channel blockers (e.g. verapamil, diltiazem)	6.2	6.9	4.5	6.4	4.1	7.8	0.082
Non-DHP calcium-channel blockers and digoxin	1.1	0.9	0.1	1.1	3.5	2.3	<0.001
Statins	49.4	48.4	50.1	49.2	60.4	47.2	0.072
Oral antidiabetics	14.3	14.0	11.5	15.3	18.6	16.7	0.034
Insulin	5.6	6.1	4.7	5.1	5.5	6.5	0.612
Thyroid-suppressing drugs	2.4	1.7	2.7	2.3	4.8	2.7	0.213
Beta-2 agonists	1.6	2.0	0.5	1.4	3.5	2.5	0.012
Anticholinergic agents	2.0	3.4	0.7	1.7	0.7	2.3	0.002

Data are presented as observed number (%) within the type of AF.
*Difference among the four AF types.

Table 6 Stroke risk factors

	Whole cohort	First detected	Paroxysmal	Persistent AF	Long-standing persistent	Permanent	*P* value*
N = 3049 patients	3049	923	808	647	145	526	
Stroke risk factors							
Chronic heart failure (%)	47.5	47.4	30.8	48.0	72.9	64.0	<0.001
LVEF (%)	78.3	84.7	76.9	72.5	57.9	81.4	<0.001
Hypertension (%)	70.9	71.9	67.9	71.85	77.8	70.6	0.112
Age ≥75 years (%)	33.6	35.1	26.5	28.1	37.2	47.7	<0.001
Diabetes mellitus (%)	20.6	20.8	16.8	20.2	23.8	25.8	0.002
Stroke/TIA (%)	10.4	9.1	8.0	8.2	14.9	13.8	0.001
Age 60–74 years (%)	46.8	44.0	48.0	52.1	50.3	42.2	<0.001
Female gender (%)	40.4	37.2	43.4	40.3	42.1	40.9	0.119
Mitral stenosis (%)	5.4	4.1	2.9	4.7	10.9	9.3	<0.001
Mitral valvuloplasty (%)	1.7	2.2	0.6	1.2	1.1	2.5	0.208
Transcatheter valve intervention (%)	0.6	0.7	0.3	0.5	0.0	1.0	0.804
$CHAD_2$ score (mean ± SD)	1.93 ± 1.27	1.95 ± 1.28	1.58 ± 1.21	1.85 ± 1.20	2.46 ± 1.28	2.37 ± 1.27	<0.001
$CHAD_2$ score (median, IQR)	2.0 (1.0–3.0)	2.0 (1.0–3.0)	1.0 (1.0–2.0)	2.0 (1.0–3.0)	2.0 (2.0–3.0)	2.0 (2.0–3.0)	
CHA_2DS_2-VASc score (mean ± SD)	3.24 ± 1.80	3.26 ± 1.82	2.81 ± 1.77	3.13 ± 1.75	3.86 ± 1.71	3.86 ± 1.67	<0.001
CHA_2DS_2-VASc score (median, IQR)	3.0 (2.0–4.0)	3.0 (2.0–4.0)	3.0 (1.0–4.0)	3.0 (2.0–4.0)	4.0 (3.0–5.0)	4.0 (3.0–5.0)	
Bleeding risk factors							
Liver disease (%)	4.6	4.7	2.4	5.1	8.4	6.5	0.001
Chronic kidney disease (%)	13.2	15.5	7.9	12.3	11.9	18.9	<0.001
Previous stroke (%)	6.4	6.4	4.7	4.5	12.5	9.5	<0.001
Labile INRs (%) (if on VKA only) = >without condition	20.2	15.2	28.0	12.5	0.0	27.8	0.272
Elderly, e.g. age >65 years (%)	63.6	64.4	56.1	60.1	71.0	76.1	<0.001
Alcohol abuse or excess (> 4/day) (%)	1.9	2.2	1.2	2.2	0.8	2.2	0.017
Alcohol use (%)	38.1	38.6	36.6	41.3	37.8	35.7	0.331
HAS-BLED score (mean ± SD)	1.37 ± 1.06	1.40 ± 1.05	1.18 ± 1.02	1.30 ± 1.07	1.66 ± 1.13	1.60 ± 1.06	<0.001
HAS-BLED score (median, IQR)	1.00 (1.0–2.0)	1.0 (1.0–2.0)	1.0 (0.0–2.0)	1.0 (1.0–2.0)	2.0 (1.0–2.0)	1.0 (1.0–2.0)	
Haemorrhagic stroke (%)	4.0	3.7	2.6	3.3	16.7	4.2	0.552
Other/major bleeding (%)	27.7	24.1	30.8	23.3	16.7	33.3	0.745
Malignancy (%)	5.3	6.1	5.3	5.7	2.5	4.2	0.344

Data are presented as observed number (%) within the type of AF.
LVEF, left ventricular ejection fraction; TIA, transient ischaemic attack; CAD, coronary artery disease; TEE, transoesophageal echocardiography.
*Difference among the four AF types.

aspirin). However, aspirin is minimally effective for stroke prevention and may not be any safer.[15]

Independent predictors of OAC use were younger age, higher BMI, hyperthyroidism, prior stroke, and high CHA_2DS_2-VASc score—while significantly less used in females, high HAS-BLED score, and chronic kidney disease (CKD). Hyperthyroidism is not an established independent risk factor for stroke,[16] although older data suggest a higher stroke risk in hyperthyroidism and AF, and its presence seems to increase cardiologists' use of OAC. Suboptimal treatment of females with AF with OAC has previously been reported[17] despite higher warfarin prescription among females,[18] and in those with CKD, where there is concern that such patients are at high risk of bleeding, as well as stroke, death, and myocardial infarction.[19]

In the recent ESC guidelines, bleeding risk assessment using the HAS-BLED score is recommended.[2,14] This registry shows that cardiologists use OAC in >65% of the AF population, irrespective of the HAS-BLED score, and are supportive of the manner in which the HAS-BLED score is to be used as per the guidelines. The latter state that a high HAS-BLED score should not be used to preclude patients from OAC therapy, and the score 'flags up' patients potentially at risk of bleeding (score ≥3) for careful review and follow-up. However, the lack of relation to OAC use could also represent lack of awareness of the HAS-BLED score, but a recent EP Wire survey from the European Heart Rhythm Society suggests a high awareness of HAS-BLED (and the CHA_2DS_2-VASc) scores.[20] The follow-up information from EORP will provide insights into the adherence to careful management of risk factors, and follow-up.

Limitations

This pilot registry is limited by its dependence upon the data obtained from cardiologists in nine ESC member countries only, and in many healthcare systems, AF patients are often looked after by

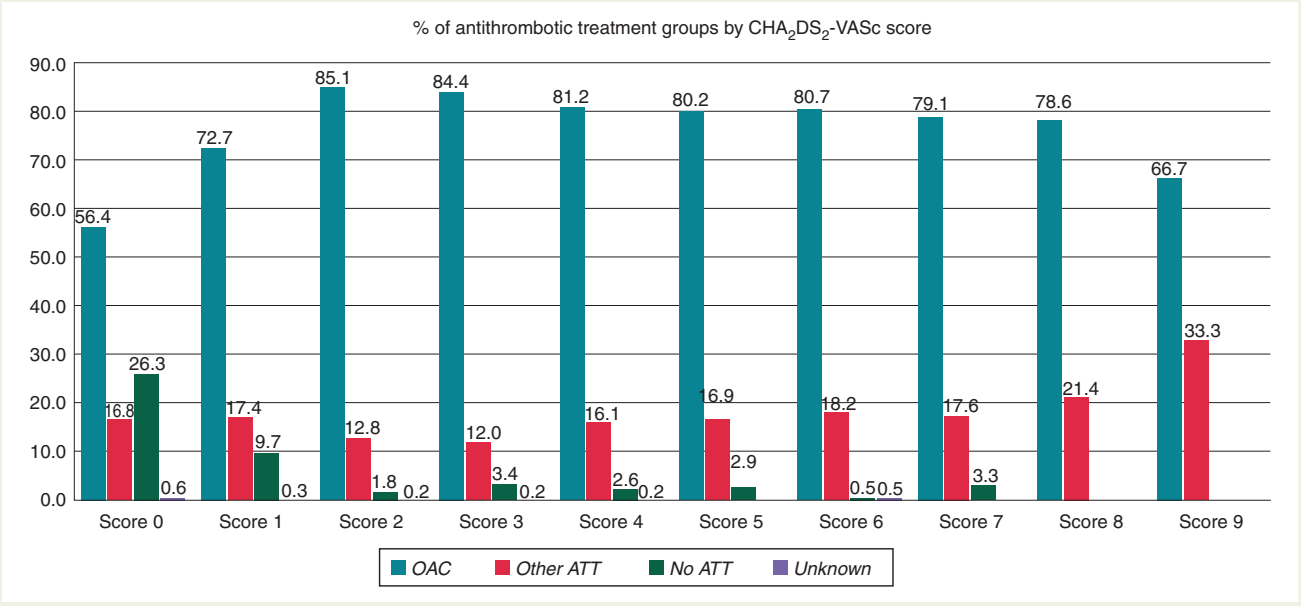

Figure 1 Proportions of patients treated with antithrombotic drugs by CHA_2DS_2-VASc score.

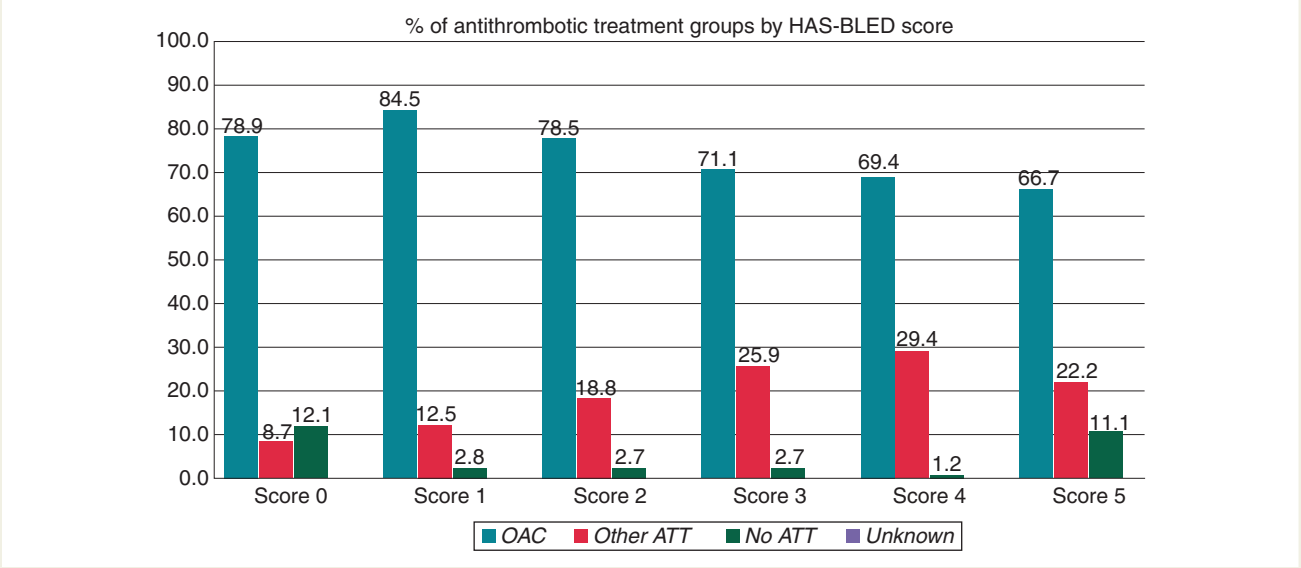

Figure 2 Proportions of patients treated with antithrombotic drugs by HAS-BLED score.

non-cardiologists. Also, the present paper only reports the baseline data of the EORP-AF Pilot Registry, and the follow-up is ongoing. A more comprehensive assessment of the data on management and treatment of AF in all ESC member countries would be obtained from the EORP-AF general long-term registry, which is scheduled to commence in Autumn 2013.

Conclusions

The EORP-AF Pilot Registry has provided systematic collection of contemporary data regarding the management and treatment of AF in the nine participating ESC member countries. Oral anticoagulant use has increased but new OAC use was still low. Compliance with the treatment guidelines for patients with the lowest (CHA_2DS_2-VASc = 0) and higher stroke risk scores remains suboptimal.

Supplementary material

Supplementary material is available at *Europace* online.

Table 7 Independent predictors of OAC use: multivariable analysis

Variable	OR	95% CI	*P* value
Age <70 years by 10 years	1.44	1.20–1.73	0.0003
Female gender	0.65	0.51–0.83	0.0005
BMI (per increase by 5 kg/m^2)	1.22	1.05–1.42	0.01
SBP (per increase by 20 mmHg)	0.83	0.71–0.98	0.03
CHA_2DS_2-VASC: <2 vs. ≥2	0.43	0.30–0.62	<0.0001
HAS-BLED score >2 vs. ≤2	0.47	0.35–0.63	<0.0001
Hyperthyroidism	2.82	1.11–7.17	0.03
Previous ischaemic/ thrombo-embolic events	1.67	1.14–2.46	0.009
Chronic kidney disease	0.70	0.50–0.97	0.03

OR, odds ratio; CI, confidence interval; SBP, systolic blood pressure.

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Electrocautery-induced ventricular fibrillation during routine implantable cardioverter-defibrillator generator replacement

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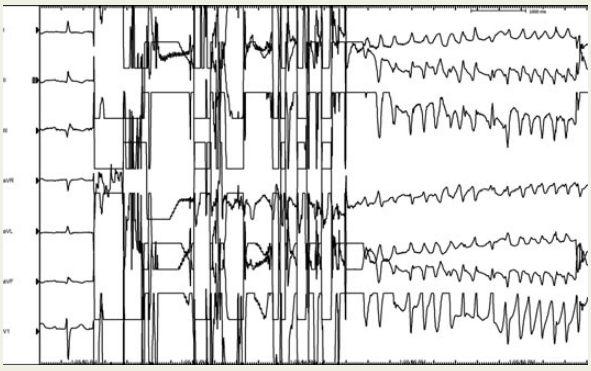
A 78-year-old man with a primary-prevention implantable cardioverter-defibrillator (ICD) underwent an elective generator replacement. The pre-procedural lead parameters were normal and tachycardia detection was turned off during the procedure. During a 4.6 s application of unipolar electrocautery to the pocket, transient contact was made with the device generator and the patient developed ventricular fibrillation. The cautery pen had not contacted the lead, which had no obvious insulation breach. Transthoracic cardioversion was delivered and successfully restored sinus rhythm. The patient suffered no long-term harm.



Although electrocautery is frequently used in device surgery and accidental contact with the ICD generator is common, the induction of ventricular arrhythmias is extremely rare. It has been previously reported with bipolar electrocautery at a low-power setting, but this case involved unipolar cautery. In Medtronic ICDs, the pulse generator internal circuitry is electrically isolated from the leads by a field effect transistor (FET). However, in situations where the FET is overloaded or bypassed such as with externalized conductor wires or insulation breach, there is a risk of transmitting cautery energy down the leads and inducing ventricular fibrillation. Care should be employed when using electrocautery near an implanted device.

The full-length version of this report can be viewed at: http://www.escardio.org/communities/EHRA/publications/ep-case-reports/Documents/electrocautery-induced-ventricular-fibrillation.pdf.