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Atrial fibrillation management by practice cardiologists: a prospective survey on the adherence to guidelines in the real world

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Aims The purpose of this prospective study was to characterize the clinical profile of patients with atrial fibrillation (AF) in cardiology practice and to assess how successfully guidelines have been implemented in real-world practice.

Methods and results This prospective study involved 23 cardiologists established in office practice in Geneva. Enrolment started on 1 January 2005 and ended on 31 December 2005. Consecutive patients were included if they were >18 years and had AF documented on an ECG during the index office visit or during the preceding month. In this survey, 622 ambulatory patients were enrolled (390 males and 232 females; mean age 69.8 ± 11.8 years). The prevalence of paroxysmal, persistent, and permanent AF was 35, 18, and 47%, respectively. Underlying cardiac disorders present in 513 patients (82%) included hypertensive heart disease (30%), valvular heart disease (27%), coronary artery disease (18%), and myocardial disease (11%). A rate-control strategy was chosen in 53% of the patients (331/622). The mean $CHADS_2$ score was 1.43 ± 1.24, and 458/622 patients (73.6%) had a $CHADS_2$ score ≥1. Among patients with an indication to oral anticoagulant therapy (OAT), 88% (403/458) effectively received it. The rate of OAT was closely correlated with an increasing $CHADS_2$ score, particularly with patients age (72, 81, and 87% for patients <65, 65–75, and >75 years of age, respectively). True contraindication for OAT was present in 4% (18/458). In the low-risk group ($CHADS_2$ score = 0), 58% were prescribed OAT, but in 37% of them only for a short period of time (cardioversion/ablation). After a follow-up of 396 ± 109 days, 72% of the study group (410/570) was still treated by OAT. During follow-up, 23/570 patients died (4%), essentially from a cardiovascular cause (15/23), 15 had a non-lethal embolic stroke (2.7%), and 8 had significant bleeding complications (1.5%).

Conclusion This study shows one of the highest OAT prescription rates for AF reported until now and demonstrates how successfully guidelines can be applied in the real world. A definite overinterpretation of current guidelines is observed in low-risk patients with AF. True contraindication for OAT (4%) and significant bleeding during OAT (1.5%) were rare.

Introduction

Atrial fibrillation (AF) is the most commonly sustained cardiac arrhythmia, strongly associated with an increased morbidity and mortality. Atrial fibrillation causes a five-fold rise in the risk of stroke, and one of every six strokes occurs in a patient with AF. Despite evidence of benefit for cardio-embolic complications with oral anticoagulation,[1] this therapy is often underused in this setting.[2–7] Atrial fibrillation is also associated with heart failure, resulting in frequent visits to physicians and departments as well as increased hospitalizations, and this is reflected in an increasing economic burden. In the last decade, important acquisitions in the management of AF have emerged, particularly concerning treatment strategies (rate vs. rhythm control),[8] stroke prevention scales (validation of a new stroke risk index—the $CHADS_2$ score), and publication of 'unified' guidelines (ACC/AHA/ESC) for AF management.[9] Several community-based studies have provided important

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data on these topics, but most of these reports are older than 10 years, which have focused on hospitalized patients or were performed by highly specialized centres.[10–13] Only a few studies have targeted the out-of-hospital population,[14] and most of them were performed before the release of ACC/AHA/ESC guidelines. Moreover, stroke risk stratification in most of these studies was not perfectly defined. The purposes of this prospective study were: (i) to characterize the clinical profile of patients with AF in cardiology practice with special attention paid to anti-thrombotic treatment and to the proposed treatment strategy and (ii) to assess how successfully guidelines have been implemented in real-world practice.

Methods

This prospective survey, entitled AF in Geneva (AFIB Geneva), involved 23 cardiologists established in office practice representing 62% of the cardiologists in the canton of Geneva, Switzerland.

Patients

Patients were prospectively included if they were 18 years or older and had documented AF on an ECG during the index office visit or in the preceding month. Patients with atrial flutter were excluded. Enrolment started on 1 January 2005 and ended on 31 December 2005, and by definition, only outpatients were enrolled. The specifically designed report form included patient's characteristics, presence and type of underlying heart disease, thyroid status, excessive alcohol intake, high level of sporting activities, anti-arrhythmic treatment, and anticoagulation status. Diagnosis of hypertensive heart disease required a history of hypertension and an echocardiographic evidence of left ventricular hypertrophy and/or systolic or diastolic dysfunction. Coronary artery disease was diagnosed on the basis of a documented history of angina/myocardial infarction or on the presence of significant coronary obstructive lesions on an angiogram. Patients symptoms directly related to AF were also recorded.

Atrial fibrillation classification

Atrial fibrillation was subdivided into three clinical patterns at presentation: paroxysmal non-sustained ($<$1 min) or sustained ($>$1 min but $<$7 days), persistent ($>$7 days but $<$3 months), and permanent ($>$3 months). The term 'new onset AF' was applied when AF was recorded for the first time, and the estimated duration of the AF episode was reported. The term 'lone AF' was defined as an episode of AF in a patient younger than 65 years with exclusion of clinical, biochemical, and echocardiographic evidence of cardiovascular disease. The choice of management strategy was indicated as well as prior or intended direct current cardioversion. Specific therapy proposed at the end of office visit was included in the report.

Stroke risk stratification

We used the recently validated $CHADS_2$ score to stratify the patients for stroke risk.[15] Briefly, this index measures stroke risk by assigning one point each for congestive heart failure, hypertension, age 75 years or older, and diabetes mellitus, with two points added for a history of stroke or transient ischaemic attack (TIA).

Diagnostic evaluation

Two-dimensional and Doppler transthoracic echocardiography was performed with special attention paid to the left atrial size, left ventricular systolic and diastolic function, presence of valvular heart disease, and pulmonary arterial hypertension. Coronary angiography was only performed if clinically indicated.

Follow-up

Follow-up information was required 12 months after inclusion in all patients. A specifically designed follow-up form was prepared to evaluate the effect of anti-arrhythmic treatment, the rate of sinus rhythm maintenance, the rate and timing of AF recurrences, and complications. Deaths were classified as cardiovascular, non-cardiovascular, or unknown.

Statistical analysis

Continuous variables are expressed as mean $\pm$ standard deviation and categorical variables as percentages. Differences in continuous variables between the two groups were evaluated using unpaired *t*-test when comparing two groups and with ANOVA when comparing three groups, and differences in categorical variables were evaluated using Fisher's exact test. A *P*-value of less than 0.05 was considered as statistically significant.

Results

Patients characteristics

In this survey, 622 patients were enrolled by 23 cardiologists. The contribution of each cardiologist was variable and enrolment ranged from 1 to 144 patients per cardiologist (mean 27 ± 33 and median 14). Baseline clinical characteristics of the patients are summarized in *Table 1*. The male/female ratio was 0.63 (390 males and 232 females). The age ranged from 31 to 97 years with a mean age of 69.8 ± 11.8 years. Underlying cardiac diseases were present in 513 patients (82%), the remaining patients belonging to the 'lone AF' group ($n = 109$). Hypertension was the most prevalent associated medical condition, diagnosed in 56% of the patients, with hypertensive heart disease in only 53% of them. A history of previous cerebrovascular accident was present in 12%, and 25% of the study group had a history of hospitalization directly related to AF.

Atrial fibrillation was paroxysmal in 220 patients (35.4%), persistent in 113 patients (18.1%), and permanent in 289 patients (46.5%). The heart rate was significantly higher in the paroxysmal form when compared with the persistent or with the permanent form (115 ± 26 vs. 101 ± 26 and 84 ± 19 bpm, respectively, $P < 0.0001$). For 30.4% of the patients (189/622), AF at inclusion could be classified as 'new onset'. Seventy-four per cent of patients reported AF-related symptoms, which were essentially dyspnoea (49%), palpitations (45%), malaise (14%), or congestive heart failure (11%). Syncope was rarely reported (2%). Extracardiac factors which could have precipitated AF were thyroid disease (5%), excessive alcohol intake (9%), and regular heavy sporting activities (6%).

Diagnostic evaluation

An echocardiographic examination was made in 607 patients (98%). The main findings were slight enlargement of the left atrium in 72% (mean 45 ± 8 mm), a preserved left ventricular function in 74%, the presence of diastolic dysfunction in 24%, and signs of pulmonary hypertension in 8% (*Table 1*). Coronary angiography was performed in 26% (161/622) of

Table 1 Clinical characteristics of study population

	Total population (%) $n = 622$	Paroxysmal AF (%) $n = 220$	Persistent AF (%) $n = 113$	Permanent AF (%) $n = 289$
Age (years)	69.8 ± 11.8	65.4 ± 11.7	70.7 ± 11.5	72.9 ± 10.9
Male/female ratio	390/232	136/84	64/49	190/99
«Lone» AF	109 (17.5)	71 (32.3)	17 (15.0)	21 (7.3)
Heart disease (*)	513 (82.5)	149 (67.7)	96 (85.0)	268 (92.7)
Hypertensive HD	187 (30.1)	40 (18.2)	41 (36.3)	106 (36.7)
CAD	112 (18.0)	31 (14.1)	14 (12.4)	67 (23.2)
Valvulopathy	166 (26.7)	44 (20.0)	27 (23.9)	95 (32.9)
Hypertrophic CM	21 (3.4)	5 (2.3)	5 (4.4)	11 (3.8)
Dilated CM	49 (7.9)	7 (3.2)	11 (9.7)	31 (10.7)
SSS	64 (10.3)	12 (5.5)	7 (6.2)	45 (15.6)
Hypertension	351 (56.4)	92 (41.8)	80 (70.8)	179 (61.9)
Hyperthyroidism	28 (4.5)	10 (4.5)	8 (7.1)	10 (3.5)
Diabetes	77 (12.4)	15 (6.8)	13 (11.5)	49 (17.0)
Heavy sporting activities	36 (5.8)	26 (11.8)	3 (2.7)	7 (2.4)
Excessive alcohol intake	57 (9.2)	14 (6.4)	7 (6.2)	36 (12.5)
Hx of thoracotomy	50 (8.0)	9 (4.1)	8 (7.1)	33 (11.4)
Symptoms (*)				
Dyspnea	304 (49.9)	89 (40.5)	57 (50.4)	158 (54.7)
Palpitations	279 (44.9)	152 (69.1)	49 (43.4)	78 (27.0)
Malaise	87 (14.0)	52 (23.6)	11 (9.7)	24 (8.3)
Syncope	11 (1.8)	2 (0.9)	2 (1.8)	7 (2.4)
No symptom	163 (26.2)	36 (16.4)	30 (26.5)	97 (33.6)
AF-related hospitalization	156 (25.1)	67 (30.5)	13 (11.5)	76 (26.3)
Hx of congestive heart failure	95 (15.3)	11 (5.0)	12 (10.6)	72 (24.9)
Prior stroke or TIA	73 (11.7)	22 (10.0)	7 (6.2)	44 (15.2)
$CHADS_2$ score	1.43 ± 1.24	0.96 ± 1.14	1.05 ± 1.50	1.78 ± 1.30
Echocardiographic data				
LA diameter (mm)	45 ± 8	40 ± 7	46 ± 7	50 ± 8
LA surface (cm^2)	25 ± 8	21 ± 6	25 ± 7	29 ± 8
EF > 55%	462 (74.3)	192 (87.3)	81 (71.7)	189 (65.4)
EF 40–55%	86 (13.8)	14 (6.4)	16 (14.2)	56 (19.4)
EF 30–40%	39 (6.3)	6 (2.7)	10 (8.8)	23 (8.0)
EF < 30%	17 (2.7)	3 (1.4)	2 (1.8)	12 (4.2)
Diastolic dysfunction	149 (24.0)	47 (21.4)	33 (29.2)	69 (23.9)
Mitral regurgitation	168 (27.0)	38 (17.3)	34 (30.1)	96 (33.2)
Pulmonary hypertension	48 (7.7)	6 (2.7)	8 (7.1)	34 (11.8)

AF, atrial fibrillation; HD, heart disease; CAD, coronary artery disease; CM, cardiomyopathy; SSS, sick sinus syndrome; TIA, transient ischaemic attack; Hx, history; LA, left atrial; EF, ejection fraction of the left ventricle; and (*), several diagnosis/symptoms possible in the same patient.

the study group, and significant coronary artery disease was diagnosed in 15% (96/622).

Rhythm management

Rate control was the predominant strategy chosen in 53.2% of the patients (331/622), whereas the remaining 291 patients (46.8%) were treated using a rhythm-control approach. Patients treated according to the rate-control strategy had a higher $CHADS_2$ index (1.80 vs. 1.02, $P < 0.0001$) and a higher anticoagulation rate compared with the patients assigned to the rhythm-control strategy (89 vs. 71%, $P < 0.0001$). Anti-arrhythmic drug therapy for the three forms of AF is summarized in *Table 2*. Direct-current cardioversion was performed electively in 17.4% of the patients with persistent or permanent AF (64/368), and radiofrequency catheter ablation (pulmonary vein isolation) was proposed in 4.8% of the study group (30/622).

Stroke risk stratification and anticoagulation therapy

Oral anticoagulant therapy (OAT) was prescribed in 498/622 patients (80%) in this study with a mean $CHADS_2$ score of 1.45 ± 1.24. For the vast majority of the patients (458/622, 73.6%), the main indication was a $CHADS_2$ score of ≥1, i.e. the presence of at least one stroke risk factor. Anticoagulation was prescribed in 151/185 patients with a $CHADS_2$ score of 1 (81.6%) and in 252/273 patients with a $CHADS_2$ score of ≥2 (92.3%). Therefore, 88% (403/458) of the patients who should be prescribed anticoagulant prophylaxis had received this therapy. Conversely, in the group of patients with a $CHADS_2$ score of 0, 57.9% of these low-risk patients (95/164) were prescribed anticoagulant prophylaxis. In 35/95 of these patients (36.8%), OAT was prescribed for a short period of time (mean 2.1 ± 1.8 month) in order to perform electrical cardioversion or ablation. Antithrombotic prophylaxis according to each $CHADS_2$ score is summarized in *Table 3* and graphically represented

Table 2 Drug therapy

	Total population (%) $n = 622$	Paroxysmal AF (%) $n = 220$	Persistent AF (%) $n = 113$	Permanent AF (%) $n = 289$
Anti-arrhythmic				
Class I	69 (11.1)	58 (26.4)	4 (3.5)	7 (2.4)
β-Blocker (+sotalol)	324 (52.1)	118 (53.6)	67 (59.3)	139 (48.1)
Amiodarone	128 (20.6)	62 (28.2)	28 (24.8)	38 (13.1)
Calcium channel blocker	98 (15.8)	22 (10.0)	20 (17.7)	56 (19.4)
Digitalis	158 (25.4)	14 (6.4)	29 (25.7)	115 (39.8)
Pacemaker	64 (10.3)	11 (5.0)	6 (5.3)	47 (16.3)
AV node ablation	11 (1.8)	0 (0.0)	2 (1.8)	9 (3.1)
PV isolation	30 (4.8)	25 (11.4)	2 (1.8)	3 (1.0)
Anti-thrombotic				
Oral anticoagulation	498 (80.1)	130 (59.1)	104 (92.0)	264 (91.3)
Aspirin	194 (31.2)	93 (42.3)	23 (20.4)	78 (27.0)
Clopidogrel	19 (3.0)	8 (3.6)	4 (3.5)	7 (2.4)
Oral anticoagulation + aspirin	97 (15.6)	24 (10.9)	17 (15.0)	56 (19.4)

AF, atrial fibrillation; AV, atrioventricular; and PV, pulmonary vein.

Table 3 Antithrombotic prophylaxis according to $CHADS_2$ score

$CHADS_2$ score	0	1	2	3	4	5	6
Number of patients	164	185	170	59	30	12	2
Anticoagulation (%)	96 (57.9)	151 (81.6)	156 (91.8)	53 (89.8)	29 (96.7)	12 (100)	2 (100)
Aspirin (%)	53 (32.3)	27 (14.6)	11 (6.5)	6 (10.2)	1 (3.3)	0 (0)	0 (0)
Combination of the above (%)	10 (6.1)	30 (16.2)	28 (16.4)	9 (15.2)	15 (50)	4 (33)	1 (50)
No prophylaxis (%)	16 (9.8)	7 (3.8)	3 (1.7)	0 (0)	0 (0)	0 (0)	0 (0)

in *Figure 1*. In assessing the impact of age on anti-thrombotic therapy, we analysed three different age groups: <65, 65–75, and >75 years. The anticoagulation rates were 72.4, 80.5, and 86.6% for the three subgroups, respectively. Mean $CHADS_2$ score values were 0.96, 1.05, and 1.78 in the paroxysmal, persistent, and permanent forms, respectively. Patients with the persistent and permanent forms of AF were more often anticoagulated than those with the paroxysmal form of AF (92 and 91 vs. 59%, $P < 0.0001$).

Follow-up

Follow-up data were obtained in 570/622 patients (91.6%) and the mean follow-up was 396 ± 109 days. At the time of the last follow-up, rate control was applied in 319/570 (56.0%) and rhythm control in 251/570 (44.0%). Twenty-seven patients (8.2%) crossed-over from the rate to rhythm control and 45/291 (15.5%) switched from a rhythm-control to a rate-control strategy. At the end of the follow-up period, 242/570 patients (42.5%) were in sinus rhythm, 227/251 (90.4%) in the rhythm-control group, and 15/319 (4.7%) in the rate-control group. Class I anti-arrhythmic drug therapy was still used by 60/570 patients (10.5%), β-blockers by 295/570 (51.8%), amiodarone by 98/570 (17.2%), calcium channel antagonists by 106/570 (18.6%), and digitalis by 152/570 (26.7%). During the follow-up period, atrioventricular node ablation was performed in 14/570 patients (2.5%) and pulmonary vein isolation in

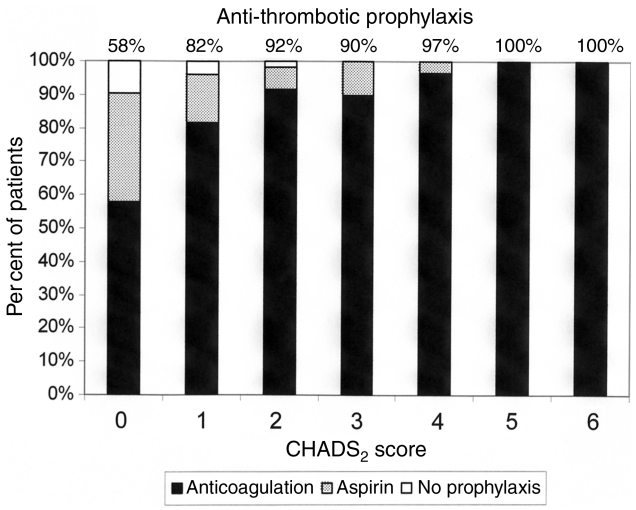

Figure 1 Graphic representation of anti-thrombotic prophylaxis rate according to the $CHADS_2$ score (see text for details).

33/570 patients (5.8%). In the rhythm-control group, only 39/319 patients (9.4%) had no anti-arrhythmic drug therapy at last follow-up, and in 18/39 (46.2%), the absence of drug therapy was related to successful pulmonary vein isolation. At the follow-up visit, 410/570 patients (71.9%) were still treated by OAT and 196/570 (34.4%) were on aspirin. Oral anticoagulant therapy was stopped

during the follow-up period in 74/498 (14.9%) (60 in the rhythm-control group and 14 in the rate-control group). Oral anticoagulant therapy was instituted during follow-up in 23/124 (18.5%).

During follow-up, 23/570 patients were died (4.0%). The mean age of the patients who died was 78.7 $\pm$ 10.9 years. Death was cardiovascular in origin in 15/23 patients (65%) (2/15 in the rhythm-control group and 13/15 in the rate-control group; 14/15 treated by OAT; 12/15 sudden death; 2 non-sudden cardiac death; and 1 cerebral haemorrhage). The remaining deaths were related to cancer in three (13%) and of unknown origin in five (22%). Among the 547 survivors, there were 15 non-lethal embolic stroke or TIA (2.7%) (12/15 in the rate-control group and 4/15 without OAT). Eight significant bleeding complications (1.5%) were reported (one intracranial, one epidural, one gastrointestinal, one tamponade, one haemoptysis, two epistaxis, and one dental): 6/8 bleeding complications occurred in the rate-control group; 8/8 of these patients were treated by oral anticoagulation; and 6/8 complications occurred in patients older than 80 years of age. Forty episodes of congestive heart failure (16.2%) and 20 hospitalizations for uncontrolled AF (8.1%) were observed during follow-up.

Discussion

Main findings

The main results of this prospective study performed in an out-of-hospital patient population followed by cardiologists can be summarized as follows:

(i) A rate-control strategy was the preferred option by cardiologists in 53% of the patients presenting with AF during the office visit and this percentage increased to 56% after 1 year of follow-up.
(ii) To the best of our knowledge, this study shows the highest oral anticoagulation prescription rate for AF reported until now and demonstrates how successfully ACC/AHA/ESC guidelines can be applied in the real world. Eighty-eight per cent of the patients with a moderate or high stroke risk effectively received OAT and true contraindications for OAT were encountered in only 4% of the study group.
(iii) In low-risk patients, OAT prescription rate was 58%, which denotes a definite overinterpretation of current guidelines.
(iv) The rate of significant bleeding during the first year of OAT treatment is low (2.2%) even in patients $>$80 years of age (4.2%).

Treatment strategy

Rate-control was adopted in 53% of the patients mainly because of lack of symptoms or because of long-lasting AF. Pharmacological approach was comparable with what was observed in the Euro Heart Survey except that β-blockers were more often used for rate control and amiodarone was less often prescribed for rhythm control. Electrical cardioversion was planned in 17% of the study group and radiofrequency catheter ablation was proposed in 4.5% of cases, a figure which is concordant with results from the Euro Heart Survey.[13]

Anti-thrombotic prophylaxis

To define the stroke risk categories, we used the $CHADS_2$ score validated by Gage *et al.*[15] in 2001 because essentially this scoring system is simple, easy to use, and efficient. According to the $CHADS_2$ score, patients with at least one stroke risk factor have an annual stroke risk of 2.8 and should be prescribed OAT. Such a condition was observed in 458/622 patients (73.6%) in our study group. The main finding is that 88% of the patients who should be prescribed OAT had received this therapy. This prescription rate appears to be the highest ever reported and represents the best adherence level between the guidelines and 'real-world' clinical practice. This high OAT prescription rate may be related to the fact that this study was performed by cardiologists who have a good knowledge of the guidelines[5] and to a good control of the anticoagulation level in our environment (widespread availability of facilities for INR checks and excellent cooperation with general practitioners and visiting nurses) making physicians perceive bleeding as an unlikely event.

Prior studies performed with a similar out-of-hospital population and a comparable stroke risk reported much lower anticoagulation rates but most of these studies were published before ACC/AHA/ESC guidelines release.[2,14,16] Only 37% of the patients received an anticoagulation therapy in a community-based study representative of the elderly population of the USA in 1999[17], for example. In the French ALFA study,[14] a similar ambulatory cohort also followed exclusively by cardiologists, only 40% of the patients received OAT. In the recent Euro Heart Survey,[7,13] published after the release of the ACC/AHA/ESC guidelines, OAT was prescribed in 67% of the eligible patients. These results were encouraging and could partially be attributed to the impact of the guidelines on the management of AF. However, anticoagulation rate could have been even higher considering the studied population: half of the patients were included by university reference centres, mainly by cardiology units with electrophysiological facilities or specialized in AF management. With regard to the broad sample of participating countries, results of the Euro Heart Survey represented only an average of the different clinical approaches among European countries. In another recent out-of-hospital study performed in the Canton of Zurich (Switzerland), Marty *et al.*[18] reported a high level of guidelines adherence by general practitioners as 74% of patients with an indication for OAT actually received it. A relatively high percentage of patients (15.9%) received both OAC and aspirin, essentially because of associated vascular or coronary artery disease; this observation underlines the fact that physicians in the present study believe that both drugs offer different mechanisms of protection and perceive bleeding as an unlikely event.

Anti-thrombotic prophylaxis and type of atrial fibrillation

Patients with paroxysmal AF were less often prescribed OAT (59%) than those with persistent (92%) or permanent AF (91%) ($P < 0.0001$), and such an observation has already been made by others.[7,12] Although epidemiological studies showed no real difference in the risk of stroke between paroxysmal AF and chronic AF, [19,20] the difference in OAT prescription in this study and in others appears to be due to

physician's and patient's perception that paroxysmal forms of AF carry a lower risk[13] as well as to a lower patients mean age and lower $CHADS_2$ score in paroxysmal AF.

Anti-thrombotic prophylaxis and age

By opposition to several other studies, we did not observe a negative effect of age on the rate of OAT prescription.[5,12,16,17,21,22] Elderly patients have the maximal benefit of OAT as they usually have many comorbidities and the highest $CHADS_2$ score. In our study, the rate of OAT prescription increased with advancing age: 72% in the $<$65 years group, 81% in the 66–75 years group, and 87% in the $>$75 years group. In fact, only 7/458 eligible patients (1.5%) were denied OAT only on the basis of age ($>$85 years in 7/7) and only 1/458 patient refused OAT (0.2%).

Anti-thrombotic prophylaxis and gender

In the present study, there was no difference in OAT between men and women (315/390, 80.8% vs. 183/232, 78.9%, $P = 0.6$), and this result differs from what was observed by DeWilde *et al.*[16] in the UK. In our study group, there was no statistical difference in none of the parameters between men and women except for age at presentation (68 ± 11 vs. 73 ± 11, $P = 0.002$).

Overtreatment in low-risk atrial fibrillation patients

In this study, 58% of the AF patients with a low-risk profile received OAT despite ineligibility according to current guidelines, a rate similar to the one observed in the Euro Heart Survey.[13] Overtreatment was related partly to a peri-procedural period (cardioversion or ablation in 36.8% in the present study),[23,24] but was also probably related to physician's and patient's fear of a disabling stroke in young patients.

Follow-up

In the present study, overall mortality at 1 year was 4%, which is in accordance with data from the ALFA[14] or the AFFIRM study[25] with two-thirds of deaths being related to cardiovascular causes. Stroke rate was relatively low (2.7%) in accordance with previous studies,[14] but lower than what was observed for the entire population in the AFFIRM study[25] and much lower than untreated groups in randomized trials of anti-thrombotic therapy (4.9–8.0% according to age).[26] Possible explanations are the high rate of OAT in high-risk patients in our study and facilities related to INR control in our environment. Major haemorrhage during OAT was low (1.5%) even in patients $>$80 years of age (4.2%), a result which is in accordance with previous observations from Copeland *et al.*[27] but in opposition with the recent study of Hylek *et al.*[28] which showed a very high rate of bleeding in patients $>$80 years of age (13.1%) and a high rate of OAT discontinuation in this group of patients despite $CHADS_2$ scores $\geq$3. Differences between our study and the one of Hylek *et al.* may be due to the mean age of the study population (69.8 vs. 77 years), OAT experience (many patients were already taking OAT when they were enrolled in our study), sex distribution (female in 37.3 vs. 47%), or concomitant use of antiplatelet agents (15.6 vs. 40%).

Limitations

Results of the present study are only applicable to an out-of-hospital population of patients with AF and may not be applicable to the hospital-based population. Data were collected on a voluntary basis with its inherent limitations and enrolment was not uniform among participants. The way patients were managed may have been influenced by the study itself. The true burden of AF recurrence may have been underestimated as follow-up was a single visit at 12 months and some recurrences may have been completely asymptomatic. The value of the $CHADS_2$ score used in this study may be subject to debate, especially in evaluating the risk associated with controlled hypertension and in defining the upper age limit (75 or 65 years?). The mean $CHADS_2$ score in the present study was relatively low (1.43), possibly reflecting a lower stroke risk profile in this out-of-hospital cohort. In this study, we reported oral anticoagulation prescription rate but we could not ensure that this treatment was effective because it was not possible to have a complete overlook of the INR during the 1 year follow-up period. This limitation was particularly true for stroke or major bleedings as the INR was not available for most of the patients; therefore, no conclusion can be drawn concerning the exact cause of these events.

Conclusion

This survey showed the highest OAT prescription rate for AF yet reported in the literature and demonstrated that ACC/AHA/ESC guidelines can be successfully applied in the 'real-word' clinical practice. In contrast to prior studies,[6] we have not identified in this study any substantial underuse of anticoagulation therapy in different clinical settings, but only an excess of OAT prescription in lone AF. Moreover, the rate of major bleeding was low even in the elderly. Overutilization of OAT in low-risk patients is an another important issue. Such a result was obtained by cardiologists, but efforts should now be directed to improve education and diffusion of guidelines in other medical specialities to tailor optimally stroke prophylaxis to the patient's risk profile.

Participating investigators

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References

1. Hart RG, Benavente O, McBride R, Pearce LA. Antithrombotic therapy to prevent stroke in patients with atrial fibrillation: a metaanalysis. *Ann Intern Med* 1999;**131**:492–501.
2. Frykman V, Beerman B, Ryden L, Rosenqvist M. Management of atrial fibrillation: discrepancy between guidelines recommendations and

actual practice exposes patients to risks for complications. *Eur Heart J* 2001;**22**:1954–9.
3. Bradley BC, Perdue KS, Tisdel KA, Gilligan DM. Frequency of anticoagulation for atrial fibrillation and reasons for its non-use at a Veterans Affairs Medical Center. *Am J Cardiol* 2000;**85**:568–72.
4. Inoue H, Nozawa T, Okamura K, Iwasa A, Lee DJ, Shimizu A *et al*. Attitudes of Japanese cardiologists toward anticoagulation for nonvalvular atrial fibrillation and reasons for it's underuse. *Circ J* 2004;**68**:417–21.
5. Friberg L, Hammar N, Ringh M, Petterson H, Rosenqvist M. Stroke prophylaxis in atrial fibrillation: who gets it and who does not? *Eur Heart J* 2006; **27**:1954–64.
6. Monte S, Macchia A, Pellegrini F, Romero M, Lepore V, D'Ettore A *et al*. Antithrombotic treatment is strongly underused despite reducing overall mortality among high-risk elderly patients hospitalized with atrial fibrillation. *Eur Heart J* 2006;**27**:2217–23.
7. Nieuwlaat R, Capucci A, Lip GYH, Olsson SB, Prins MH, Nieman FH *et al*. HJGM on behalf of the Euro Heart Survey Investigators. Antithrombotic treatment in real-life atrial fibrillation patients: a report from the Euro Heart Survey on atrial fibrillation. *Eur Heart J* 2006;**27**:3018–26.
8. Wyse DG, Waldo AL, DiMarco JP, Domanski MJ, Rosenberg Y, Schron EB *et al*. A comparison of rate and rhythm control in patients with atrial fibrillation. *N Engl J Med* 2002;**347**:1825–33.
9. ACC/AHA/ESC. Guidelines for the management of patients with atrial-fibrillation— executive summary. *Eur Heart J* 2006;**27**:1979–2030.
10. Albers GW, Yim JM, Belew KM, Bittar N, Hattemer CR, Phillips BG *et al*. Status of antithrombotic therapy for patients with atrial fibrillation in university hospitals. *Arch Intern Med* 1996;**156**:2311–6.
11. Munschauer FE, Priore RL, Hens M, Castilone A. Thromboembolism prophylaxis in chronic atrial fibrillation. Practice patterns in community and tertiary-care hospitals. *Stroke* 1997;**28**:72–6.
12. Waldo AL, Becker RC, Tapson VF, Colgan KJ. Hospitalized patients with atrial fibrillation and a high risk of stroke are not being provided with adequate anticoagulation. *J Am Coll Cardiol* 2005;**46**:1729–36.
13. Nieuwlaat R, Capucci A, Camm AJ, Olsson SB, Andresen D, Davies DW *et al*. HJGM on behalf of the Euro Heart Survey Investigators. Atrial fibrillation management: a prospective survey in ESC member countries. The Euro Heart Survey on atrial fibrillation. *Eur Heart J* 2005;**26**:2422–34.
14. Levy S, Maarek M, Coumel P, Guize L, Lekieffre J, Medvedowsky J-L *et al*. on behalf of the College of French Cardiologists. Characterization of different subsets of atrial fibrillation in general practice in France. The ALPHA study. *Circulation* 1999;**99**:3028–35.
15. Gage B, Waterman AD, Shannon W, Boechler M, Rich MW, Radford MJ. Validation of clinical classification schemes for predicting stroke: results from the National Registry of Atrial Fibrillation. *JAMA* 2001; **285**:2864–70.
16. DeWilde S, Carey IM, Emmas C, Richards N, Cook DG. Trends in the prevalence of diagnosed atrial fibrillation, its treatment with anticoagulation and predictors of such treatment in UK primary care. *Heart* 2006;**92**: 1064–70.
17. White RH, McBurnie MA, Manolio T, Furberg CD, Gardin JM, Kittner SJ *et al*. Oral anticoagulation in patients with atrial fibrillation. Adherence with guidelines in an elderly cohort. *Am J Med* 1999;**106**:165–71.
18. Marty T, Hurni R, Zoller M, Steiger U, Steurer J, Eichle K. Antikoagulation bei Vorhofflimmern. Stand der Therapie in einem Arztenetzwerk. *Praxis* 2003;**92**:801–8.
19. Wolf PA, Dawber TR, Thomas HE Jr, Kannel WB. Epidemiologic assessment of chronic atrial fibrillation and risk of stroke: the Framingham study. *Neurology* 1978;**28**:973–7.
20. Hart RG, Pearce LA, Rothbart RM, McAnulty JH, Asinger RW, Halperin JL. Stroke with intermittent atrial fibrillation: incidence and predictors during aspirin therapy. Stroke prevention in atrial fibrillation investigators. *J Am Coll Cardiol* 2000;**35**:183–7.
21. Gurwitz JH, Monette J, Rochon PA, Eckler MA, Avom J. Atrial fibrillation and stroke prevention with warfarin in the long term care setting. *Arch Intern Med* 1997;**157**:978–84.
22. Stafford RS, Singer DE. National patterns of warfarin use in atrial fibrillation. *Arch Intern Med* 1996;**156**:2537–41.
23. Arnold AZ, Mick MJ, Mazurek RP, Loop FD, Trohman RG. Role of prophylactic anticoagulation for direct current cardioversion in patients with atrial fibrillation or atrial flutter. *J Am Coll Cardiol* 1992;**98**:479–86.
24. Corrado G, Beretta S, Sormani L, Tadeo G, Foglia-Manzillo G, Tagliagambe LM *et al*. Prevalence of atrial thrombi in patients with atrial fibrillation/flutter and subtherapeutic anticoagulation prior to cardioversion. *Eur J Echocardiogr* 2004;**5**:257–61.
25. The Atrial Fibrillation Follow-up Investigators of Rhythm Management (AFFIRM) Investigators. A comparison of rate control and rhythm control in patients with atrial fibrillation. *N Engl J Med* 2002;**347**: 1825–33.
26. Atrial Fibrillation Investigators. Risk factors for stroke and efficacy of antithrombotic therapy in atrial fibrillation. Analysis of pooled data from five randomized controlled trials. *Arch Intern Med* 1994;**154**: 1449–57.
27. Copeland M, Walker ID, Tait RD. Oral anticoagulation and haemorrhage complications in an elderly population with atrial fibrillation. *Arch Intern Med* 2001;**161**:2125–8.
28. Hylek EM, Evans-Molina C, Shea C, Henault LE, Regan S. Major haemorrhage and tolerability of warfarin in the first year of therapy among elderly patients with atrial fibrillation. *Circulation* 2007;**115**: 2689–96.