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Management and 1-Year Outcomes of Patients With Atrial Fibrillation in the Middle East: Gulf Survey of Atrial Fibrillation Events

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Abstract

We describe management and outcomes of patients with nonvalvular atrial fibrillation (AF) in the Middle East. Consecutive patients with AF presenting to emergency departments (EDs) were prospectively enrolled. Among 1721 patients with nonvalvular AF, mean age was 59 $\pm$ 16 years and 44% were women. Comorbidities were common such as hypertension (59%), diabetes (33%), and coronary artery disease (33%). Warfarin was not prescribed to 40% of patients with Congestive heart failure, Hypertension, Age, Diabetes mellitus, Stroke/TIA_2 score of $\geq$2. One-year rates of stroke/transient ischemic attack (TIA) and all-cause mortality were 4.2% and 15.3%, respectively. Warfarin use at hospital–ED discharge was independently associated with lower 1-year rate of stroke/TIA (odds ratio [OR], 0.38; 95% confidence interval [CI], 0.17-0.85; $P = .015$) and all-cause mortality (OR, 0.51; 95% CI, 0.32-0.83; $P = .006$). Prior history of heart failure and peripheral vascular disease was independent mortality predictors. Our patients are relatively young with significant cardiovascular risk. Their anticoagulation treatment is suboptimal, and 1-year all-cause mortality and stroke/TIA event rates are relatively high.

Keywords

atrial fibrillation, stroke, anticoagulation, risk assessment, Middle East

Introduction

Atrial fibrillation (AF) is a cardiac arrhythmia associated with significant mortality and morbidity, most notably stroke, transient ischemic attack (TIA), and heart failure.[1-3] Moreover, management of this common arrhythmia comes at a significant economic cost predominantly driven by in-hospital care.[4]

Evidence from large randomized clinical trials has shaped the current guidelines for AF management (eg, rate vs rhythm control and stroke prevention).[5-8] In addition, several observational registries studied management and outcomes of patients with AF in the uncontrolled setting of daily practice.[9-14] Most of these trials and registries were conducted in Europe and North America, where the majority of patients are caucasians, typically older, and often treated in health care settings that are different from other regions of the world.[15,16] This limitation is also apparent in 2 large contemporary, ongoing AF registries, in which patients from the Middle East are not included.[17,18] Management and outcomes of patients with AF in the Middle East may differ from other parts of the world, given the different demographics, health care settings, and risk factor profile.

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We conducted a prospective registry of patients with AF presenting to emergency departments (EDs) in 6 countries in the Gulf region of the Middle East. In this report, we describe characteristics, management practices, and outcomes of patients with nonvalvular AF in this part of the world, where no such studies have been previously carried out.

Methods

Gulf Survey of Atrial Fibrillation Events (Gulf SAFE) is a prospective, observational study of consecutive patients with AF recruited between October 2009 and June 2010 from EDs of 23 hospitals in 6 countries of the Gulf region of the Middle East. Patients were followed for 1 year after enrollment. Full details of the methods have been previously published.[19] Briefly, patients were eligible if they were $\geq$18 years, found to have AF >30 seconds on a 12-lead electrocardiogram or rhythm strip while in ED, and provided informed consent. Patients were enrolled regardless of the primary reason for their ED visit. Patient management was at the discretion of the treating physician. Follow-up by clinic visit or telephone interview was planned at 1, 6, and 12 months from the time of enrollment. For the purpose of this report, we analyzed data for patients with AF who do not have rheumatic mitral stenosis or a prosthetic heart valve (ie, nonvalvular AF).

Ethics

The study protocol conforms to the ethical guidelines of the 1975 Declaration of Helsinki as reflected in a priori approval by internal review bodies/ethics committees of each institution/country. All patients provided informed consent prior to their enrollment in the study.

Data were collected on a standardized case report form (CRF) and entered online. Data included patient baseline characteristics, AF type and history, ED, and hospital management and outcomes. Variable definitions were in accordance with American College of Cardiology/American Heart Association key data elements and definitions for AF.[20] At the time of study design and conduct, Congestive heart failure, Hypertension, Age, Diabetes mellitus, Stroke/TIA$_2$ ($CHADS_2$) score was recommended by AF guidelines for estimating the risk of stroke and thromboembolism in patients with nonvalvular AF.[21] Therefore, variables required for calculating $CHADS_2$ score were included in the CRF. The Congestive heart failure, Hypertension, Age $\geq$75 years, Diabetes mellitus, Stroke/TIA$_2$, vascular disease, age 65-74 years, sex category (CHA_2DS_2-VASc) score was later introduced by the European Society of Cardiology for risk stratification of patients with AF.[22] Therefore, in this article, we refer to the $CHADS_2$ score when we report on practice pattern and refer to both $CHADS_2$ and CHA_2DS_2-VASc scores when we report on patients' outcomes.

Data source verification was performed by a clinical research associate who conducted site visits in 35% of participating hospitals. Key data variables like age, gender, and comorbidities were 100% complete. Key outcome data such as mortality, stroke, and bleeding were known for all patients who completed 1-year follow-up (96%).

Statistical Analysis

Patient characteristics were summarized using frequencies and percentages for categorical variables and means and standard deviations for continuous variables. We used medians and interquartile range (IQR) for continuous variables that were not normally distributed. Group comparisons for categorical variables were performed using Pearson chi-square test. Multivariate logistic regression models were constructed to identify factors independently associated with the outcomes of stroke/TIA and all-cause mortality during 1 year of follow-up. For the outcome stroke/TIA, we adjusted for age, gender, stroke risk score, and other baseline characteristics not accounted for in the risk score but associated with stroke/TIA in univariate analyses. We considered 2 risk scores (the $CHADS_2$ and the CHA_2DS_2-VASc) and constructed 2 separate multivariate logistic models with each score. For the outcome of all-cause mortality, we adjusted for age, gender, and other baseline characteristics associated with all-cause mortality in univariate analyses. Model fit of the regressions was analyzed using Hosmer and Lemeshow statistics and area under the receiving–operating curve, also known as c-statistics. A P value <.05 was considered statistically significant. Analyses were performed using STATA version 12.1 (STATA Corporation, College Station, Texas).

Results

Baseline Characteristics

Of 2043 patients with AF recruited, 1721 (84%) had nonvalvular AF (Table 1). The mean age was 59 $\pm$ 16 years, 60% were younger than 65 years and 44% were women. The most common baseline comorbid conditions were hypertension (59%), diabetes mellitus (33%), coronary artery disease (32%), and history of heart failure (27%). Prior stroke/TIA was reported in 13% of patients. About half (52%) of the patients presented to ED for a reason/symptoms other than AF (26% for cardiac and 26% for noncardiac reasons). The most common cardiac reasons for ED presentation were heart failure (9%), acute coronary syndrome (5%), and chest pain (4%). The most common noncardiac reasons for ED presentation were stroke/TIA (6%), infection/fever (4%), and respiratory disease (3%).

Management

Rhythm management in ED is shown in Figure 1. A small (10%) proportion of patients spontaneously cardioverted to sinus rhythm. Almost three-quarters were managed with rate control strategy. When rhythm control strategy was selected, cardioversion was attempted using amiodarone in the majority of patients. Sinus rhythm was achieved in 76% of patients when electrical cardioversion was attempted and 43% of patients when pharmacological cardioversion was attempted. Overall,

Table 1. Baseline Characteristics of 1721 Patients With Nonvalvular Atrial Fibrillation.

Characteristic	No. (%), n = 1721
Age, mean ± SD, years	59.1 ± 15.8
Age ≥ 65 years	686 (39.9)
Female gender	764 (44.4)
Comorbid conditions and risk factors	
Hypertension	1019 (59.2)
Diabetes	563 (32.7)
Smoking	409 (23.8)
CAD	553 (32.1)
Heart failure	461 (26.8)
LV systolic dysfunction	337 (19.6)
Valvular heart disease (moderate to severe)	
Mitral regurgitation	147 (8.5)
Aortic regurgitation	30 (1.7)
Aortic stenosis	22 (1.2)
Tricuspid regurgitation	73 (4.2)
COPD	95 (5.5)
Thyroid disease	100 (5.8)
Stroke	159 (9.2)
TIA	65 (3.8)
Major bleeding	35 (2.0)
Alcohol use	33 (1.9)
Body mass index[a], kg/m^2	
Underweight, <18.5	22 (1.4)
Normal weight, 18.5-24.9	462 (28.6)
Overweight, 25-30	597 (37.0)
Obese, >30	534 (33.1)
LA diameter,[b] mean ± SD, mm	42.7 ± 8.1
First heart rate, mean ± SD, bpm	120 ± 33
First SBP, mean ± SD, mm Hg	133 ± 26
Serum creatinine, mean ± SD, μmol/L	110 ± 92
Type of AF	
First attack ever	720 (41.8)
Paroxysmal AF	328 (19.1)
Permanent AF	458 (26.6)
Persistent AF	155 (9.0)
Unknown	60 (3.5)
Reason for ED visit	
Atrial fibrillation	827 (48.1)
Cardiac	450 (26.2)
Heart failure	157 (34.9)
ACS	87 (19.3)
Chest pain	64 (14.2)
Noncardiac	444 (25.8)
Stroke/TIA	97 (21.9)
Infection/fever	65 (14.6)
Respiratory disease	47 (10.6)
$CHADS_2$ score	
Mean ± SD	1.6 ± 1.4
0	430 (25.0)
1	467 (27.1)
≥2	824 (47.9)

Abbreviations: SD, standard deviation; CAD, coronary artery disease; LV, left ventricular; COPD, chronic obstructive pulmonary disease; TIA, transient ischemic attack; LA, left atrial; SBP, systolic blood pressure; ED, emergency department; ACS, acute coronary syndrome; $CHADS_2$, Congestive heart failure, Hypertension, Age, Diabetes mellitus, Stroke/TIA_2.

[a] Data on body mass index was missing in 106 patients (n = 1615).

[b] Data on LA diameter was missing in 481 patients (n = 1240).

1388 (81%) patients were admitted to hospital. The median length of hospital stay was 3 days (IQR 1-6 days).

Warfarin prescription at hospital discharge increased with increasing CHADS2 score (28% in score 0, 43% in score 1 and 60% in score ≥2, $P < .001$; Table 2), whereas 28% of CHADS2 score 0 received warfarin at discharge, 40% of patients with CHADS2 score ≥2 were not on warfarin at discharge. There were 608 patients who were discharged in AF rhythm, 62% of whom were prescribed warfarin at the time of discharge. Reasons for not prescribing warfarin to the rest of them were due to physician preference/decision (48%), high bleeding risks (28%), anticipated noncompliance (18%), and other reasons. Of 1209 available international normalized ratios (INRs) for 621 patients at 1-, 6-, and 12-month follow-up, 28% were <2, 56% were between 2 and 3, and 16% were >3.

Outcomes

One-year follow-up was completed in 1654 (96%) patients. One-year mortality rate was 15.3% while that for stroke/TIA was 4.2%. Mortality and stroke/TIA rates differed according to the reason for ED visit (Table 3). Patients whose primary reason for ED visit was noncardiac had the highest mortality rate (31%), while those with cardiac reason had the highest stroke/TIA rate (7.8%). In patients with AF as the primary reason for ED visit, mortality and stroke/TIA rates were 4.2% and 2.2%, respectively.

In multivariate models, smoking, cardiac, and noncardiac reasons for ED visit, $CHADS_2$ score ≥2, and CHA_2DS_2-VASc score ≥2 were independently associated with higher odds of stroke/TIA during 1-year follow-up (Table 4). The odds of developing stroke/TIA were approximately 60% lower for patients who were discharged on warfarin compared to patients who were not (odds ratio [OR], 0.38; 95% confidence interval [CI], 0.17-0.83; $P = .015$). The strongest independent predictors of mortality were reason for ED visit (specifically cardiac and noncardiac reasons), congestive heart failure, peripheral vascular disease, and lack of warfarin use (Table 5). Older age, higher serum creatinine, lower body mass index, and absence of a past history of hypertension were also associated with higher odds of death at 1 year.

CHA_2DS_2-VASc Score in Low-Risk Patients

Stroke/TIA rate at 1-year follow-up was 1.9% for $CHADS_2$ score 0, 3.9% for score 1, and 5.7% for score ≥2 ($P = .005$). Patients with a $CHADS_2$ score of 0/1 did not appear to be homogeneously low risk when reclassified by the CHA_2DS_2-VASc score. Of 897 patients with a CHADS2 score of 0 or 1, approximately 40% had a CHA_2DS_2-VASc score of ≥2. Adjusting for antithrombotic therapy, these patients had nearly 3-fold higher risk of stroke/TIA compared to patients with CHA_2DS_2-VASc score of 0 (adjusted OR, 2.94; 95% CI, 1.03-8.41).

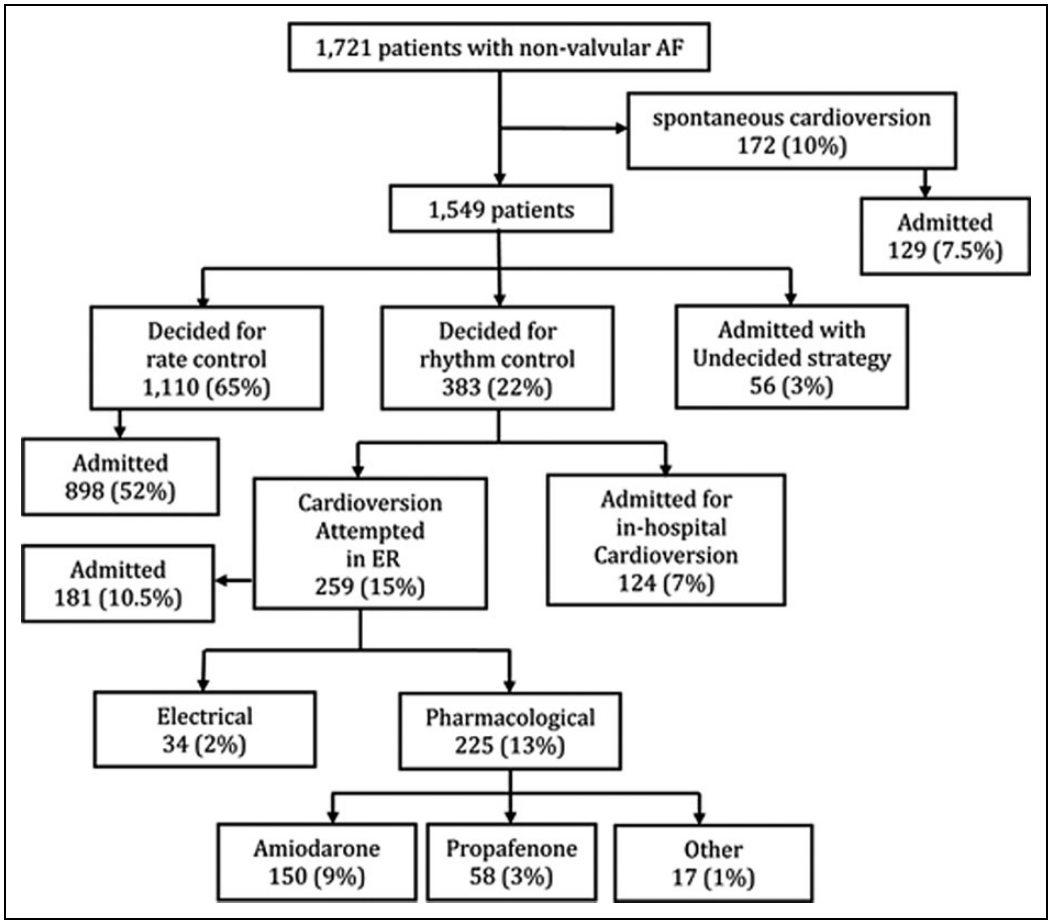

Figure 1. Rhythm management in emergency department (ED) of 1721 patients with nonvalvular AF.

Table 2. Warfarin and Antiplatelet Therapy at Discharge From Hospital Based on the $CHADS_2$ Score in Patients Discharged Alive.[a]

	$CHADS_2$ Score			
Warfarin and Antiplatelet Therapy	0, No. (%), n = 423	1, No. (%), n = 452	≥2, No. (%), n = 779	*P* Value
Warfarin	117 (27.7)	196 (43.4)	465 (59.7)	<.001
Warfarin alone	87 (74)	119 (61)	230 (49)	.003
Dual therapy	28 (24)	72 (37)	207 (45)	<.001
Triple therapy	2 (2)	5 (3)	28 (6)	<.001
Antiplatelet	234 (55.3)	217 (48.0)	266 (34.1)	<.001
None	72 (17.0)	39 (8.6)	48 (6.2)	<.001

Abbreviations: $CHADS_2$, Congestive heart failure, Hypertension, Age, Diabetes mellitus, Stroke/TIA_2; TIA, transient ischemic attack.
[a] Dual therapy, warfarin, and either of the 2 antiplatelets (aspirin or clopidogrel); triple therapy, wafarin plus aspirin plus clopidogrel; antiplatelet, aspirin or clopidogrel or both; none, neither warfarin, nor antiplatelet (n = 1654).

Discussion

This is the first multicenter, multinational, prospective, and observational study from Middle Eastern Arab countries examining the characteristics, management, and 1-year outcomes of patients with AF. Patients with AF in Arab countries of the Middle East were relatively young but possess significant cardiovascular risk profile including high prevalence of hypertension, diabetes mellitus, obesity, smoking, and concomitant cardiac disease. A large number of patients, including many with high stroke risk score, did not receive oral anticoagulation; and in those who received it, a significant proportion did not achieve optimal anticoagulation level. Relatively high rates of stoke/TIA and all-cause mortality were observed over the 1 year of follow-up.

Compared to randomized trials, registries have fewer exclusion criteria and consequently include a wider range of patients. Since patient management is not dictated by the registry protocol, registries provide details on how and who receives a particular treatment. Well-conducted registries, therefore, have the

Table 3. Outcome Events at 12-Month Follow-Up in the Entire Cohort and According to Reason for Emergency Department Visit.[a]

		Reason for ED Visit		
		AF	Cardiac	Noncardiac
Event	Entire Cohort, No. (%), N = 1721	No. (%), n = 827	No. (%), n = 450	No. (%), n = 444
All-cause death	263 (15.3)	35 (4.2)	90 (20)	138 (31.1)
Stroke/TIA	73 (4.2)	18 (2.2)	35 (7.8)	20 (4.5)
PE	3 (0.2)	0	0	3 (0.7)
Major bleed	20 (1.2)	2 (0.2)	7 (1.6)	11 (2.7)
Gastrointestinal	11	2	3	6
Intracerebral	3	0	2	1
Subdural	2	0	1	1
Other	4	0	1	3
Recurrent ED visit for AF	232 (14.0)	139 (16.9)	61 (14.3)	32 (7.9)
Recurrent hospital admission for AF	183 (11.1)	101 (12.2)	54 (12.7)	28 (6.9)
Recurrent hospital admission for HF	175 (10.6)	44 (5.3)	92 (21.6)	39 (9.7)

Abbreviations: AF, atrial fibrillation; ED, emergency department; TIA, transient ischemic attack; PE, peripheral embolization; HF, heart failure.
[a] Apart from all-cause mortality and stroke/TIA, all other outcome events were captured after hospital discharge. Hence, column percentages may not add up to 100% on the events captured after hospital discharge.

Table 4. Factors Independently Associated With Risk of Stroke/TIA in 2 Logistic Models for 1712 Patients With Nonvalvular AF.

Predictor	OR	95% CI	*P* Value	Predictor	OR	95% CI	*P* Value
Male	1.10	0.64-1.87	.735	Male	1.23	0.72-2.13	.449
Smoking	1.94	1.12-3.36	.017	Smoking	2.01	1.16-3.47	.013
Reason for ED visit				Reason for ED visit			
AF	Ref	Ref	Ref	AF	Ref	Ref	Ref
Cardiac	3.01	1.64-5.53	<.001	Cardiac	2.89	1.56-5.32	.001
Noncardiac	1.97	1.01-3.86	.048	Noncardiac	1.90	0.97-3.71	.061
$CHADS_2$ score				CHA_2DS_2-VASc score			
0	Ref	Ref	Ref	0	Ref	Ref	Ref
1	2.18	0.92-5.18	.078	1	1.60	0.48-5.38	.448
2+	3.01	1.34-6.76	.008	2+	3.47	1.29-9.35	.014
Antithrombotic therapy at discharge				Antithrombotic therapy at discharge			
None	Ref	Ref	Ref	None	Ref	Ref	Ref
Aspirin/clopidogrel	1.04	0.59-1.83	.903	Aspirin/clopidogrel	1.03	0.59-1.82	.907
Warfarin	0.38	0.17-0.83	.015	Warfarin	0.39	0.18-0.84	.016

Abbreviations: TIA, transient ischemic attack; AF, atrial Fibrillation; ED, emergency department; OR, odds ratio; CI, confidence interval; Ref, reference; $CHADS_2$, Congestive heart failure, Hypertension, Age, Diabetes mellitus, Stroke/TIA_2.

benefit of providing a representative ''real-world'' view of both clinical practice and patient outcomes.[23] Such studies are needed to understand how we are really doing, to develop targets for interventions, and to provide benchmarks for evaluating future improvements in practice. Gulf SAFE is one of the few prospective registries evaluating AF in non-Western populations.[15] The mean age of 59 years in our patients is 7 years younger than in other multinational AF registries.[11,12] This may reflect the population demographics in the region, where only 2% to 5% of the general population of Gulf SAFE participating countries are older than the age of 60.[24] Alternatively, the younger age of our patients may reflect a predisposition to AF driven by prevalent comorbid conditions including hypertension, obesity, diabetes mellitus, cigarette smoking, and prior cardiac disease. The high prevalence of risk factors in the AF population is probably a reflection of the high incidence in the general population in this part of the world.[25] A recent report from the Atherosclerosis Risk in Communities (ARIC) study showed that 57% of incident AF could be attributed to potentially modifiable risk factors.[26] Additionally, there may be other unmeasured genetic or environmental factors that predispose our populations to AF, a possibility that should stimulate future research.[27,28]

The management strategy of choice while in ED was rate control for most of our patients. It is uncertain why a relatively low proportion of physicians opted for a rhythm control strategy in the present study. This may reflect limited availability of antiarrhythmic drugs other than amiodarone, concerns over long-term adverse events and proarrhythmia, low familiarity with clinical indications for antiarrhythmics, or broad conviction among practicing physicians in the region that rate control is universally a noninferior strategy in all patients. The

Table 5. Factors Independently Associated With Risk of Death in Patients With Nonvalvular AF in Gulf SAFE.

Predictor	Adjusted OR	95% CI	*P* Value
Age	1.04	1.03-1.05	<.001
Male	0.83	0.59-1.18	.302
Reason for ED visit			
AF	Ref	Ref	Ref
Cardiac	2.46	1.51-4.02	<.001
Noncardiac	5.99	3.74-9.61	<.001
Hypertension	0.64	0.43-0.95	.026
Diabetes mellitus	1.34	0.92-1.93	.123
CAD	1.12	0.77-1.64	.550
CHF	2.64	1.79-3.89	<.001
COPD	1.49	0.84-2.62	.172
Prior stroke/TIA	1.41	0.91-2.19	.126
PVD	2.26	1.01-5.08	.048
BMI	0.96	0.93-0.99	.012
Serum creatinine	1.01	1.01-1.01	<.001
AF type			
First attack ever	Ref	Ref	Ref
Paroxysmal	1.01	0.60-1.73	.959
Permanent	0.86	0.55-1.34	.499
Persistent	1.44	0.78-2.67	.241
Antithrombotic therapy at discharge			
None	Ref	Ref	Ref
Aspirin/clopidogrel	0.55	0.35-0.87	.010
Warfarin	0.51	0.32-0.83	.006

Abbreviations: AF, atrial fibrillation; TIA, transient ischemic attack; OR, odds ratio; CI, confidence interval; CAD, coronary artery disease; CHF, congestive heart failure; COPD, chronic obstructive pulmonary disease; PVD, peripheral vascular disease; BMI, body mass index; ED, emergency department; SAFE, Survey of Atrial Fibrillation Events.

great majority (81%) of patients were admitted to hospital regardless of the management strategy used. This high rate of hospital admission has important economic implications. Half of the financial costs of AF management relates to hospital admissions.[4,29] Possible reasons for the high admission rate in our population include tendency of ED physicians to defer decisions regarding management strategy to admitting doctors, preference to cardiovert patients while in-hospital, unavailability of urgent transesophageal echocardiography service to guide immediate cardioversion, anticipated poor follow-up in primary care clinics, and limited availability of anticoagulation clinics.

We observed higher rate of stroke/TIA (4.2%) at 1-year follow-up in our relatively young patients compared to rates (0.5%-2%) reported by most AF registries conducted in the West.[9-14] This may be explained by the lack of anticoagulation in 40% of the patients with CHADS2 score $\geq$2 and the suboptimal levels of INRs achieved in almost half of those who received warfarin. This deficiency in anticoagulation was also observed in patients who were in AF rhythm at the time of hospital discharge, where only 62% of patients were placed on anticoagulation. When physicians were asked about the reason why the rest of this group of patients was not anticoagulated, 48% cited "physician preference/decision." This hesitancy on the part of physicians needs to be explored and whether the new novel oral anticoagulants would reduce this hesitancy remains to be seen. We observed that warfarin prescription at discharge was independently associated with $\sim$60% lower risk of stroke/TIA at 1 year. This magnitude of risk reduction is similar to that observed in clinical trials comparing warfarin to placebo for stroke prevention in AF and suggests that better adherence to evidence-based guidelines of stroke prevention with oral anticoagulation should improve outcomes in our patients.[30] At the time our registry was designed and conducted, $CHADS_2$ score was the only risk stratification score for guiding anticoagulation treatment. Since then, CHA_2DS_2-VASc score was developed and is currently used in patients with $CHADS_2$ score of 0/1 to improve risk stratification.[31] We found that patients with a $CHADS_2$ score of 0/1 were not uniformly low risk. Among them, those who were reclassified with CHADS2-VASc score of $\geq$2 had nearly 3-fold greater risk of stroke/TIA compared to the subgroup with CHADS2-VASc score of 0.

We observed high mortality rates (15%) at 1-year follow-up in our patients. The mortality rate was lowest in patients presenting mainly with AF (4.2%) and highest (31%) in patients presenting with noncardiac reasons (eg, stroke, infection, or respiratory disease). The high mortality rate could be related to the comorbidity associated with AF in these patients.

Our study presents data on patients with AF from the region, making it possible to validate the $CHADS_2$ and CHA_2DS_2-VASc scores in Middle Eastern populations. Training and educating ED physicians, internists, and cardiologists managing AF are likely to improve adherence to treatment guidelines. Additional reduction to the cost of AF management can be achieved by revising our admission policy to reduce the rate of admission of patients with AF at low risk of short-term complications. Finally, the high prevalence of atherosclerotic risk factors in our patients highlights the need to focus on primary prevention programs aimed at smoking cessation, a healthier diet, and a more active lifestyle. Such programs will be expected to decrease the burden of AF, coronary artery disease, and stroke.

Strengths and Limitations

This study's strengths include its prospective design and high completed follow-up rate (96%), lending validity to our results. The near equal representation of both genders and recruitment from a wide range of hospitals make our findings representative of the region.[19] Future work should overcome some of the limitations of the current study including more information on interim medication use, adequacy of anticoagulation levels, and longer follow-up. Although we believe that we enrolled all consecutive patients with AF who presented to the EDs of participating hospitals, we did not use log-books to document the number of patients who were not enrolled and the reasons for not enrolling them.

Conclusion

Patients with AF in the Middle East are relatively young with high burden of atherosclerotic risk factors that may play a

major role in the onset of AF at this young age. Their anticoagulation treatment is suboptimal, and mortality and stroke/TIA events at 1 year are high. Emergency department management revealed high use of rate control strategy and high rate of hospital admissions, which would contribute to the increased cost of management.

Appendix

Gulf SAFE Administrative Organization

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