Epidemiology and Significance of Atrial Fibrillation

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Atrial fibrillation (AF) is the most common sustained arrhythmia, affecting an estimated 2.2 million adults in the United States. The median age of people with AF is 75, and it affects 8.8% of the US population >80 years of age. Prevalence data from other countries are presented. Direct comparisons are limited by study design, but rough comparisons suggest that the prevalence of AF in Europe is similar to the prevalence in the United States, whereas the prevalence in Asia may be lower. The limited comparative data underscore our lack of understanding of AF risk factors and complications in racial subgroups and in developing countries. AF increases stroke risk 5-fold. The clinical features that predict higher risk of stroke in AF are prior stroke, hypertension, advancing age, diabetes, and congestive heart failure. Predicting which patients with atrial fibrillation are at the highest risk of stroke remains a challenge. Echocardiographic findings have been investigated to assist in the risk stratification of patients with AF. Despite evidence from clinical trials that anticoagulation with warfarin reduces stroke incidence and even mortality, anticoagulation remains underutilized, especially in the elderly. Improvement in the rate of anticoagulation in patients with AF at risk of stroke can be expected to decrease the complications and mortality of AF.

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It is estimated that 2.2 million adults in the United States have intermittent or chronic atrial fibrillation (AF),[1] making it the most common sustained arrhythmia. Although once considered to be only a marker for other cardiovascular disease in its relation to stroke,[2] AF is now recognized to be an independent predictor of morbidity and even mortality.[3–5] Because AF increases in prevalence with age,[6] AF and its cerebrovascular complications will have major societal costs as the population ages.[7] This article reviews the prevalence, incidence, risk factors, and complications associated with AF to identify those subgroups most at risk for AF and its complications.

INCIDENCE AND PREVALENCE OF AF

Selection of AF cases: Estimates of the incidence and prevalence of AF vary based on the characteristics of population studied and how AF is ascertained. Variations in the age and severity of illness in the population studied, diligence with which medical records are sought, duration of follow-up, and frequency of electrocardiograms affect the reported prevalence of AF. For example, there was a 22% prevalence of AF in one study of ill, hospitalized, elderly patients,[8] whereas a community study in middle-aged to elderly Japanese patients that relied upon a single electrocardiogram for AF diagnosis revealed a prevalence of only 1.3%.[9]

Furthermore, the number of AF cases may be underestimated because of the exclusion of unrecognized, asymptomatic AF. In the Cardiovascular Health Study, 12% of AF cases were diagnosed solely by annual electrocardiographic screening and presumably were asymptomatic.[10] A study of 8 patients with known AF who were continually monitored for 30 days showed that 1 patient never had symptoms while in AF, and 5 of the other patients had both symptomatic and asymptomatic episodes of AF.[11]

Estimates from different data sets: In 4 major population-based studies (Cardiovascular Health Study,[12] Framingham Heart Study (FHS),[13] Western Australia study,[14] and Rochester, MN study[15]), the overall prevalence of AF was 1.5–6.2% (Table I).[9,12–27] Using data from these 4 studies, Feinberg et al[1] calculated that nearly 6% of those >65 years of age have AF.

Much of our knowledge of the epidemiology of AF is based on predominantly white cohorts. In the Cardiovascular Health Study, 5% of the cohort was African American. There was a trend toward a lower incidence of AF in African Americans (relative risk 0.47, 95% confidence intervals 0.22–1.01).[10]

AF is a disease that is increasing in prevalence: Data from a wide range of settings suggest that the prevalence of AF is increasing. The National Ambulatory Medical Care Surveys demonstrated that the annual number of visits for AF nearly tripled between 1980 and 1992, from 1.3 million to 3.1 million.[28] Additionally, the National Hospital Discharge Survey showed that AF increased as a hospital discharge diagnosis between 1982 and 1993 from 30.6 per 10,000 to 59.5 per 10,000.[29] Although these discharge data are suggestive, there was no adjustment for change in age composition in the >65 years category over time, so this could also reflect a higher proportion of the very

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elderly in the datum set from 1993. Furthermore, clinical practice data may be susceptible to biases such as upcoding and a secular trend toward an increase in telemetry and routine electrocardiograms.

Data from the FHS also support an increase in the prevalence of AF over time in men. Between 1968 and 1989, the prevalence of AF in men in the FHS population nearly tripled, from 3.2% to 9.1%.[29] When the analysis was restricted to electrocardiograms performed at routine biennial examinations, thereby eliminating ascertainment and upcoding bias, there was a trend toward an increase in prevalence of AF over time in men.[29]

A clinical factor behind the increase in prevalence of AF may be recent improvements in survival after myocardial infarction. In myocardial infarction survivors, the increase in AF over time was dramatic; the prevalence of AF increased from 4.9–17.4% between 1968 and 1989.[29] Additionally, an increase in the performance of cardiothoracic surgeries, which are associated with a high rate of postoperative AF, likely contributes to the increase in prevalence.[30]

AF is a disease of the elderly: The incidence of AF increases dramatically with increasing age.[6,10] Data from the FHS shows that the risk factor-adjusted odds ratio for developing AF approximately doubled with each decade,[6,31] which resulted in a rapid increase in AF prevalence with advancing age. Whereas only 0.5[13]–0.9%[19] of those 50–59 years old had a history of AF, between 6.7%[12] and 13.2%[19] of those in their ninth decade have had AF. This increase is borne out in multiple population-based studies (Table I).[12,14,15,19]

Gender differences in AF: Men developed AF at 1.5 times the rate of women, even after adjustment for potential confounders.[6] The etiology of this gender difference was unclear. Although the incidence and prevalence of AF was greater in men, because of the greater longevity in women, women made up the majority of AF cases. It is estimated that 53% of all people affected by AF are female.[1]

AF in the remainder of the world: Population-based epidemiologic data from Europe, Iceland, Australia, Asia, and the United States are presented in Table I. Analysis of epidemiologic information from these different areas are complicated by the inclusion of younger people in some studies as well as different methods of ascertainment of AF, as discussed previously. A review of the literature underscores the deficit in our understanding of the epidemiology of AF in various ethnic groups and in much of the developing world. Comparisons of AF epidemiology are important in that they may provide insight into environmental and genetic factors that contribute to the development of AF and its complications. For example, in a hospital-based study of patients of various ethnic groups with AF in England, black and Afro-Caribbean patients had hypertension as the major underlying risk factor for AF, whereas South Asian patients had ischemic heart disease as the major risk factor.[32] Rheumatic heart disease is now an infrequent cause of AF in the United States, but in a clinic-based study in Ethiopia, rheumatic heart disease was the most common cause of AF.[33]

Rough comparisons between data from Europe and the United States suggest a similar prevalence of AF. One group of investigators explored the prevalence of AF in whites and other ethnic groups >50 years of age in England. In a largely white population, the prevalence of AF was 2.4%,[24] whereas South Asians in the same area had a prevalence of AF of only 0.6%.[25] These values are not adjusted for age, so it cannot be stated with certainty that South Asians have a lower prevalence of AF.

At first glance, it appears that the prevalence of AF is much lower in Asia compared with the United States. Comparisons need to made cautiously, however, because all 3 of the studies from Asia relied upon single electrocardiograms performed in healthy or ambulatory populations. The study from Japan was discussed previously.[9] More remarkable are numbers from elderly centers in Hong Kong, in which only 1.3% of people aged 60–94 years had AF.[26] Lower still are numbers from residents in a Himalayan village, in which only 0.1% (n = 1) of the population had AF.[27] A number of factors may have contributed to the low prevalence of AF in this study, including a low prevalence of ischemic heart disease (by electrocardiograph), the young age of the sample (>15 years old), and the ascertainment of AF based on a single electrocardiogram.[27]

RISK FACTORS FOR ATRIAL FIBRILLATION

This section draws from population-based studies that utilize multivariate analysis to determine risk factors associated with AF. Multivariate analysis is helpful to tease out the independent contribution of each risk factor for the development of AF. For example, myocardial infarction and AF share common antecedents. Multivariate analysis can determine if myocardial infarction independently contributes to AF after controlling for the other risk factors like hypertension or diabetes that are associated with both outcomes.

Cardiac disease as a risk factor for AF: Congestive heart failure and valvular heart disease conferred a high risk of developing AF in the FHS,[6] the Cardiovascular Health Study,[12] and the Manitoba Follow-Up Study, a longitudinal study of men fit for pilot training (Table II).[5] Myocardial infarction occurred prior to or at the diagnosis of AF in 26% of men and 13% of women in the FHS.[6] A history of prior myocardial infarction significantly increased the risk of AF in men.[5,6] AF complicated up to 10% of acute myocardial infarctions[34] and occurred in the setting of more severe infarctions.[35] Thrombolysis has been shown to decrease the incidence of AF in the setting of acute infarction.[36]

Cardiac and noncardiac surgery: AF is a common and costly complication of surgery, occurring in nearly 4% of noncardiac[37] and 33% of coronary artery bypass graft surgeries.[38] AF significantly lengthened hospital stay[37,38] and led to over 10,000 dollars in

extra costs after coronary artery bypass grafting.[38] Since an estimated 367,00 people in the United States underwent coronary artery bypass grafting in 1996,[39] AF leads to enormous excess costs.

Cardiovascular disease risk factors and AF: Diabetes and obesity increased the risk of AF in some studies.[5,6,12] Hypertension consistently was associated with an increased risk of AF[5,6,12] (Table II). Because hypertension occurs in a large percentage of the population, it is not surprising that potentially 14% of cases of AF in men and women would be eliminated if hypertension were eradicated.[6]

Other medical conditions and AF: Lung disease was an independent risk factor for AF in the Cardiovascular Health Study[10] but not in the FHS.[6] Subclinical hyperthyroidism increased the risk of AF (odds ratio 3.7) in the FHS.[40] Surprisingly, alcohol consumption was associated with a lower risk of AF in the Cardiovascular Health Study.[10] However, binge drinking, even in the absence of alcoholism, is associated with AF.[41,42]

Genetic: Familial AF is undoubtedly rare, but the existence of a family in Spain in which AF appeared to segregate in an autosomal dominant fashion provided evidence that there may be a genetic susceptibility to AF.[43] Nearly half of the living family members had AF. Genetic linkage localized the responsible gene to chromosome 10q.[43] Whether the defect represents an isolated rare familial type of AF or is suggestive of a molecular basis for AF remains unclear.[44]

Echocardiographic risk factors: Echocardiographic abnormalities increased the risk of AF even after adjustment for clinical AF risk factors. Left atrial size was an independent predictor of AF.[10,45] Left ventricular abnormalities, specifically diminished left ventricular fractional shortening (an indicator of systolic dysfunction) and increased left ventricular wall thickness, also independently contributed to AF.[45]

CEREBRAL COMPLICATIONS OF ATRIAL FIBRILLATION

AF is an independent risk factor for stroke: It is estimated that 15% of strokes occur in the setting of AF.[39] Whereas the age-adjusted incidence of stroke approximately doubled with coronary artery disease, trebled with hypertension, and quadrupled in the presence of congestive heart failure, AF conferred a nearly 5-fold risk of stroke.[13] As the cohort in the FHS aged, the percentage of strokes attributable to AF increased. In the youngest age group (50–59 years), the percentage of strokes that would be prevented if AF could be eliminated as a risk factor was quite low at 1.5% versus nearly 50% from hypertension. In the oldest age group (80–89 years), the percentage of strokes attributed to AF had increased dramatically to 23.5%, whereas the percentage of strokes attributed to hypertension and coronary artery disease had decreased.[13]

AF causes more severe strokes: Stroke in the setting of AF was nearly twice as likely to be fatal compared with stroke from other causes.[46] Survivors of stroke who had AF had longer hospital stays,[47] increased disability,[46,47] and were more likely to have recurrent strokes.[46]

AF and other cerebral complications: Atrial fibrillation may even contribute to dementia. In a prospective study in Rotterdam, dementia was twice as common in presence of AF, even after adjustment for other dementia risk factors.[19]

A possible mechanism by which AF contributes to dementia is through "silent infarcts." Data from the Stroke Prevention in Nonrheumatic Atrial Fibrillation (SPINAF) trial show that 15% of the trial sample with a normal neurologic exam had occult strokes on baseline computerized tomography scan. It is possible that conditions associated with AF, like hypertension, could have been the cause of the infarcts, but over half of the silent infarcts were consistent with emboli.[48]

STROKE RISK FACTORS

Among patients with AF, the risk of stroke depends on the presence of other stroke risk factors. The identification of patients with AF at relatively higher and lower risk for complications of AF may assist in identifying which patients would most benefit from anticoagulation, so as not to expose low-risk subgroups to the inconvenience of monitoring and the risk of hemorrhage.[49]

Clinical risk factors: The combination of data from 5 prospective trials of anticoagulation in AF provides adequate numbers to perform multivariate analysis to determine independent risk factors for stroke in patients with AF.[50] The results should be applied cautiously, because the mean age in the AF trials was 69 years,[50] compared with the median age of 75 years in the United States.[1] Additionally, not all AF patients were eligible for the trials; in the Stroke Prevention in Atrial Fibrillation (SPAF) trial, for example, only 7% of those screened were enrolled.[51]

The AF investigators identified 4 risk factors that independently contributed to stroke: (1) prior history of stroke or transient ischemic attack; (2) hypertension; (3) age; and (4) diabetes[50] (Table III). A recent history of congestive heart failure was another risk factor identified in the SPAF study.[52]

Factors that did not prove to be independent risks for stroke included gender and duration of AF. Intermittent AF, that was severe enough to lead to enrollment in an anticoagulation trial, was not associated with an increase or decrease in risk of stroke compared with chronic AF.[50]

Low-risk subgroups: It is possible to identify low-risk subgroups with AF, whose risk of stroke is less than the risk of major complications with anticoagulation. The AF investigators found that patients <65 years old without stroke risk factors had a low stroke rate of 1% per year. This contrasts with a yearly stroke rate of 8.1% in the subgroup that was >75 years old and had ≥ 1 risk factor (Table IV).[50]

Stroke risk in racial subgroups: It is noteworthy that the percentage of ethnic minorities in the atrial fibrillation trials is quite low. Whether the rate of stroke in AF is different in ethnic minorities in the United

TABLE I Prevalence of Atrial Fibrillation in Different Countries

Study	Site	Study Population	Study Period and Follow-up	Use of Medical Records for Diagnosis	Age (yr)	Percent Female	Prevalence*
Boysen et al[16]	Copenhagen, Denmark	Stratified, random sample of population	Single ECG, 1976–1978	No	≥35	54%	Overall: 0.6%
Onundarson et al[17]	Reykjavik, Iceland	Invited residents born specific years	Single ECG, 1968–1971	No	32–64	52%	Overall: 0.41% m; 0.15% f
Gehring et al[18]	West Germany	Stratified, random sample of population	Single ECG, 1984–1985	No	25–64	50%	Overall: 0.22% m; 0.34% f 25–44: 0.0% 45–54: 0.2% m; 0% f 55–64: 0.9% m; 1.4% f
Ott et al[19]	Rotterdam, Netherlands	Invited residents in suburb of Rotterdam	Single ECG, 1990–1993	No	55–106	59%	Overall: 3.3% m; 2.7% f 55: 0.9% m; 0.3% f 65: 3% m; 1.8% f 75: 7.6% m; 5.2% f ≥85: 13.2% m; 10.6% f
Langenberg et al[20]	Netherlands	10 general practices	Single ECG and medical records review	Yes	≥60		Overall: 5.1% 60–69: 3.3% m; 2.3% f 70–79: 7.0% m; 6.3% f ≥80: 12.1% m; 8.7% f
Sudlow et al[21]	Northumberland, UK	26 urban and rural general practices	Single ECG	No	≥65		>65: 4.7% ≥75: 10% m; 5.6% f
Wheeldon et al[22]	Sheffield, UK	1 general practice	Single ECG	No	≥65		Overall: 5.4% 65–69: 2.3% 70–74: 4.1% 75–79: 5.8% 80–84: 6.4% ≥85: 8.1%
Hill et al[23]	Staffordshire, UK	1 general practice	Single ECG	No	>65		Overall: 3.7% 65–69: 3.4% 70–74: 2.7% 75–79: 3.4% 80–84: 5.4% ≥85: 5.9%
Lip et al[24]	Birmingham, UK	2 general practices	Medical record review Chronic AF only	Yes	>50		Overall: 2.4%
Lip et al[25]	Birmingham, UK	Indo-Asians in 6 general practices	Medical record review Chronic AF only	Yes	>50		Overall: 0.6%
Nakayama et al[9]	Shibata, Japan	Invited all residents	Single ECG in 1977	No	≥40	58%	Overall: 1.3%
Lok et al[26]	Hong Kong, China	Ambulatory participants at 7 elderly centers	Single ECG	No	60–94	85%	Overall: 1.3%
Kaushal et al[27]	Himalayan Village, India	All residents over 15	Single ECG	No	Only 14% >54	56%	Overall: 0.1%
Lake et al[14]	Busselton, W. Australia	Invited all residents	Triennial surveys, 1966–1981	No	>60	48%	Overall: 1.5% 60–64: 1.1% m; 2.3% f 65–69: 3.3% m; 2.7% f 70–74: 8.6% m; 5.5% f ≥75: 15% m; 11.6% f

Wolf et al (FHS)[13]	Framingham, MA, USA	Invited all residents	Biennial surveys, 1948–1982	Yes	≥50		50–59: 0.5% 60–69: 1.8%
			Prevalence of a history of AF				70–79: 4.8% 80–89: 8.8%
Furberg et al (CHS)[12]	4 communities in USA	Random sample of Medicare recipients	Single ECG and self-report	No	≥65	57%	Overall: 6.2% m; 4.8% f 65–69: 5.9% m; 2.8% f 70–79: 5.8% m; 5.9% f ≥80: 8.0% m; 6.7% f
Phillips et al[15]	Rochester, MN, USA	Stratified, random sample of population	Medical record review	Yes	≥35		Overall: 2.8% 25–34: 0.0% 45–54: 0.5% m; 0.5% f 55–64: 1.0% m; 1.5% f 65–74: 6.0% m; 3.0% f ≥75: 16.1% m; 12.2% f

CHS = Cardiovascular Health Study; f = female; FHS = Framingham Heart Study; m = male.
*Specified by age, if available.

TABLE II Significant Multivariable Risks for Developing Atrial Fibrillation

	Odds Ratio (95% CI)		
	FHS[6]* (per 10 yr)	CHS[12]*† (per 7 yr)	MFUS[5]*
Age			
Overall	—	1.03	—
Male	2.1 (1.8–2.5)	—	—
Female	2.2 (1.9–2.6)	—	—
CHF			
Overall	—	2.67	3.37 (2.29–4.96)
Male	4.5 (3.1–6.6)	—	—
Female	5.9 (4.2–8.4)	—	—
VHD			
Overall	—	3.27	3.15 (1.99–5.00)
Male	1.8 (1.2–2.5)	—	—
Female	3.4 (2.5–4.5)	—	—
Prior MI			
Overall	—	NS	3.62 (2.59–5.07)
Male	1.4 (1.0–2.0)	—	—
Female	NS	—	—
HTN			
Overall	—	1.39	1.42 (1.10–1.84)
Male	1.5 (1.2–2.0)	—	—
Female	1.4 (1.1–1.8)	—	—
Diabetes			
Overall	—	NS	NS
Male	1.4 (1.0–2.0)	—	—
Female	1.6 (1.1–2.2)	—	—
Obesity			
Overall	NS	—	1.28 (1.02–1.62)

*FHS, CHS, and MFUS data adjusted for age, cardiovascular disease, and cardiac risk factors.
†CHS data also adjusted for sex and echocardiographic findings.
CHF = congestive heart failure; CHS = Cardiovascular Health Study; CI = confidence interval; FHS = Framingham Heart Study; HTN = hypertension; MFUS = Manitoba Follow-Up Study; MI = myocardial infarction; NS = not significant; VHD = valvular heart disease.

TABLE III Multivariate Analysis of Predictors of Stroke

Variable	Relative Risk	Annual Stroke Event Rate (%)
Prior stroke/transient ischemic attack	2.5	11.7
History of hypertension	1.6	5.6
Age (per decade)	1.4	
History of diabetes	1.7	8.6

Adapted from *Arch Intern Med.*[50]

TABLE IV Annual Event Rate and 95% Confidence Interval (CI) per Age Group and Risk Factors

Risk	Categories*	Event Rate, % (95% CI)
Age (yr)		
<65	No risk factors	1.0 (0.3–3.1)
	One or more risk factors	4.9 (3.0–8.1)
65–75	No risk factors	4.3 (2.7–7.1)
	One or more risk factors	5.7 (3.9–8.3)
>75	No risk factors	3.5 (1.6–7.7)
	One or more risk factors	8.1 (4.7–13.9)

*Risk factors are a history of hypertension, a history of diabetes, and a history of prior stroke or transient ischemic attack.
Adapted from *Arch Intern Med.*[50]

States and whether the risk factors for stroke vary by ethnicity remains poorly understood.

Does echocardiography add anything to clinical risk factors?: It is controversial whether echocardiography provides useful information beyond clinical risk factors in determining which subsets of patients with AF are at risk of thromboembolism. The AF investigators addressed this issue by pooling data from 3 anticoagulation trials (the Boston Area Anticoagulation Trial for Atrial Fibrillation [BAATAF], SPAF, and SPINAF).[53] After adjustment for clinical factors, moderate to severe left ventricular systolic dysfunction remained a strong predictor of stroke (RR 2.5). However, the transthoracic echocardiographic findings did not have any value in defining low-risk subgroups beyond clinical data. In patients <65 years of age without clinical risk factors, the stroke rate was 0% even including the small number of patients without clinical heart failure but with echocardiographic evidence of left ventricular systolic dysfunction.[53]

The role of transesophageal echocardiography (TEE) in risk-stratifying patients with AF is also controversial. TEE is superior to transthoracic echocardiography in the evaluation for spontaneous echo contrast, atrial thrombus, and aortic plaque, yet TEE is more costly and invasive. TEE is used in some centers to evaluate patients with AF for early cardioversion.[49] TEE's potential may lie in the prediction of which patients with AF are at extremely high risk of thromboembolism. The SPAF investigators reported on patients at high risk for stroke that were assigned to adjusted-dose warfarin or to aspirin plus low-intensity anticoagulation.[54] Complex aortic plaque was associated with a high risk of stroke, and the absence of plaque was associated with a low risk of stroke (1.1–1.2%). In the presence of both complex plaque and other atrial abnormalities, the event rate was >20% in the combination therapy group. Interestingly, if an atrial thrombus was seen at study entry, patients assigned to adjusted-dose warfarin with a target international normalized ratio (INR) of 2.0 to 3.0 had a substantial 17.9% annual stroke rate.[54] The presence of atrial thrombus may mandate even more aggressive therapy than this INR range.[49] However, in a separate study that enrolled younger patients who were not necessarily high risk, thrombus of the left atrium occurred infrequently and was not an independent predictor of future thromboembolic events.[55]

COSTS OF ATRIAL FIBRILLATION

Little is known about the overall economic costs of AF. Data cited earlier addresses the excess costs after cardiac surgery. The American Heart Association recently estimated that AF was a discharge diagnosis for 325,000 hospitalizations.[39] A prospective cohort study of hospitalized Medicare patients with and without AF suggests that total Medicare spending was 9–23% greater in men and 10–11% greater in women with AF compared with those without AF.[56]

ATRIAL FIBRILLATION AND MORTALITY

Recent evidence from multiple studies supports an independent effect of AF on all-cause mortality.[3–5,14] In the FHS, AF remained a predictor of mortality in men (OR 1.5) and women (OR 1.9) after adjusting for age, cardiovascular disease, and cardiovascular risk factors. Even in low-risk patients without cardiovascular disease or valvular heart disease prior to the diagnosis of AF, AF more than doubled the risk of death.[3] Within subsets of patients with congestive heart failure, acute myocardial infarction, or acute stroke, AF increased mortality in some studies,[46,47,57–59] but not others.[34,35,60–62]

PREVALENCE OF ANTICOAGULATION

The AF investigators estimated that warfarin reduced the rate of stroke by 68% and death by 33%.[50] Unfortunately, the majority of AF patients do not receive anticoagulation. Data from the National Ambulatory Medical Care Surveys demonstrated that warfarin use was increasing between 1989 and 1993, from 13% to 40%, but plateaued thereafter. Age >80 years was a risk factor for not receiving anticoagulation.[28]

A low rate of warfarin use in the elderly is seen in a wide variety of settings.[63,64] In a study in the United Kingdom that included outpatients and nursing home residents, the lowest use of warfarin was among women over >75 years old, in whom use was a mere 12%.[21] Data from community, tertiary care, and academic hospitals, in which the patients would theoretically be more prone to thromboembolic complications, also demonstrated a low rate of anticoagulation.[65,66] Again, patient age correlated with the decision to withhold anticoagulation. Twice as many patients aged 45–54 years received anticoagulation compared with those aged 75–84 years.[66]

Why do physicians underuse anticoagulation in the elderly, although the elderly account for the majority of AF-related strokes? A survey of physicians at academic medical centers revealed that over half believed the risk of hemorrhage outweighed the benefit of stroke prevention in the elderly.[67] The issue of increased hemorrhagic risk in the elderly is controversial. In SPAF II, those >75 years old had a higher risk of major hemorrhage than the younger patients with similar INR values.[68] Conversely, in a large retrospective study of patients referred to a university anticoagulation clinic, there was no relation between bleeding complications and age.[69]

SUMMARY

AF is a common arrhythmia, and its prevalence may be increasing. Because the prevalence of AF and the risk of stroke with AF increase with age, the burden of AF will increase with the expected increase in the elderly in the United States. The association of AF with dementia will increase the morbidity from AF even further.

Information on the epidemiology of AF in racial subgroups and in developing countries is limited.

Therefore, it is unclear whether the risk factors that predispose to AF in white populations have the same relative risk in other ethnic groups. Similarly, the stroke risk factors described by the AF investigators in a mainly white sample may confer different stroke risk among other ethnic groups.

Remaining challenges in the care for the patient with AF include the need to prevent the onset of AF and to prevent the complications of AF. Because AF seems to be increasing in prevalence, efforts should be made to modify cardiovascular risk factors to attempt to reverse this trend. The application of the data from recent anticoagulation trials should reduce the complications and mortality from AF. More widespread understanding of the benefits of warfarin treatment should increase the prevalence of appropriate anticoagulation, as should further improvements in methods to stratify patients into low and high risk subgroups for stroke and for complications from anticoagulation.

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