REVIEW

Epidemiology of atrial fibrillation in France: Extrapolation of international epidemiological data to France and analysis of French hospitalization data

Épidémiologie de la fibrillation atriale en France : extrapolation à partir des données internationales et point sur les hospitalisations

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KEYWORDS
Atrial fibrillation;

Summary The prevalence of atrial fibrillation is steadily increasing throughout the world because of ageing populations and better management of coronary heart disease. An international literature review was conducted to estimate the prevalence and incidence of atrial
fibrillation in France. A review of the literature on comorbidities was also performed. Finally, French mortality and hospitalization data were analysed using the PMSI database. The prevalence of atrial fibrillation is estimated to be between 600,000 and 1 million people; of these, two-thirds are aged > 75 years. The incidence is estimated at between 110,000 and 230,000 new cases per year. In 2008, 412,000 hospitalized patients had a diagnosis of atrial fibrillation; this figure increased by 26% in the 3-year period between 2005 and 2008. These findings highlight the importance of targeting therapy, of upstream therapy, and of therapy that provides clear clinical and economic advantages over the well-established reductions already achieved in atrial fibrillation morbidity, mortality and cost. In addition, new prevention strategies should be developed, particularly secondary prevention strategies in patients with cardiovascular diseases.

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**MOTS CLÉS**
Fibrillation atriale ; Épidémiologie ; Prévalence ; Incidence ; Comorbidités ; Hospitalisation

**Résumé** La fibrillation atriale (FA) est en augmentation constante dans le monde, du fait du vieillissement des populations et de la meilleure prise en charge de la pathologie coronaire. Une revue de littérature internationale a été réalisée pour estimer la prévalence et l’incidence de la FA en France. Une analyse des publications sur les comorbidités a également été réalisée, ainsi qu’une analyse des données françaises de mortalité et d’hospitalisations (PMSI). La prévalence de la FA est estimée entre 600 000 et un million de personnes, dont deux tiers de plus de 75 ans et l’incidence est estimée entre 110 000 et 230 000 nouveaux cas par an. En 2008, 412 000 patients hospitalisés ont eu un diagnostic de FA. Ce chiffre a augmenté de 26 % sur les trois années 2005—2008. Ces données soulignent l’importance de la prévention des maladies cardiovasculaires et du développement de thérapies ciblant la FA, avec des avantages clairement établis en termes d’efficacité clinique et de rapport bénéfice/risque, ainsi que le développement de stratégies de prévention secondaire chez les patients porteurs de maladie cardiovasculaire.

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**Abbreviations**

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Full Form</th>
<th>Description</th>
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<tbody>
<tr>
<td>AF</td>
<td>atrial fibrillation</td>
<td></td>
</tr>
<tr>
<td>CHF</td>
<td>congestive heart failure</td>
<td></td>
</tr>
<tr>
<td>CI</td>
<td>confidence interval</td>
<td></td>
</tr>
<tr>
<td>NYHA</td>
<td>New York Heart Association</td>
<td></td>
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<tr>
<td>PMSI</td>
<td>Programme for the Medicalization of Information Systems</td>
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</tbody>
</table>

**Background**

AF is the most common arrhythmia and is characterized by uncontrolled atrial activation and a subsequent deterioration of atrial mechanical function. Stroke and CHF are the most common complications in subjects with AF [1], and associated mortality rates are higher than in patients without AF [1–3]. Epidemiological surveys show that the risk of AF increases with age, particularly during the sixth and seventh decades of life [1,4–6]. The increase in prevalence of AF over the past 50 years, due to the growing elderly population in industrialized countries, reflects this trend [6–8]. The projected continued increase in the prevalence of AF is a cause of great concern, as this disease presents a major public health and socioeconomic burden [9–11]. Targeting preventive healthcare and treatment for patients who are at risk is becoming an increasingly attractive option in order to reduce morbidity and control medical costs.

In this report, we carried out a systematic review of the literature to gather data on the prevalence and consequences of AF. Extrapolation of these data to French population statistics should enable us to better define the public health repercussions of AF in France and to identify specific target populations for monitoring and treatment. The incidence and prevalence of AF are not well known in France. A study by Guize et al. was published in 2007, but the study population was not representative of the general population [12].

**Methods**

**Literature review**

A literature review of published epidemiological studies in the field of AF was conducted using PubMed, with the following terms: ‘atrial fibrillation’ and ‘epidemiology’ or ‘prevalence’ or ‘incidence’ or ‘mortality’ or ‘comorbidity’. This literature review took into account only general population or community-based studies, which relate to the sampling of a geographical territory or of an administrative database, such as the Health Maintenance Organization in the USA or the General Practitioner database in the UK or other European countries. These studies covered all types of AF and the distinction between different types of AF is generally not detailed in the published articles or in the data sources.
Epidemiology of atrial fibrillation in France

Statistics

Data from international studies were used to extrapolate incidence and prevalence rates in the French population: the prevalence or incidence rates by age observed in the different studies were applied to the French population structure.

Analysis of French hospitalization data

Since 1991, public and private hospitals have been required to evaluate and analyse their activities. This analysis is based on the systematic collecting and computerized processing of minimal standardized medicoadministrative information contained in the standardized discharge case records, in a medicoeconomic database called PMSI.

The standardized discharge case record contains a limited amount of mandatory information: diagnoses (principal diagnosis and associated diagnosis) according to the International Classification of Diseases (ICD-10), procedures, related complications and/or morbidities and other information such as length of stay, patient’s age, etc.

An analysis of the PMSI database records for 2005–2008 was conducted for patients hospitalized for AF (as the principal or associated diagnosis).

Classification of atrial fibrillation

Several different classifications of AF can be found in the literature, complicating interstudy group comparisons [10,13]. The following classification, dividing AF into one of four types based on the number and duration of episodes, is recommended by the current guidelines of the American College of Cardiology, the American Heart Association and the European Society of Cardiology [10]: first detected episode of AF (symptomatic or asymptomatic); paroxysmal (self-terminating) AF, when an episode lasts ≤ 24 hours; persistent AF, when an episode lasts > 7 days, usually requiring termination by electrical or pharmacological cardioversion; permanent AF (previously referred to as chronic AF [13]), when AF fails to stop after cardioversion, or cardioversion is not attempted [10]. Paroxysmal and persistent AF may both be recurrent (two or more episodes) and are often progressive. Approximately 8–9% of patients with paroxysmal AF progress to permanent AF within 1 year and 25% within 5 years [14]. Higher rates of progression are observed in patients with persistent AF, with approximately 40% developing permanent AF by the end of the 1-year period [15].

The classifications have been defined for clinical research; they are very detailed and based on clinical features, so they are difficult to use in epidemiological studies.

Results

Prevalence of atrial fibrillation: international data

The prevalence of AF increases with age in both men and women (Table 1) and approximately 70% of patients with AF are aged 65–85 years [4]. In the general population aged > 60 years, the prevalence of AF is estimated to be below 1% [4,5,16]. However, a meta-analysis of four large population-based surveys [17–20] carried out in the USA, western Australia and Europe revealed that the prevalence of AF doubles with each decade of life after the age of 50 years, increasing to around 10% in individuals aged > 80 years [4]. In another long-term, follow-up study of 3983 male aircrew recruits, the probability of developing AF over a 44-year follow-up period was 7.5% [3]. These observations are supported by surveys conducted in the UK [21] and Scotland [22,23]. Murphy et al. recorded a prevalence of 9.4/1000 persons in men and 7.9/1000 in women, increasing to 71/1000 in subjects aged > 85 years [22] (Fig. 1).

A higher age-adjusted prevalence of AF has been documented consistently in men compared with in women [4,5,17–19,24,25]. The age-adjusted risk of developing AF is also significantly higher in Caucasians than in Africans [5,21,26].

Asymptomatic AF has been reported in 11–32% of patients in different studies [12,27,28] and seems to be more common in white (92% vs 88%, P = 0.01), male (77% vs 59%, P < 0.0001) patients.

The prevalence of AF has increased significantly over the past 50 years. Between 1968 and 1970, the prevalence of AF in US men aged 65–84 years was reported to be 3.2%, but this increased to 9.1% in the same age group between 1987 and 1989 [1]. A similar increase in the prevalence of AF, from 0.84 to 1.49% in men, and from 0.83 to 1.29% in women, was also observed in the UK between 1994 and 2003 [7].

<table>
<thead>
<tr>
<th>Study</th>
<th>Number of persons</th>
<th>Prevalence of atrial fibrillation (%)</th>
<th>Median age (years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meta-analysis of four USA studies [4]</td>
<td>14,000</td>
<td>Overall 0.89</td>
<td>75</td>
</tr>
<tr>
<td></td>
<td></td>
<td>≥ 40 years 2.3</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>≥ 65 years 5.9</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Median age (years) 75</td>
<td></td>
</tr>
<tr>
<td>Atrial fibrillation in California 1996–1997 (ATRIA study) [5]</td>
<td>17,974</td>
<td>Overall (≥ 20 years) 0.95</td>
<td>71.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>20–55 years 0.1</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>≥ 60 years 3.8</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>≥ 80 years 9.0</td>
<td></td>
</tr>
<tr>
<td>ECG baseline study (Rotterdam study) [25]</td>
<td>6808</td>
<td>Overall (≥ 55 years) 5.5</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>55–59 years 0.7</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>≥ 85 years 17.8</td>
<td></td>
</tr>
<tr>
<td>ECG: electrocardiogram.</td>
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</tr>
</tbody>
</table>

Table 1: Prevalence of atrial fibrillation in large, population-based surveys.
Prevalence of atrial fibrillation in France

A study carried out in the 1990s (ALFA) attempted to characterize the different subsets of AF observed by general cardiologists in office practice in France. The relative prevalences of paroxysmal, chronic and recent onset AF among 756 patients with electrocardiogram-confirmed AF were 22.1, 51.4 and 26.4%, respectively [13]. Patients with chronic AF were significantly older \( (P < 0.0002) \) than those with paroxysmal AF but there was no association between sex and type of AF [13]. Asymptomatic AF was present in 11.4% of patients.

The current prevalence of AF in France was recently estimated by Guize et al. in a study population comprising 98,961 men and 55,109 women, who had a free check-up in the Centre d’Investigations Préventives et Cliniques, Paris [12]. AF was identified in 0.05% of men and 0.01% of women aged < 50 years, compared with in 6.5% of men and 5.2% of women aged > 80 years.

By applying the prevalence figures calculated for the different age groups and sexes in the USA, Australia and Europe [4,5,25] to the French population, we estimated that there are currently between 600,000 and 1 million people in France with AF, that two-thirds of these subjects are likely to be aged > 75 years and that most of them will be women.

Incidence of atrial fibrillation: international data

The incidence of AF is also higher in older subjects (Table 2) [3,24–26]. The incidence of AF has been reported to double for every 10-year increment in age, with an annual incidence of 3.1 cases per 1000 patient-examinations in men and 1.9 cases in women aged 55–64 years, increasing to 38.0 and 31.4 cases, respectively, in elderly patients aged 85–94 years [24]. Mabo et al. also reported a higher annual incidence in older subjects, increasing from 0.1% in those aged < 40 years to more than 1.5% in women and more than 2% in men aged > 80 years [16].

The incidence of AF has also increased over the past 30 years [16]. Miyasaka et al., in the Minnesota study, showed an age- and sex-adjusted incidence of AF per 1000 person-years of 3.04 (95% CI 2.78–3.31) in 1980, which increased to 3.68 (95% CI 3.42–3.95) in 2000 [29]. Poisson regression with adjustment for age and sex confirmed an increase in the incidence over the 21-year period of 12.6% (95%CI 2.1–23.1) \( (P = 0.014) \). The incidence ratio for men/women was 1.86 \( (P < 0.01) \) [29].

### Table 2  Age-related incidence of atrial fibrillation in different studies (calculated as number of cases per 1000 patient-years).

<table>
<thead>
<tr>
<th>Study/Region</th>
<th>Age (years)</th>
<th>Incidence of AF Men</th>
<th>Incidence of AF Women</th>
</tr>
</thead>
<tbody>
<tr>
<td>Framingham study [24]</td>
<td>55–64</td>
<td>3.1</td>
<td>1.9</td>
</tr>
<tr>
<td>Cardiovascular Health study [26]</td>
<td>65–74</td>
<td>9.0</td>
<td>5.5</td>
</tr>
<tr>
<td></td>
<td>70–74</td>
<td>22.8</td>
<td>9.1</td>
</tr>
<tr>
<td></td>
<td>75–79</td>
<td>34.8</td>
<td>23.1</td>
</tr>
<tr>
<td></td>
<td>≥ 80</td>
<td>58.7</td>
<td>25.1</td>
</tr>
<tr>
<td>Total</td>
<td>85–94</td>
<td>38.0</td>
<td>31.4</td>
</tr>
<tr>
<td>Total Combined</td>
<td>26.4</td>
<td>14.1</td>
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</tbody>
</table>

AF: atrial fibrillation.
Estimated incidence of atrial fibrillation in France

The current incidence of AF in France is unknown, but by applying the above incidence rates to French population figures, it is estimated that there are between 110,000 and 230,000 new cases of AF per year in France. This represents a significant burden for the healthcare service.

Comorbidities and risk factors for atrial fibrillation

Underlying heart disease is present in 70% of patients with AF, and a number of specific predictors have been identified, including ischaemic heart disease, valvular (mitral) disease, CHF, hypertension, cardiomyopathy, supraventricular and ventricular rhythm disturbances [1,3,10]. The prevalence of AF increases in line with the severity of heart disease (NYHA I prevalence 4% vs NYHA IV prevalence 50%) [10].

In the Framingham 38-year study, 20.6% of men who developed AF had CHF at inclusion, compared with only 3.2% without AF (26% vs 2.9% of women) [24]. In this study, patients with CHF (odds ratio 4.5 [95% CI 3.1—6.6] in men and 5.9 [4.2—8.4] in women) and valvular heart disease (odds ratio 1.8 [95% CI 1.2—2.5] in men and 3.4 [2.5—4.5] in women) had a particularly high risk of developing AF. The 2—3 year incidence of AF in heart failure patients has been reported to be 5—10% [30].

Patients with asymptomatic AF are more likely to have less severe heart disease and a lower incidence of coronary artery disease (28% vs 40%, P < 0.0001), CHF (13% vs 24%, P < 0.0001) and peripheral vascular disease (4% vs 7%, P = 0.018) [27]. Conversely, the prevalence of symptomatic AF increases with the severity of these conditions.

Hypertension (odds ratio 1.5 [95% CI 1.2—2.0] in men and 1.4 [1.1—1.8] in women) and myocardial infarction in men (odds ratio 1.4 [95% CI 1.0—2.0]) also increase the risk of AF (Table 3) [24]. According to the different studies related to AF comorbidities, 9—21% of AF patients also present diabetes mellitus [5,11,13,21,27,31,32]. Diabetes mellitus was an independent risk factor for AF (odds ratio 1.4 [95% CI 1.0—2.0] in men and 1.6 [1.1—2.2] in women) [1,2]. Obesity is also reported to carry a 50% higher risk of AF in both men and women, mediated by left atrial dilation [33].

Cigarette smoking has been identified as a significant age-adjusted risk factor in women [1,2]. A number of non-cardiovascular factors have also been reported to trigger acute, temporary AF, including alcohol intoxication (so-called ‘holiday heart syndrome’), cardiac or thoracic surgery, electrocution, myocardial infarction, pericarditis, myocarditis, pulmonary embolism and other pulmonary disorders, hyperthyroidism or other metabolic disorders and severe infections [10].

Complications and prognosis of atrial fibrillation

Morbidity and atrial fibrillation

The major complication associated with AF is stroke. It is estimated that one of every six strokes occurs in AF patients [3] and that approximately 5% of patients with persistent or permanent AF each year will have a stroke [10].

The CHADS2 index is now used to determine the yearly thromboembolic risk of AF patients, according to presence or absence of the following risk factors: CHF (1 point), hypertension (1 point), age > 75 years (1 point), diabetes (1 point), history of stroke or transitory ischaemic attack (2 points) [34]. The predictive value of this scoring system was evaluated in 1733 elderly patients with nonvalvular atrial fibrillation, aged 65—95 years, who were not given warfarin at hospital discharge. The risk of stroke increased from 1.9 in AF patient with a CHADS2 score of 0 to 18.2 in AF patients with CHADS2 score of 6 [35]. These figures have been validated by Rietbrock et al. in more than 50,000 AF patients from the General Practice Research Database in the UK [36].

The risk of ischaemic stroke has been reported to be 2—7-fold higher in patients with non-rheumatic AF than in patients without AF after adjustment for other factors and in the absence of anticoagulant treatment [3,10]. Patients with asymptomatic AF have less severe heart disease, but seem to have more frequent strokes or transient ischaemic attacks than symptomatic patients (17% vs 13%, P = 0.005) [27].

The proportion of strokes attributable to AF increases with age [20]. In the Framingham Heart study, the annual incidence of stroke due to AF was 23.5% in patients aged 80—89 years, compared with only 1.5% in patients aged < 59 years [20]. In patients with rheumatic heart disease and AF, the stroke risk increased 17-fold compared with age-matched controls. The attributable risk was five-fold greater than in those with non-rheumatic AF [37]. The risk of stroke is higher in AF patients with predisposing factors such as a previous history of stroke, arterial hypertension, coronary artery disease, myocardial infarction, diabetes and recent heart failure. Combining the results of several studies, Hart et al. highlighted four consistent risk factors for stroke in patients with nonvalvular AF: increasing age, hypertension, diabetes, and previous stroke or transient ischaemic accident, which is the most powerful risk factor, associated with high rates of stroke (10% per year on average) [38].

The risk of distal embolic events is also higher in patients with AF [39]. Authors of the ALFA study reported a 2.4% increase in the incidence of emboli in subjects with AF, over a mean follow-up period of 8.6 months [13]. AF has also been reported to increase the risk of evolution towards CHF (relative risk 2.98) [3].

Heart failure

A study in a community-based cohort in Minnesota showed an incidence of CHF of 7.8% within the first 12 months after AF diagnosis and of around 3% per year in the following years, with a cumulative CHF rate of 20% at 5 years [40]. In this study, CHF in AF patients was associated with an increased mortality risk of 3.4 [95% CI 3.1—3.8]. A higher risk of mortality has also been observed by Nieuwlaat et al. in AF patients with heart failure: 9.5% vs 3.3% after a 1-year follow-up period [41]. Wang et al. studied the relationship between AF and heart failure, particularly the temporal relationship between the two conditions, in the Framingham cohort [42]. During the study period, 1470 participants developed AF, CHF or both. Among patients with both conditions, 38% had AF first, 41% had CHF first and 21% had both diagnosed on the same day. The incidence of CHF among AF subjects was
Table 3  Common comorbidities in patients with atrial fibrillation.

<table>
<thead>
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<tbody>
<tr>
<td></td>
<td>[USA]</td>
<td>USA</td>
<td>USA</td>
<td>USA</td>
<td>UK</td>
<td>UK</td>
<td>France</td>
<td>France</td>
</tr>
<tr>
<td>Mean age (years)</td>
<td></td>
<td>71.2</td>
<td>70</td>
<td>69.7</td>
<td>76.6</td>
<td>&gt; 75</td>
<td>68.6</td>
<td>69.0</td>
</tr>
<tr>
<td>Eligibility</td>
<td></td>
<td>&gt; 65 years of age or at least one risk factor</td>
<td>Paroxystic or persistent AF, &gt; 50 years</td>
<td>ECG AF in patients aged &gt; 65 years</td>
<td>AF patients of 206 cardiologists</td>
<td>AF patients of 82 cardiologists</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sample size</td>
<td></td>
<td>17,974</td>
<td>481</td>
<td>3576</td>
<td>3400</td>
<td>660</td>
<td>756</td>
<td>671</td>
</tr>
<tr>
<td>Hypertension (%)</td>
<td></td>
<td>49.3</td>
<td>68</td>
<td>71</td>
<td>51</td>
<td>48</td>
<td>160</td>
<td>47</td>
</tr>
<tr>
<td>CAD (%)</td>
<td></td>
<td>34.6</td>
<td>28</td>
<td>40</td>
<td>26</td>
<td>25</td>
<td>39.4</td>
<td>43</td>
</tr>
<tr>
<td>Cardiomyopathy (%)</td>
<td></td>
<td>—</td>
<td>6.0</td>
<td>9.0</td>
<td>5</td>
<td>3</td>
<td>28.8</td>
<td>13</td>
</tr>
<tr>
<td>Heart failure (%)</td>
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<td>29.2</td>
<td>13</td>
<td>24</td>
<td>24</td>
<td>18</td>
<td>15.3</td>
<td>—</td>
</tr>
<tr>
<td>Valvular disease (%)</td>
<td></td>
<td>4.9</td>
<td>12</td>
<td>12</td>
<td>5</td>
<td>6</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Diabetes mellitus (%)</td>
<td></td>
<td>17.1</td>
<td>21</td>
<td>20</td>
<td>20</td>
<td>18</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Ischaemic stroke/TIA (%)</td>
<td></td>
<td>8.9</td>
<td>17</td>
<td>13</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

Asympt: asymptomatic; CAD: coronary artery disease; ECG: electrocardiogram; Sympt.: symptomatic; TIA: transient ischaemic attack; WBAFP: West Birmingham Atrial Fibrillation Project.
33 per 1000 person-years, and the incidence of AF among CHF subjects was 54 per 1000 person-years. Development of the other condition in patients with AF or CHF is associated with a poor prognosis.

Atrial fibrillation and quality of life
AF leading to reduced functional capacity, dyspnoea, palpitations, fatigue, tachycardia-induced cardiomyopathy, heart failure or angina significantly affects quality of life [43]. Even subjects with paroxysmal AF reported a substantially worse quality of life than healthy control subjects, using validated quality of life questionnaires [44].

Mortality and atrial fibrillation: international data
Data on the contribution of AF to mortality are conflicting, particularly in patients with mild-to-moderate heart failure. One study showed no increase in mortality in patients with concomitant AF [45], whereas in another study, mortality was significantly higher in patients with AF than in those with normal sinus rhythm (34% vs 23% respectively, P<0.001) [46]. In most studies, the increased mortality seen in patients with AF has been linked to the severity of the underlying heart disease rather than to the presence of AF itself [1,3,27,45,46]. In some studies, AF does nevertheless appear to contribute directly to increased mortality. In the Manitoba follow-up study, AF increased the total mortality risk 1.31-fold (P<0.05) and increased the risk of cardiovascular mortality 1.41-fold. AF also increased the risk of fatal stroke 2.48-fold [95% CI 1.35—4.57] [3]. After adjustment for age, AF was associated with an overmortality of 2.4 in men and 3.5 in women. After adjustment for other coexisting cardiovascular conditions and risk factors, AF was associated with a 1.5-fold [1.2—1.8] higher risk of death in men and 1.9-fold [1.5—2.2] increased risk in women, over all age ranges [2].

In Sweden, a recent study of 888 patients treated for paroxysmal AF at the hospital in Stockholm showed a mean annual mortality rate of 7%, which corresponds to a standardized mortality ratio of 1.6 for all-cause mortality, compared with the general population [47].

No association has been found between AF and non-cardiovascular mortality in either men or women [29].

Atrial fibrillation mortality in France
Although the hazard risk of stroke-related mortality was 2.0 [0.7—4.3] in men and 4.5 [1.3—16] in women in a French population study, the risk of death among men without cardiopathy or hypertension, after adjustment for other risk factors, was not significantly increased (overall mortality 1.1 [0.5—2.0], cardiovascular mortality 1.4 [0.6—2.9]) [12]. Furthermore, in the ALFA study, two-thirds of the 3.7% mortality over 8.6 months was due to underlying cardiovascular causes [13].

Data from CepiDC-IFR 69-INSERM on the medical causes of death in French subjects [48] indicate that the annual number of deaths from AF increased between 2000 and 2007, particularly in older subjects (Fig. 2). A total of 3440 French subjects (1183 men and 2257 women) died from AF in 2000 and 4747 (1678 men, 3069 women) died in 2007, but these data are probably underestimated because they depend on the details listed on death certificates. The age- and sex-standardized mortality rate increased from 6.1 to 9.5 per 100,000 between 2000 and 2007.

Hospitalizations
Approximately one-third of hospital admissions for cardiac rhythm disturbances are due to AF. In patients in the west of Scotland, Stewart et al. reported a rate of incident hospitalization of 1.9 cases/1000 person-years in the 20 years after initial screening for their study [23]. The number of hospital admissions for AF has increased by 66% over the last 20 years due to the ageing population, the increasing prevalence of chronic heart disease and more frequent diagnosis [10]. In the USA, the number of hospitalizations with AF as the primary diagnosis increased by 34% over the 6 years between 1996 and 2001 [49].

In France, the 2008 PMSI database showed that around 84,000 patients were hospitalized with a principal diagnosis of AF and 349,000 with an associated diagnosis of AF (total of 412,000 patients corresponding to 610,198 hospital stays, 53.3% male). The number of cases increased regularly over the 3 years (+26% for the number of patients, +32% for the number of hospitalizations) (Fig. 3). Most of these patients (92%) were aged ≥60 years. Major comorbidities were hypertension, heart disease, heart failure, stroke, syncope and collapse, and dialysis (Table 4). In patients with AF as the principal diagnosis, the attributable mortality was 0.6%; however, in patients who were hospitalized with AF associated with another pathology, the mortality rate was 6.6%, giving an overall hospital mortality of 5.6%.

In the Cost of Care in AF (COCAF) study, 31.3% of 671 patients with AF recruited by cardiologists across France...
were hospitalized because of their disease [11]. Subjects with persistent or permanent AF were significantly more likely to be hospitalized or to die compared with those with paroxysmal AF ($P < 0.05$, $P < 0.001$, respectively). In this study, the financial burden of AF was related to hospitalization (52%), drugs (23%), consultations (9%), further investigations (8%), loss of work (6%) and paramedic procedures (2%).

**Perspectives**

The prevalence of AF in France is estimated at between 600,000 and 1 million patients, of which 400,000—660,000 are aged > 75 years. The number of new cases is 110,000—230,000 per year.

The number of patients with AF is increasing every year and the socioeconomic burden of AF is expected to continue to increase in the foreseeable future.

An estimate of the projected number of AF patients in France in 2050, based on central projected population trends (70 million inhabitants; life expectancy 86.4 years; reproduction rate 1.9; migration + 100,000 per year) and former AF rates, has been calculated. With all reserves, particularly due to the evolution of cardiovascular diseases and other risk factors in the population, it is estimated that between 1.1 and 2 million French people will present AF by 2050.

### Table 4  Characteristics of patients hospitalized with atrial fibrillation in France in 2008.

<table>
<thead>
<tr>
<th></th>
<th>Principal diagnosis</th>
<th>Associated diagnosis</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of patients (n)</td>
<td>84,603</td>
<td>348,683</td>
<td>412,047</td>
</tr>
<tr>
<td>Men/women (%)</td>
<td>57.7/42.3</td>
<td>52.4/47.6</td>
<td>53.3/46.7</td>
</tr>
<tr>
<td>Age group (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 40 years</td>
<td>2.6</td>
<td>0.4</td>
<td>0.8</td>
</tr>
<tr>
<td>40–44 years</td>
<td>1.6</td>
<td>0.3</td>
<td>0.6</td>
</tr>
<tr>
<td>45–49 years</td>
<td>2.8</td>
<td>0.7</td>
<td>1.1</td>
</tr>
<tr>
<td>50–59 years</td>
<td>12.5</td>
<td>4.4</td>
<td>5.8</td>
</tr>
<tr>
<td>60–69 years</td>
<td>20.6</td>
<td>11.3</td>
<td>12.9</td>
</tr>
<tr>
<td>70–79 years</td>
<td>31.4</td>
<td>30.4</td>
<td>30.4</td>
</tr>
<tr>
<td>≥ 80 years</td>
<td>28.3</td>
<td>52.4</td>
<td>48.4</td>
</tr>
<tr>
<td>Comorbidities (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hypertension (I10 to I15)</td>
<td>33.9</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Heart disease (I20 to I2298)</td>
<td>2.2</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Heart failure (I50)</td>
<td>9.1</td>
<td>15.0</td>
<td>—</td>
</tr>
<tr>
<td>Stroke (I60 to I669)</td>
<td>1.2</td>
<td>0.8</td>
<td>—</td>
</tr>
<tr>
<td>Aortic stenosis</td>
<td>—</td>
<td>1.0</td>
<td>—</td>
</tr>
<tr>
<td>Syncope and collapse (R55)</td>
<td>—</td>
<td>1.1</td>
<td>—</td>
</tr>
<tr>
<td>Dialysis (Z491)</td>
<td>—</td>
<td>2.9</td>
<td>—</td>
</tr>
<tr>
<td>Hospital deaths (%)</td>
<td>0.6</td>
<td>6.6</td>
<td>5.6</td>
</tr>
</tbody>
</table>
Conclusion

This study focuses on the major published studies on the incidence and prevalence of AF, and highlights the disparity of approaches in terms of reference population studied and definition of AF. These studies do not yet take into account the recent recommendations of the European Society of Cardiology with respect to the classification of AF or the use of different risk scores, including the CHA2DS2-VASc score.

The prevalence of AF in France is estimated to be between 600,000 and 1 million people and the incidence between 110,000 and 230,000 new cases per year. In 2008, 412,000 hospitalized patients had a diagnosis of AF, which represents an increase of 26% over the 3 years from 2005 and 2008.

These figures emphasize the importance of targeting therapy, of upstream therapy and of therapy that provides clinical and economic advantages over the well-established therapy, of upstream therapy and of therapy that provides clinical and economic advantages over the well-established therapy. The development of a scoring system to predict an individual's risk of developing AF may contribute to its prevention.

New prevention strategies should be developed, particularly secondary prevention strategies in patients with cardiovascular diseases.

Conflict of interest statement


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References


