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Trends in Hospitalization for Atrial Fibrillation: Epidemiology, Cost, and Implications for the Future

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ABSTRACT

Atrial fibrillation (AF) is the most prevalent arrhythmia worldwide and the most common arrhythmia leading to hospitalization. Due to a substantial increase in incidence and prevalence of AF over the past few decades, it attributes to an extensive economic and public health burden. The increasing number of hospitalizations, aging population, anticoagulation management, and increasing trend for disposition to a skilled facility are drivers of the increasing cost associated with AF. There has been significant progress in AF management with the release of new oral anticoagulants, use of left atrial catheter ablation, and novel techniques for left atrial appendage closure. In this article, we aim to review the trends in epidemiology, hospitalization, and cost of AF along with its future implications on public health.

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Atrial fibrillation (AF) is the most common sustained arrhythmia worldwide and the most common arrhythmia for which the patients are hospitalized. A steadily aging population in the United States (US) and the recent advances in AF diagnosis lead to an increase in cases of AF over the past few decades, attributing to substantial economic and public

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Abbreviations and Acronyms

AAD = anti-arrhythmic drugs

AF = atrial fibrillation

AHI = apnea/hypopnea index

ARIC = Atherosclerosis Risk in Communities

BID = bis in die (Latin for twice daily)

BMI = body mass index

CAD = coronary artery disease

CARAF = Canadian Registry of Atrial Fibrillation

CD = celiac disease

CHF = congestive heart failure

CHS = Cardiovascular Health study

CI = confidence interval

CKD = chronic kidney disease

COPD = chronic obstructive pulmonary disease

CPAP = continuous positive airway pressure

CV = cardiovascular

DM = diabetes mellitus

ECG = electrocardiogram

ED = emergency department

ER = emergency room

HR = hazard ratio

HT = hyperthyroidism

HTN = hypertension

ICER = incremental cost-effectiveness ratio

ICM = implantable cardiac monitor

INR = international normalized ratio

IR = incidence rate

IRR = incidence rate ratio

LAA = left atrial appendage

LACA = left atrial catheter ablation

LAE = left atrial enlargement

LOS = length of stay

health burden.[1,2] AF also increases the risk of morbidity and mortality resulting from stroke, congestive heart failure (CHF), acute coronary syndrome and impairs quality of life, all of which accentuate this burden.[3] There have been multiple studies done looking at economic implications of AF in several nations including the US,[4] France[5] and United Kingdom. Studies in US have shown that the cost of hospitalization is approximately three times higher for patients with AF than those without AF.[4,6] Despite the latest advancements, all indicators point to an increasing burden of AF in the 21st century that will remain a therapeutic and economic challenge. Here we aim to review the economic trends in atrial fibrillation hospitalization and their implications on public health.

Epidemiology of AF

AF is a major healthcare problem worldwide, with enormous economic and public health implications. A systematic review of population-based studies of AF from 1998 to 2010 (n = 184) gave an estimate of 33.5 million cases of AF in 2010, with 5 million new cases being reported each year.[7] In the US alone AF incidence has been projected to double from 1.2 million cases in 2010 to 2.6 million cases by 2030. Given the increase in incidence, AF prevalence is projected to increase from 5.2 million cases in 2010 to 12.1 million cases by 2030.[1,2] This growth can be attributed to a growing proportion of elderly population along with improved AF diagnostic procedures.

Incidence

There have been multiple studies demonstrating that incidence of AF increases with advancing age. During 2010, in men and women respectively, the incidence rates (per 100,000 person years) were estimated to be 77.5 (95% CI 65.2–95.4) and 59.5 (95% CI 49.9–74.9).[7] Its incidence is scarce until the seventh decade where it exponentially increases in successive decades.[8] In the Manitoba Follow-Up study, the risk of AF increased with advancing age from 0.5 per 1000 person years before the age 50 to 9.7 per 1000 person years after age 70.[9] It was also apparent that the higher incidence of AF was associated with male gender. A study conducted by Michelena et al. showed that the cumulative risk for AF is 17% for women when compared to 21 % in men.[10] Overall the incidence of AF was higher in men than women in all age groups across all the studies.[2]

Studies regarding the association between race and incidence of AF show that gender differences are more prominent in the Caucasian population.[11,12] AF was much less prevalent in African Americans (19.7%) than Caucasians (38.3%, $p < 0.001$). After adjustment for risk factors for AF and other potential confounders, African Americans had 49% lower odds of AF (adjusted OR 0.51, 95% CI 0.35–0.76).[13] Dewland et al. conducted a study that included 13,967,949 patients and evaluated the relationship between race and incidence. They found that compared to the Caucasian population, African Americans (hazard ratio [HR] 0.84), Hispanics (HR 0.78) and Asians (HR 0.78) had lower risk of AF.[14] The reason for this disparity is not completely understood.

Prevalence

In the general population the prevalence was reported to be 0.5%–1% and is strongly associated with increasing age. During 2010, in men and women respectively, the prevalence rates (per 100,000 population) were 596.2 (95% CI 558.4–636.7) and 373.1 (95% CI 347.9–402.2).[7] The population prevalence of each of the risk factors for AF is increasing, as there are advances in medical therapy that increase the life expectancy. There is evidence of increasing prevalence over time of AF both on an age-adjusted and absolute basis. The prevalence of AF is low before the age of 40 years and increases exponentially beyond the age of 65 years.[15] In addition, the Framingham study provided evidence for a steady increase in the point prevalence of AF between the 1960s and 1980s.[8] The point prevalence of AF in the general population at the end of the 20th century was reported to be around 1–2%; ranging from 0.1% of adults aged 55 years or less, increasing to 10% or more in those aged 80 years or more.[11,15] Similar to its incidence, prevalence of AF is consistently higher in men than women across the majority of the study cohorts in most age groups. Within the different study cohorts, point prevalence ranged from 0.1% at the lowest in females aged younger than 55 years to 27.8% in males aged 85