Epidemiology, management, and outcomes of atrial fibrillation among 30 million citizens in Shanghai, China from 2015 to 2020: A medical insurance database study

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Summary

Background Atrial fibrillation (AF) has become a significant public health concern in China, with population aging and urbanization.

Methods Data screening was performed for 30,244,930 subjects with medical insurance in the Shanghai Municipal Health Commission database between 2015 and 2020. Patients diagnosed with AF were identified and further assessed for treatment information and clinical outcomes, as well as sex differences and impact of COVID-19 pandemic on AF management.

Findings AF prevalence was 0.88% in Shanghai, which increased with age and reached 6.70% at subjects 80 years and over. AF was more prevalent in women compared with men (0.89% vs. 0.88%, p<0.0001), which could be attributed to higher AF burden in women over 80 years. Driven by increased prescription of non-vitamin K antagonist oral anticoagulants, anticoagulant use increased from 19.46% in 2015 to 56.57% in 2020. The number of left atrial appendage closure increased from 0.16% in 2015 to 1.23% in 2020. Rhythm control strategy was increasingly adopted, as the use of antiarrhythmic drugs doubled and ablation increased by 21% in 2020 compared to 2015. Compared with men, women were less prone to receive rhythm control treatments, including antiarrhythmics, ablation and cardioversion, but more likely to adopt rate control drugs. During the 5.5 years follow-up, the incidences of stroke, transient ischemic attack, systemic embolism, bleeding, myocardial infarction, and in-hospital death were 6.09%, 5.74%, 1.44%, 5.11%, 8.41%, and 12.84% in patients with index diagnosis of AF in 2015, respectively.

Interpretation The burdens of AF and AF-related outcomes in Shanghai are high. Management of AF is markedly improved in recent years, and was not or only slightly impeded by the COVID-19 pandemic. There are sex differences in the prevalence, management, and outcomes of AF.

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Introduction

Atrial fibrillation (AF) has become a major global health burden owing to multiple factors, including economic growth, an aging population, and increased prevalence of AF-related risk factors in both Western and developing countries such as China. Although epidemiological data...
Research in context

Evidence before this study

Atrial fibrillation (AF) has become a significant public health concern worldwide. We searched PubMed for articles published in English using the search terms “prevalence”, “China”, “atrial fibrillation”, “anticoagulation”, “left atrial appendage closure”, “ablation”, “rhythm control”, and “rate control”. Additionally, Google Scholar was used to search for manuscripts and unpublished reports. Previous studies, which conducted years or even decades ago with small sample sizes, have reported that prevalence of AF was 0.65%, 0.71%-1.2%, 1.1%-2.31% and 3.3% among adults over 30, 35, 40 and 65 years old in China, respectively. With the process of population aging and urbanization, the implementation of the Hierarchical Medical System, the expansion of medical insurance coverage and the emergence of new drugs and interventional treatments, the demographic features and management of AF have rapidly shifted in China in recent years. Also, the impact of COVID-19 pandemic on AF management was rarely discussed.

Added value of this study

Taken advantage of the Shanghai Municipal Health Commission database which covers 96% of Shanghai residents, this real-world study provided a panoramic, near-whole-population and up-to-date view of the epidemiology, management and outcomes of AF in Shanghai, the largest and most aging city in China. AF prevalence was estimated at 0.88% in Shanghai, and was slightly elevated in women (0.89%) than in men (0.88%). For stroke reduction, the prescription of the oral anticoagulants, especially non-vitamin K antagonist anticoagulants, and the implantation of left atrial appendage closure devices have been prominently improved since 2015. In the aspect of symptom control, beta-blockers were wildly prescribed for controlling ventricular rate, and amiodarone was the most applied antiarrhythmic drug. Radiofrequency catheter ablation was the dominant method for ablation, while cryoballoon ablation showed a rapid increase. The adoption of cardioversion was limited. AF was accompanied by non-negligible risks of clinical events during follow-up, such as myocardial infarction, stroke, transient ischemic attacks, systemic embolism, bleeding, and in-hospital death. The COVID-19 pandemic had limited impact on AF management in Shanghai. Significant sex differences were observed in AF prevalence, management, comorbidities and outcomes.

Implications of all the available evidence

The burden of AF in Shanghai was substantial. The comprehensive management of AF has markedly improved in recent years. New approaches for better AF management are proposed to further improve AF-related outcomes. Due to the unique demographic and socioeconomic features of Shanghai, the experience in AF management in Shanghai may provide valuable implication for other parts of China and developing countries worldwide.

on the prevalence of AF in North America and Europe are available, corresponding data in China are limited and are based on relatively small sample studies, which reported AF prevalence rates of 0.65%, 0.71%-1.2%, 1.1%-2.31% and 3.3% among adults over 30, 35, 40 and 65 years old, respectively. More importantly, those epidemiological studies of AF were conducted years or even decades ago, before the era that non-vitamin K antagonist oral anticoagulants (NOACs) and catheter ablation were widely adopted. With population aging and urbanization, the implementation of the Hierarchical Medical System and the expansion of medical insurance coverage, the demographic features and management of AF have rapidly shifted in China. Newly emerged approaches with rapidly expanding market, e.g., NOACs, left atrial appendage closure (LAAC), and cryoballoon ablation, have drastically reshaped AF management and related outcomes consequently, which was not covered in previous studies. Sex differences, which are important information for health care improvement for both sexes, were less investigated regarding the prevalence, management and outcomes of AF in China. Whether the COVID-19 pandemic exerts negative effects on AF management was also rarely discussed.

As the largest and most developed city in China, Shanghai has the highest rate of elderly, where AF burden has become substantial. As 96% of registered residents were covered by the government-issued medical insurances, it enabled us to perform a near-whole-population epidemiological investigation of AF using the Shanghai Municipal Health Commission database. Medical data were collected from more than 30 million Shanghai residents within 6 years, from 2015 to 2020. Thus, this real-world study aimed to provide a panoramic, near-whole-population and up-to-date view of the epidemiology, management and outcomes of clinically diagnosed AF in Shanghai, which may also have valuable implication for other parts of China and developing countries worldwide. This study also investigated the sex differences regarding AF prevalence, management and clinical outcomes, and the impact of COVID-19 pandemic on AF management in Shanghai, China.

Methods

Study Population and Data Collection

This study was approved by the ethics committee of Xinhua Hospital, School of Medicine, Shanghai Jiao Tong University. It included subjects enrolled in the Shanghai Municipal Health Commission database from 2015 to 2020. The database covers all sources of medical records in Shanghai from 2,346 medical institutions, including information of inpatient and outpatient visits at all hospitals, clinics, and routine primary and family cares. It provides complete lists of admission and discharge dates with diagnostic codes according to the 10th revision of
the International Classification of Diseases (ICD-10), as well as codes for surgical and therapeutic procedures. The database not only included medical information of Shanghai residents, but also contained a nonnegligible amount of nonlocals who sought medical care in Shanghai. With the near-universal health care policy of Shanghai, the population with government-issued health insurance, including the Urban Residents’ Basic Medical Insurance (URBMI), the Urban-Employ Based Medical Insurance (UBBMI) and the New Rural Cooperative Medical Scheme (NRCMS), largely represents the permanent registered residents.8 Therefore, patients without local medical insurance were excluded to avoid confounding by nonlocals. The Chinese citizen identification number was applied to avoid repeated counting of subjects when calculating the prevalence. A total of 30,244,930 subjects with local medical insurance were further screened for AF (Flowchart in Supplemental Figure 1).

Patients with AF

Among the population with medical insurance, patients with diagnosed AF were identified by searching for the presence of ICD-10 codes of AF (I48 01-03; O99.418). As there might be multiple records for one person in this database, unique identification number was applied when counting the absolute number of AF patients. Nevertheless, all medical records were screened and analyzed for any diagnoses of comorbidities, therapeutic management, and clinical events. ICD-10 coded comorbidities, including hypertension, diabetes, coronary artery diseases, vulvar heart diseases, renal dysfunction, chronic obstructive pulmonary diseases (COPD), thyroid dysfunction, mental and behavioral disorders, and history of valvular surgery and coronary artery bypass grafting were evaluated. Outcomes and treatment-related complications, including stroke, transient ischemic attack (TIA), systemic embolism, myocardial infarction, major bleeding, and in-hospital death, were also extracted. Medication data were retrieved from this database. Codes for drugs, including oral anticoagulants, antiarrhythmic drugs and rate control drugs, were obtained based on the Sunshine Medical Procurement All-In-One, a system of centralized purchasing of drugs (including different trade names) covering all hospitals in Shanghai (http://www.smnpaa.cn/). Procedures, including LAAC, cardioversion, radiofrequency catheter ablation, cryoballoon ablation and surgical ablation, were extracted based on the operation codes. Detailed codes for diseases, operations and drugs are listed in Supplemental Table 1-3.

Statistical Analysis

Data was presented as mean ± standard deviation (SD), or as absolute value and percentage. The crude prevalence of AF was derived directly from the number of patients with AF and the total number of subjects included in the database from 2015 to 2020, and it was further stratified by age group and sex. The standardized prevalence of AF was calculated according to the Seventh National Population Census of China.9 The proportion of medication and procedures in each year were calculated from the number of patients who were prescribed with certain medications or underwent procedures in that year divided by the number of subjects with AF diagnosis in the same year. Differences of each research index in different age groups or sexes were tested with Pearson’s Chi-square test or Fisher’s exact test when appropriate. P<0.05 was considered statistically significant. All analyses were performed with SPSS 20.0 (IBM Corporation, NY, USA).

Role of the funding source

The funder of the study had no role in the study design, data collection, data analysis, data interpretation, or writing of the reports. The corresponding author had full access to all the data in the study and had final responsibility for the decision to submit for publication.

Results

AF prevalence in Shanghai

During the 6-year inclusion period, 268,466 subjects were diagnosed with AF in Shanghai. The mean age at index AF diagnosis was 74.9 ± 13.4 years (men: 73.5 ± 12.2 vs. women: 76.2 ± 14.3, p<0.001). The baseline characteristics of AF patients were shown in Table 1. The crude prevalence of AF was 0.88%, and increased with age drastically (0.002%, 0.26%, 2.42% and 6.7% in subjects aged <18, 18-64, 65-80 and >80 years, respectively, p<0.0001, Figure 1). The overall AF prevalence was higher in women (0.89%) than in men (0.88%, p<0.0001), which was attributed to the higher prevalence in women than men over 80 years old (7.09% vs. 6.07%, p<0.0001). In adults under 80 years, AF was more prevalent in men compared with women (between 18-64 years: 0.32% vs. 0.23, p<0.0001; between 65-80 years: 2.61% vs. 2.20%, p<0.0001). Using the Seventh National Population Census of China for standardization, the age-adjusted prevalence of AF in Shanghai was 0.69% (95% confidence interval: 0.65%-0.72%).

Anticoagulation and avoiding stroke

From 2015 to 2020, the use of anticoagulants increased markedly from 19.46% to 56.97%, which was largely attributed to the increased use of NOACs (Figure 2). While warfarin was dominant in 2015, prescriptions of warfarin and NOACs became comparable in 2019. In 2020, prescription of NOACs as a whole exceeded that of warfarin, and Factor Xa inhibitors were more prescribed over direct thrombin inhibitors. Compared with 2015, prescription of anticoagulants at the time when AF was
first diagnosed was significantly improved in 2018 (Figure 2B), as well as anticoagulant compliance in the following 2 years after AF diagnosis. Anticoagulants were more commonly prescribed in patients between 65 and 80 years compared with those under 65 or over 80 years. Men were more prone to receive anticoagulants than women.

As a significant alternative option for AF-related stroke prevention, LAAC showed a surge from 0.16% in 2015 to 1.23% in 2020, regardless of the potential negative impact of the COVID-19 pandemic (Figure 3, Supplemental Table 4). Men were more prone to receive LAAC compared with women.

Symptom control improvement
From 2015 to 2020, the use of rate control drugs decreased from 71.04% to 65.48%, while that of antiarrhythmic drugs doubled (from 18.94% to 38.09%) (Figure 4). Of these, beta-blockers and amiodarone were the most applied rate and rhythm control drugs, respectively. Women were more prone to receive rate control drugs, while men were more likely to be on antiarrhythmic drugs. As shown in Figure 5, cardioversion, a rhythm control approach, was only performed in a limited number of AF cases in Shanghai (less than 0.5%). Men were more prone to undergo cardioversion than women.

In comparison, ablation, a more popular rhythm control strategy, was applied in roughly 5% of AF patients (Figure 6). In these cases, radiofrequency catheter ablation was the dominant ablation method. However, cryoballoon ablation showed a surge since 2018 and accounted for 10% of all ablation cases in 2020. Surgical ablation, an alternative approach, accounted for less than 4% of total ablation cases.

Comorbidities and outcomes
Comorbid hypertension, diabetes mellitus, coronary artery diseases, valvular heart diseases, chronic kidney disease, COPD and thyroid dysfunction were detected in 63.0%, 18.2%, 82.9%, 1.3%, 12.0%, 15.3% and 3.7% of AF cases, respectively. The recorded comorbidities had higher prevalence rates in women than in men, except for COPD (Table 1).

Clinical events in patients with index diagnosed of AF in 2015 were assessed from 2015 to 2020 (Figure 7). During an averaging 5.5 years follow-up, acute myocardial infarction, stroke, TIA, bleeding, and systemic embolism were observed in 83.4%, 6.09%, 5.72%, 5.11% and 1.44% of AF patients, respectively. Specifically, ischemic stroke was the dominant type of stroke versus hemorrhagic stroke. In-hospital death was observed in 12.84% of the AF patients. Compared with men, women were more likely to experience stroke (especially ischemic stroke), TIA, and in-hospital mortality. Men were more prone to have bleeding and hemorrhagic stroke.
Exploiting the full-coverage database of the population with medical insurance, AF prevalence in adults was estimated at 0.88% in Shanghai, and was slightly elevated in women (0.89%) than in men (0.88%). AF prevalence increased with age, with a prevalence reaching 6.7% in subjects over 80 years. The use of oral anticoagulants has been prominently improved since 2015, which could be largely attributed to the increased use of NOACs, especially Factor Xa inhibitors. LAAC, an alternative option of stroke prevention, also exhibited a surge. Beta-blockers were widely prescribed for ventricular rate control. As for rhythm control, amiodarone was the most applied antiarrhythmic, while cardioversion was not commonly carried out. Radiofrequency catheter ablation was the dominant method for ablation, while cryoballoon ablation showed a rapid increase. AF was commonly comorbid with hypertension, diabetes, coronary artery diseases, chronic kidney diseases, COPD, and mental and behavior disorders. AF was also accompanied by nonnegligible risks of clinical events during follow-up, e.g., myocardial infarction, stroke, TIA, systemic embolism, bleeding, and in-hospital mortality. Significant differences between sexes were detected in AF prevalence, management, comorbidities and clinical outcomes.

Substantial AF burden in Shanghai

Geographical features and ethnicity affect the prevalence and demographic properties of AF, which may result from differences in study design, genetics, and socioeconomic and environmental factors. The prevalence and management of AF vary among socioeconomic regions and populations. Distinct prevalence rates for AF have been reported between developing and developed countries, urban versus rural regions, and Asian and White, etc. Previous epidemiological surveys reported a 0.6% AF prevalence in subjects over 30 years and 0.7% in over 35 years in the Chinese population, which was lower than that reported in Western countries. A recent nationwide survey reported an AF prevalence of 1.8% in the Chinese population over 45 years, which was close to that reported in Western countries. However, this study also reported a very large variation across geographical regions (from 0.9% to 2.4%), and Shanghai was not included.

The importance of the present study is highlighted by the unique demographic structure and socioeconomic background in Shanghai versus other regions in China and across the world. Firstly, as the largest and arguably most industrialized city in China, Shanghai has established a healthcare infrastructure with a nearly universal healthcare policy, which is not common in low-income and middle-income countries (LMICs). Secondly, as a highly urbanized region, Shanghai has the highest rate of aging in China, where AF has become a substantial social issue. Thirdly, with a sophisticated local government, Shanghai is now building a more mature and efficient hierarchical medical system, the basic working of which involves initial diagnoses at...
Figure 2. Prescription of anticoagulants in AF patients. A. Prescription of oral anticoagulants in AF patients between 2015 and 2020. B. Prescription of NOACs (Factor Xa inhibitors vs. Dabigatran) in AF patients between 2015 and 2020. C. Prescription of anticoagulants in AF patients with index AF diagnosis in 2015 and 2018, respectively, and in the subsequent 1 and 2 years after the index diagnosis. D. Anticoagulation among different age groups. E. Sex differences in the anticoagulant use. AF, atrial fibrillation; NOAC, non-vitamin K antagonist oral anticoagulant.
primary medical institutions and two-way referrals among different tiers of hospitals. The medical academic associations also apply strong support to standardized diagnosis and treatment of AF, which might largely improve AF management. Taken together, the epidemiological features and management of AF in Shanghai thus may have mixed characteristics of those in LMICs and high-income counterparts. With the rapid economic growth and aging in other regions of China, the epidemiological data assessed in the present study may represent the future epidemiological trending of AF in China.

In the present study, a 0.88% AF prevalence in Shanghainese was determined. This value was within the range of previous reports in China and other Asian countries, but lower than the estimated prevalence in 2020 ESC guidelines. Despite the potential underestimation, AF burden in elder individuals was substantial, involving 2.42% and 6.70% of individuals between 65 and 80, and >80 years, respectively. According to 2020 Shanghai Statistical Yearbook, the life expectancy of Shanghai residents has reached 83.66 years (81.27 in men and 86.14 in women), which was the highest across China and was even higher than that of the high-income countries in Europe. The rapidly aging population poses serious challenges in managing the growing number of AF patients in Shanghai, where demographic shifts are rapid and exacerbated by the one-child family policy. While Shanghai takes the lead in the process of aging society, the demographic shift and AF management in Shanghai may be a valuable experience for other parts of China, as well as developing countries across the world.

Shift in AF management
The management of AF experienced a drastic shift from 2015 to 2020, concerning both stroke prevention and symptom control. Before 2013, warfarin was the unique oral anticoagulant available in China, but underused in clinical practice. The underutilization and discontinuation of warfarin were attributed to perceived bleeding risks, intolerability, and the hassle of frequent blood monitoring. Previous studies have reported very low use of anticoagulants in eligible AF cases in China. This low anticoagulation rate was substantially improved recently, particularly in large cities, including Beijing and Shanghai as shown in this study. Despite more educational programs offered to both patients and physicians, the observed situation improvement was largely attributed to the launch of NOACs. Dabigatran became the first NOAC approved for AF in China, followed by rivaroxaban in 2015. As depicted in Figure 2, the gaining-ground process of NOACs has been accelerated at the end of 2017, when dabigatran and rivaroxaban were added to the list of medicines covered by the medical-insurance system in Shanghai. In 2020, NOACs as a
Figure 4. Rhythm versus rate control drugs in AF patients. A. Use of rhythm control drugs (Class I and III antiarrhythmics) versus rate control drugs (digoxin, beta-blockers and non-dihydropyridine CCB) in AF patients. B. Use of Class I and III antiarrhythmic drugs in AF patients. C. Use of rate control drugs in AF patients. D. Sex differences in the use of rhythm and rate control drugs. CCB, calcium channel blocker.
Figure 5. Cardioversion in AF patients. A. AF patients who received cardioversion to restore sinus rhythm. B. Sex differences in AF patients administered cardioversion. AF, atrial fibrillation.

Figure 6. Ablation in AF patients. A. AF patients administered ablation between 2015 and 2020. B. Different ablation strategies in AF patients. C. Sex differences in AF patients administered ablation. AF, atrial fibrillation.
Figure 7. Five-and-a-half year follow-up of patients with index diagnosed AF in 2015. A. Clinical events between 2015 and 2020 in patients with index diagnosis of AF in 2015. B. Ischemic versus hemorrhagic stroke in AF patients. C. Sex differences in AF-related clinical outcomes. AF, atrial fibrillation; AMI, acute myocardial infarction; TIA, transient ischemic attack.
whole overtook warfarin, becoming the most prescribed anticoagulants in Shanghai, and Factor Xa inhibitors was preferred over dabigatran. These findings suggest the overall improvement of anticoagulant use was driven by increased NOAC use, as the parallel trajectories between the prescriptions of total anticoagulants and NOACs.

As a novel interventional strategy, LAAC serves as another important driving force in optimizing stroke risk reduction. In 2014, Watchman (Boston Scientific, MA, US) became the first LAAC device approved in China, followed by AMPLATZER Cardiac Plug (St. Jude Medical-Abbott, IL, US) in 2016, LAmbre (Lifetech Scientific, Shenzhen, China) in 2017, LACBES (Shanghai Pushmed, Shanghai, China) in 2019, and Lefort (Shape Memory Alloy, Shanghai, China) in 2020. The past few years of experience in Shanghai have seen a substantial increase in LAAC application, with an 8-fold rise in the percentage of AF cases administered LAAC from 2015 to 2020 (Figure 3). However, the pace may not be uniform across China at the current stage, due to late start in marketing, limited procedural experience and lack of medical insurance coverage in regions outside Shanghai.

The choice for symptom control has shifted in favor of rhythm over rate control strategies since 2015. Compared with 2015, the use of rate control drugs was decreased by 6%, but antiarrhythmic drugs doubled in 2020. Ablation increased by approximately 21%, and radiofrequency was the dominant energy form of ablation. The volume of cryoballoon ablation has markedly increased and accounted for 15% of ablation cases in 2020, which was attributed to China’s approval of the second-generation cryoballoon, the indication for persistent AF, and positive trial results as the initial treatment option for AF. In comparison, cardioversion has remained at a constant low level, probably due to its burdensome requirements of general anesthesia and ruling out intracardiac thrombus.

Sex differences in AF management
In 2016, the U.S. National Institutes of Health has announced the appreciation of sex as a biological variable (SABV) in all stages of biomedical research, including studies of cardiovascular diseases. The concept of sex medicine, which includes the biological and social behaviour differences between women and men, was also supported by the national health commission of China. Therefore, the current study also focused on the sex disparities in AF in order to improve the quality and equity of health care for both sexes. Significant sex differences of AF were detected in the population of Shanghai, across the whole scope of the disease process, from epidemiology to management and outcomes. The prevalence of AF was higher in women than in men, which was not in accordance with data of regions outside Shanghai. This may be attributed to the particular age and sex structures of Shanghai, characterized by longer life expectancy and higher male to female ratio compared with other regions of China. The prevalence of AF in the aging population is greater in women possibly due to their increased longevity.

In this study, we did not have a direct report of CHA2DS2-VASc score. Due to higher incidence in women of stroke-related comorbidities, including hypertension and diabetes, and the female sex per se as an add-on point, it is reasonable to presume that women patients had higher CHA2DS2-VASc scores than men in Shanghai. However, fewer women in Shanghai were on anticoagulation and underwent LAAC than men. Such phenomenon led to higher ischemic stroke and TIA, but lower hemorrhagic stroke and bleeding in women than in men. As for symptom control, the choice of rate vs. rhythm control is made jointly by the patient and their doctor, based primarily on symptom management and patient preference. In Shanghai, women were more prone to adopt the rate control strategy, and significantly less likely to be managed by rhythm control strategies, including class I and III antiarrhythmics, cardioversion, and ablation. Although women may be more symptomatic and present with worse quality of life due to AF than men, such preference differences were in line with previous studies in Europe and the US. A possible explanation is the lower tolerance of antiarrhythmic drugs by women, due to QT prolongation and bradycardia. Besides, potentially more procedural related complications were observed in women, including both catheter ablation and LAAC. Socioeconomic factors may also play roles in sex differences in AF management.

AF management during the pandemic
The COVID-19 pandemic is having a major impact on healthcare systems worldwide, for both infectious and non-infectious diseases. For AF patients without urgent conditions, health seeking behavior may be affected due to the concern about unnecessary patient exposure to COVID-19. Therefore, poorer outcomes in patients with AF were observed during the COVID-19 pandemic. As shown in Supplemental Table 4, this study found that anticoagulation rate, use of antiarrhythmics and non-urgent procedures, such as LAAC, cryoballoon and surgical ablation, kept growing in 2020, despite the total volume of ablation was slightly decreased due to a reduction in radiofrequency catheter ablation. Taken together, the COVID-19 pandemic had no or only slight impairment on the management of AF in Shanghai. The decrease-rebound dynamics of medical visits might be noticed within 2020 during the lockdown and post-lockdown periods, which was not further analyzed in the current study.

Perspectives: ACC to ABC pathways
The AF burden in Shanghai is substantial and within the range of previous reports in China and across the
Articles

would lead to better outcomes of AF patients. In addition, we found that the anticoagulation rate was further improved significantly compared with those of 2015 and 2018. The better management of AF in Shanghai was probably attributed to socioeconomic factors, such as more effective health management systems, more generous medical insurance coverage, higher educational levels and higher per capita income of the general population, etc.

Stroke reduction is one of the most important approaches to achieving the goal of Healthy China 2030, according to the national guide for public health promotion. Shanghai’s municipal government therefore pays great attention and makes efforts to AF management for reducing AF-related stroke risks. Shanghai Municipal Healthcare Commission recently proposed an “ACC to ABC” approach of AF management, modified from the “CC to ABC” (Comfirm and Characterize AF, followed by Atrial fibrillation Better Care) pathway recommended by the European guidelines. The added initial “A” has threefold interpretations with Chinese and Shanghai Characteristics, including “Administration”, “Association” and “AF centers/units”. Specifically, “Administration” stands for the administrative order and policy support from the Shanghai Municipal Health Commission to improve the hierarchical system for AF diagnosis and treatment. “Association” stands for instructions from academic associations, such as Shanghai Medical Association, Shanghai Society of Cardiology and Shanghai Alliance of AF centers. “Atrial fibrillation centers or units” stands for the standardized management of each AF center of tertiary hospitals or AF unit of primary hospitals/clinics. With the proposed “ACC to ABC” pathway, we expected the comprehensive management of AF would further improve in Shanghai and then all over China, which would lead to better outcomes of AF patients.

Conclusions
The burden of AF in Shanghai was substantial. The management of AF, including both stroke prevention and symptom control, has markedly improved in recent years. This process was not or only slightly impeded by the COVID-19 pandemic. Sex differences were observed regarding AF prevalence, management and outcomes. New approaches for better AF management are proposed to improve AF-related outcomes.

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Data sharing
The data that support the findings of this study are obtained from Shanghai Municipal Health Commission. Data are available from the corresponding author with the permission of Shanghai Municipal Health Commission.

Supplementary materials
Supplementary material associated with this article can be found in the online version at doi:10.1016/j.lanwpc.2022.100470.

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