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Neighborhood deprivation and warfarin, aspirin and statin prescription — A cohort study of men and women treated for atrial fibrillation in Swedish primary care

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ABSTRACT

Background: We aimed to study differences in the prescribing of warfarin, aspirin and statins to patients with atrial fibrillation (AF) in socio-economically diverse neighborhoods. We also aimed to explore the effects of neighborhood deprivation on the relationship between CHADS2 risk score and warfarin prescription.
Methods: Data were obtained from primary health care records that contained individual clinical data that were linked to national data on neighborhood of residence and a deprivation index for different neighborhoods. Logistic regression was used to estimate the potential neighborhood differences in prescribed warfarin, aspirin and statins, and the association between the CHADS2 score and prescribed warfarin treatment, in neighborhoods with high, middle (referent) and low socio-economic (SES).
Results: After adjustment for age, socio-economic factors, co-morbidities and moves to neighborhoods with different SES during follow-up, adults with AF living in high SES neighborhoods were more often prescribed warfarin (men odds ratio (OR) (95% confidence interval (CI): 1.44 (1.27–1.62); and women OR (95% CI): 1.19 (1.05–1.36)) and statins (men OR (95% CI): 1.23 (1.07–1.41); women OR (95% CI): 1.23 (1.05–1.44)) compared to their counterparts residing in middle SES. Prescription of aspirin was lower in men from high SES neighborhoods (OR (95% CI): 0.75 (0.65–0.86)) than in those from middle SES neighborhoods. Higher CHADS2 risk scores were associated with higher warfarin prescription which remained after adjustment for neighborhood SES.
Conclusions: The apparent inequalities in pharmacotherapy seen in the present study call for resource allocation to primary care in neighborhoods with low and middle socio-economic status.

1. Introduction

Atrial fibrillation (AF) is the most common sustained cardiac arrhythmia with a prevalence of 1%–2% in the general population [1,2]; and its prevalence is higher in the elderly [3]. Some of the risk factors for AF include, but are not limited to: increasing age, hypertension, diabetes mellitus, myocardial infarction, valvular heart disease, heart failure, obesity, obstructive sleep apnea, cardiothoracic surgery, smoking, exercise, alcohol use, hyperthyroidism, increased pulse pressure, and family history [4]. Atrial fibrillation is an independent risk factor for stroke, resulting in a 5-fold excess risk [5]. Given the debilitating consequences of stroke [6], it is imperative to identify individuals with increased risk for stroke among patients with AF. One of the commonly used scores to estimate stroke risk in patients with AF is CHADS2 [7]. Using this score, stroke risk is evaluated based on the presence of the following risk factors: congestive heart failure, hypertension, age of 75 years or older, diabetes mellitus and a history of stroke or previous transient ischemic attacks and thromboembolism [8–11].

Warfarin is the most commonly prescribed oral anticoagulant to help prevent stroke incidence among patients with AF. Anticoagulant (predominantly warfarin) therapy has benefits over antiplatelet (mostly aspirin) therapy [12]. Furthermore, we have previously shown that the mortality is lower among patients with AF who are prescribed statins, and that warfarin therapy is associated with lower mortality than that with aspirin; however, prescribing aspirin has shown to be better than no antithrombotic therapy at all [3,13–15]. However, despite clear guidelines and stroke preventative evidence, the likelihood of having warfarin prescribed in accordance with the guidelines has shown to be low in Sweden [16], other European countries [17], as well as in the USA [18]. The benefits of statin therapy in AF have been discussed, and no final conclusions about it have been made [19].

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There is an increasing amount of empirical evidence that neighborhood variables may shape the distribution of health-related behaviors of its residents independently of individual level sociodemographic factors, including socioeconomic status (SES), e.g. education, and marital status [20]. Furthermore, the risk of coronary heart disease is higher in more deprived neighborhoods [21]. Also, it has recently been shown that neighborhood deprivation is significantly associated with AF hospitalization in women [22]. However, less is known whether neighborhood deprivation may influence pharmacotherapy in AF patients. We hypothesize that prescribed pharmacotherapy differs depending on the neighborhood SES. Therefore, the objective of our study was to explore the relationship between neighborhood SES and prescribed warfarin, aspirin and statin therapy, in men and women diagnosed with atrial fibrillation in primary care. In addition, we intended to explore whether warfarin prescription differs across CHADS2 risk scores and if that difference is explained by neighborhood SES.

2. Methods

2.1. Patient data

This study was based on patient data from 75 primary health care centers (PHCCs) in the middle parts of Sweden, mainly in Stockholm County. Men and women who visited any of the 75 PHCCs between 2001 and 2008 were included in the database ($n = 1{,}098{,}420$). Two different patient samples were drawn from this database: one containing all patients with an AF diagnosis from 2002 to 2008 ($n = 12{,}283$), and the other listing all alive patients with an AF diagnosis from 2007 and onwards ($n = 4970$). We used *Extractor* software (http://www.slso.sll.se/SLPOtemplates/SLPOPage1____10400.aspx, accessed September 19, 2010), to access patient files electronically. The files were transferred by authorized personnel to Statistics Sweden, the Swedish Government-owned statistics bureau, where the patients' unique 10-digit national identification numbers were replaced with random serial numbers to ensure anonymity.

Patient data were cross-referenced to national Swedish population-based registers [23–25]. These contain individual-level information on age, gender, education and marital status of everyone residing in Sweden, including the patients in our study samples. Thus, it was possible to link clinical data from the 75 PHCCs to socio-demographic data from population registers provided to us by Statistics Sweden [26]. The data in this large dataset were organized and analyzed using SAS software (SAS, Version 9.1. Cary, NC, USA.). Information on drugs prescribed to the AF patients was obtained from patient records and was organized according to the Anatomic Therapeutic Chemical (ATC) Classification.

One of the inclusion criteria for selecting patients was that they were diagnosed with AF which was defined as the presence of ICD-10 code I48 included in the 10th version of the WHO's International Classification of Diseases.

ICD-10 codes for common cardio-metabolic co-morbidities were identified in patient records. These co-morbidities were: AF-related hypertension (I10–15), coronary heart disease (CHD; I20–25), cardiac heart failure (I50 and I110), non-rheumatic valvular diseases (I34–38), cardiomyopathy (I42), cerebrovascular diseases (I60–69), peripheral embolism (I74) and diabetes mellitus (E10–14). No diagnosis of rheumatic valvular diseases (I05–08) was recorded in these patients.

2.2. Individual socio-demographic variables

Gender: Men and women.

Age: AF patients were divided into five age groups: 45–54, 55–64, 65–74, 75–84 and 85 + years. Patients under 45 years of age were excluded since they were too few for stable statistical estimates.

Educational attainment was classified into three levels: ≤9 years (compulsory schooling or less), 10–12 years (some/completed secondary school education) and >12 years (college and/or university education).

Marital status was classified as married, unmarried, divorced or widowed.

2.3. Neighborhood socio-economic status

The neighborhoods were derived from Small Area Market Statistics (SAMS). These were originally created for commercial purposes and pertain to small geographic areas with boundaries defined by homogenous types of buildings. The average population in each SAMS neighborhood is approximately 2000 people for Stockholm and 1000 people for the rest of Sweden. Socio-economic status (SES) of these areas was classified as high, middle or low, based on a neighborhood deprivation index [22]. This index was derived from the following four variables: low educational status (<10 years of formal education), low income (<50% of the median individual income from all sources), unemployment and receipt of social welfare. The neighborhood deprivation index was categorized into three groups: more than one standard deviation (SD) below the mean (high SES or low deprivation level), more than one SD above the mean (low SES or high deprivation level), and within one SD of the mean (middle SES or moderate deprivation level).

2.4. CHADS2 score

A CHADS2 is a tool for assessing the risk of stroke in AF patients [7]. A high CHADS2 score correspond to a higher risk of stroke. Well known risk factors for stroke in patients with AF are congestive heart failure, hypertension, age >75 years, diabetes, previous stroke and transient ischemic attack [8–11]. Each factor is given one point, except for stroke, which is given two points. CHADS2 scores range from 0 to 6, with a score of 0 indicating that none of the above factors are present. AF patients with a score of 0 should not be treated with warfarin as the risk of severe bleeding is higher than the risk of stroke. Intermediate stroke risk is classified by a score of 1. In most patients with a CHADS2 score of 2 or more, the benefits of warfarin therapy will outweigh the risk of bleeding. The association between CHADS2 score and survival after stroke in AF patients was previously analyzed by using ICD-codes in the Swedish Hospital Discharge Register [27]. In the present study, we used the same method to calculate the CHADS2 score of each AF patient in primary care.

2.5. Statistical analysis

Data were presented as mean and standard deviation if continuous and as counts and percentages if categorical. Logistic regression models were used to explore the relationship between neighborhood SES and warfarin, aspirin and statin prescription in primary care. The following models were created: 1) Model A: neighborhood SES (unadjusted); 2) Model B: Model A and age-group, educational level and marital status; 3) Model C: Model B and comorbidities (hypertension, diabetes mellitus, coronary heart disease, congestive heart failure and cerebrovascular disease) and, when applicable, an interaction term between age-group and diagnosis; and 4) Model D: Model C and change of neighborhood socio-economic score during the follow-up.

Logistic regression models were also used to explore the relationship between CHADS2 risk score and warfarin prescription and whether this relationship is influenced by neighborhood SES. The following models were created: 1) Model A: CHADS2 risk score with no confounders; 2) Model B: Model A and age-group, educational level and marital status; 3) Model C: Model B and neighborhood SES and change of neighborhood socio-economic status during follow-up.

The two-sided significance level was set to 0.05.