Clinical Investigations

First-Ever Atrial Fibrillation Documented After Hemorrhagic or Ischemic Stroke: The Role of the $CHADS_2$ Score at the Time of Stroke

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ABSTRACT

Background: The $CHADS_2$ score (C, congestive heart failure [CHF]; H, hypertension [HT]; A, age ≥75 y; D, diabetes mellitus; S_2, prior stroke or transient ischemic attack) is used to assess the risk of ischemic stroke in patients with atrial fibrillation (AF). However, its role in patients without documented AF is not well explored.

Hypothesis: The goal of the current study was to explore if the incidence of hospitalization with first-ever AF after stroke increased with increasing $CHADS_2$ score.

Methods: We identified 57 636 patients with nonfatal stroke and no documented AF in the Swedish Stroke Register (Riks-Stroke) during 2001–2004 and followed them for a mean of 2.2 years through record linkage to the Inpatient and Cause of Death registers. Cox regression hazard models were used to estimate the relative risk (RR) of new AF following stroke and its association with different $CHADS_2$ scores.

Results: Overall, 2769 patients were hospitalized with new AF (4.8%, 21.7 per 1000 person-years). The incidence increased from 9.6 per 1000 person-years in $CHADS_2$ score 0 to 42.7 in $CHADS_2$ score 6, conferring a RR of 4.2 (95% confidence interval [CI]: 2.5–6.8). For $CHADS_2$ scores 3–5, the RRs were approximately 3 (vs $CHADS_2$ score 0). Adjusted RRs were 1.9 (95% CI: 1.7–2.1) for CHF, 1.4 (95% CI: 1.3–1.5) for HT, 2.1 (95% CI: 2.0–2.3) for age ≥75 years, 0.9 (95% CI: 0.8–1.0) for diabetes, and 1.0 (95% CI: 0.91–1.07) for previous stroke. The risk of AF was higher in ischemic than in hemorrhagic stroke.

Conclusions: In this retrospective register study, the incidence of AF following stroke was strongly influenced by higher $CHADS_2$ scores where age ≥75 years, CHF, and HT were the contributing $CHADS_2$ components.

Introduction

About 15% of strokes can be estimated to be of embolic origin and related to atrial fibrillation (AF).[1] The AF may have been previously documented or may be ongoing at the time of admission. Patients admitted with sinus rhythm (SR) may have had earlier episodes of paroxysmal or persistent AF, but a high proportion of patients have no history of AF. Investigation may reveal the cause of stroke, but in some patients no explanation can be found, and such patients are said to have had a cryptogenic stroke.

Scores for estimating the risk of an embolic stroke have been developed, eg, the $CHADS_2$ score (C, congestive heart failure [CHF]; H, hypertension [HT]; A, age ≥75 y; D, diabetes mellitus [DM]; S_2, prior stroke or transient ischemic attack [TIA]).[2] Using these stated clinical variables, giving 1 point to each (except 2 points for a history of stroke), the maximum possible $CHADS_2$ score is 6 points. The higher the score, the higher the risk of having a stroke. Although this score was intended for use in patients with known AF, some of its components are also relevant to the risk of developing AF.

Atrial fibrillation may or may not be symptomatic, and some patients may never feel or know that they are in AF, with a risk of stroke that may be low or high depending on concomitant risk factors. We therefore aimed to examine the relationship between the $CHADS_2$ score on admission and the incidence of hospitalization with an AF diagnosis after stroke.

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Subjects and Methods

Subjects

In this retrospective register study, we identified 57 636 patients with nonfatal stroke (International Classification of Diseases [ICD]-10 codes I61, I63, and I64) and with no history of AF (self-reported questionnaire or hospitalized with AF diagnosis [ICD-9 code 427.3, ICD-10 code I489] prior to index stroke) in Riks-Stroke from 2001 to 2004.

The Swedish Stroke Register, Riks-Stroke

Riks-Stroke (http://www.Riks-Stroke.org) is the national quality register for stroke care in Sweden. It includes all hospitals that admit patients with acute stroke and covers >80% of all stroke events in Sweden. A case-by-case validation of Riks-Stroke indicates that patients who die early, who are not treated at a stroke unit, or who are cared for in a nursing home are less likely to be included in the register.[3] The Riks-Stroke protocol has a confirmed very high validity for certain variables, eg, the stroke diagnoses.[4] It is less accurate for others, eg, smoking.

Registration consists of the completion of a case record form at admission of an acute stroke, with 37 variables covering basal information such as sex, age, cardiovascular risk factors, previous stroke, and subtype of stroke, and a follow–up questionnaire 3 months later consisting of 26 variables mainly focusing on the quality of care and daily function abilities, living conditions, and general health.[5,6]

The Swedish Hospital Discharge and Cause of Death Registers

All inhabitants have a unique 10-digit identification number that provides a reliable tool for linking to the many extensive national registers in Sweden. The medical discharge and death registers are kept by the National Board of Health and Welfare and all entries are mandatory. This in combination with a high standard of medical care provided to all citizens makes the databases quite sturdy to biases on population level. The register includes data on main and secondary diagnoses and is updated annually. We collected record-linked information on comorbidity and mortality data for all study subjects from 1987 until the end of 2005. The linkage between databases is done by the authorities after assessment and approval by the ethical committee. All data are returned without identification numbers to the researcher. This study was approved by the ethics committee of the Umeå University (reg. no. 69106, 2006).

Definition of Stroke and Atrial Fibrillation

A diagnosis was present if identified either by ICD code in the discharge register or reported in the Riks-Stroke protocol. Stroke and AF were defined according to the World Health Organization definitions, ie, intracerebral hemorrhage, cerebral infarction, and unspecified stroke (ICD-9 codes 431, 434, and 436; ICD-10 codes I61 and I63-I64), and AF (ICD-9 code 427.3 or ICD-10 code I48.9). No distinction was made between different types of AF, eg, paroxysmal, persistent or permanent AF, or atrial flutter; or whether the tachyarrhythmia was symptomatic or asymptomatic. Atrial fibrillation could be diagnosed by means of electrocardiography (ECG), in-hospital ECG monitoring, or long-term ambulatory ECG monitoring.

$CHADS_2$ Score Calculation

As previously stated, the $CHADS_2$ score ranges from 0 to 6 and is calculated by adding 1 point for each of the first 4 risk factors and 2 points for previous history of stroke or TIA. A $CHADS_2$ score can thus range from 0 (none of the comorbidities and age <75 years) to 6 (all comorbidities and age ≥75 years). In the present study, the ICD-9 and ICD-10 codes used were as follows: CHF, ICD-9 428–429, ICD-10 I50; HT, self-reported or hospitalized with diagnosis of ICD-9 401–405, ICD-10 I10-I15; age ≥75 years; DM, self-reported or hospitalized with diagnosis of ICD-9 250, ICD-10 E10-E14; and previous stroke or TIA, self-reported or hospitalized with diagnosis of ICD-9 431, 434–436, ICD-10 I61, I63, I64, or G45. The $CHADS_2$ scores were calculated based on information collected prior to the registration of the index stroke.

Statistical Analysis

We calculated the incidence of AF per 1000 person-years by $CHADS_2$ components and score. The occurrence of AF within 2 years following stroke, associated with an increasing $CHADS_2$ score was examined by means of the Kaplan-Meier method. Cox proportional hazard regression models were used to estimate the adjusted hazard ratios and their 95% confidence intervals (CIs) of AF associated with $CHADS_2$ score, and separately for each component of $CHADS_2$. To investigate the impact of age, we applied the same 4 age categories (<64, 65–74, 75–84, and ≥85) as were originally used in analyses from the Riks-Stroke database. As age is included in the $CHADS_2$ score (≥75 years yes/no), we adjusted for age as a continuous variable whenever possible. The LIFETEST and PHREG procedures in SAS version 9.1 (SAS Institute, Inc., Cary, NC) were used for the computation. Person-years were calculated individually for each patient from the date of first registration in the Riks-Stroke register to the date of first hospitalization for primary or secondary diagnosis of AF, death, or end of follow-up at December 31, 2005, whichever came first.

Results

A total of 2769 patients (4.8%) had their first documented AF after hospitalization of the index stroke, an incidence of 21.7 per 1000 person-years. The corresponding incidence during the same period for a general population aged >65 years in Sweden was 5.3 per 1000 person-years. The patients who developed AF were on an average 4 years older than those who did not, and a higher proportion was women. There were twice as many patients with $CHADS_2$ score 0 among patients without AF than with AF (16% vs 8%). Congestive heart failure, HT, and age ≥75 years were more frequent in patients with AF than without (Table 1). The 2 groups did not differ in terms of the prevalence of DM or previous stroke on admission.

The Kaplan-Meier curves for AF after stroke diverged by $CHADS_2$ score. At the end of the 2.2-year follow-up, AF had occurred in 2% of patients with $CHADS_2$ score 0, in 4%

Table 1. Characteristics of Study Subjects

	AF			
	No		Yes	
	n = 54 867	%	n = 2769	%
Age, y				
<64	12 142	22.1	249	9.0
65–74	13 487	24.6	661	23.9
75–84	20 153	36.7	1302	47.0
≥85	9085	16.6	557	20.1
Mean age, y	73.3	12.0	77.2	8.9
Mean years of follow-up	2.3	1.4	1.4	1.1
Sex				
M	28 549	52.0	1326	47.9
F	26 318	48.0	1443	52.1
Type of stroke				
Hemorrhagic	7731	14.1	156	5.6
Ischemic	44 459	81.0	2464	89.0
Unspecified	2677	4.9	149	5.4
Comorbidities				
C (CHF)	4327	7.9	337	12.2
H (HT)	29 313	53.4	1715	61.9
A75 (age ≥75 y)	29 238	53.3	1859	67.1
D (DM)	11 596	21.1	539	19.5
S (stroke/TIA)	13 651	24.9	713	25.7
$CHADS_2$ score				
0	8822	16.1	226	8.2
1	16 484	30.0	774	28.0
2	13 525	24.7	810	29.3
3	8354	15.2	499	18.0
4	5515	10.1	332	12.0
5	1882	3.4	111	4.0
6	285	0.5	17	0.6

Abbreviations: AF, atrial fibrillation; CHF, congestive heart failure; DM, diabetes mellitus; F, female; HT, hypertension; M, male; TIA, transient ischemic attack.

with score 1, in 6% with scores 2–5, and in 9% with score 6 (Figure 1). We observed a trend toward an increase in the incidence of AF at higher $CHADS_2$ scores. The hazard ratio of AF among those with the highest vs the lowest $CHADS_2$ score was 4.2 (95% CI: 2.54–6.80; Table 2).

In an analysis of $CHADS_2$ components, the incidence of AF per 1000 person-years was higher among patients with vs without CHF (46.4 vs 20.2), with vs without HT (25.3 vs 17.7), and above vs below age 75 years (31.1 vs 13.5), comprising the adjusted HR of 2.4 (95% CI: 2.06–2.77) for age, 1.8 (95% CI: 1.63–2.06) for CHF, and 1.4 (95% CI: 1.26–1.47) for HT. Diabetes and previous stroke were not associated with increased or decreased risk of developing AF after stroke (Table 2).

Ischemic vs Hemorrhagic Stroke

In ischemic stroke, the crude incidence of AF per 1000 person-years was much higher than in patients with hemorrhagic stroke (23.1 vs 10.1, respectively). This difference was even more emphasized by higher $CHADS_2$ score, so that for a $CHADS_2$ score of 0 the difference was 10.4 vs 4.7 and for a $CHADS_2$ score of 6 it increased to 45.1 vs 15.1 (Tables 3 and 4).

The relative risks (RR) of the components of the $CHADS_2$ score were also generally higher in patients with ischemic than in patients with hemorrhagic stroke (Tables 3 and 4).

In hemorrhagic stroke, men were at higher risk than women (RR: 1.30, 95% CI: 0.94–1.80), whereas the opposite was true in ischemic stroke (RR: 0.94, 95% CI: 0.87–1.02).

Discussion

The risk of being hospitalized with a new diagnosis of AF within 2.2 years was 4.8% (2769/54 867), consistent with data from 24–72-hour Holter monitoring, when new AF was identified in 3.8%–6.1% of the patients.[7] However, we do not know how many patients may have had episodes of AF but were not hospitalized, or if the AF was actually the first AF episode in these patients. The likelihood of detection is probably high in symptomatic patients, whereas in asymptomatic subjects AF could be present but undetected. If the latter is true, one would expect a risk profile that resembles those with documented AF more than those without. This was actually found in our study; the proportion of patients with $CHADS_2$ score of 0 was lower in patients who got AF, and of the components of the score, high age, HT, and CHF were more common in patients with subsequent AF.

Cryptogenic stroke is a term that implies that the origin of stroke was not identified. This may occur especially if the cause is intermittent in character, such as episodes of asymptomatic AF. Repeated ECG recordings or long-term ECG recordings increase the chances of capturing these episodes. In particular, implantable loop recorders allow long-term continuous ECG monitoring for up to 3 years and the automatic capture of predefined arrhythmias as well as manual activation of a recording during symptoms. In a report based on data from 30-day cardiac event monitoring, the authors found AF in 4 of 20 patients with cryptogenic stroke, concluding that intermittent AF may account for a large proportion of cryptogenic stroke.[8]

In the present study, 4.8% of the patients were hospitalized with AF during approximately 2 years. This is most likely an underestimation of the true occurrence of AF and a higher proportion of patients may have had incident AF that did not result in hospitalization. The risk of subsequent stroke is represented by the qualitative diagnosis of AF in combination with the comorbidities, and would probably lead to start of anticoagulation unless already ongoing.

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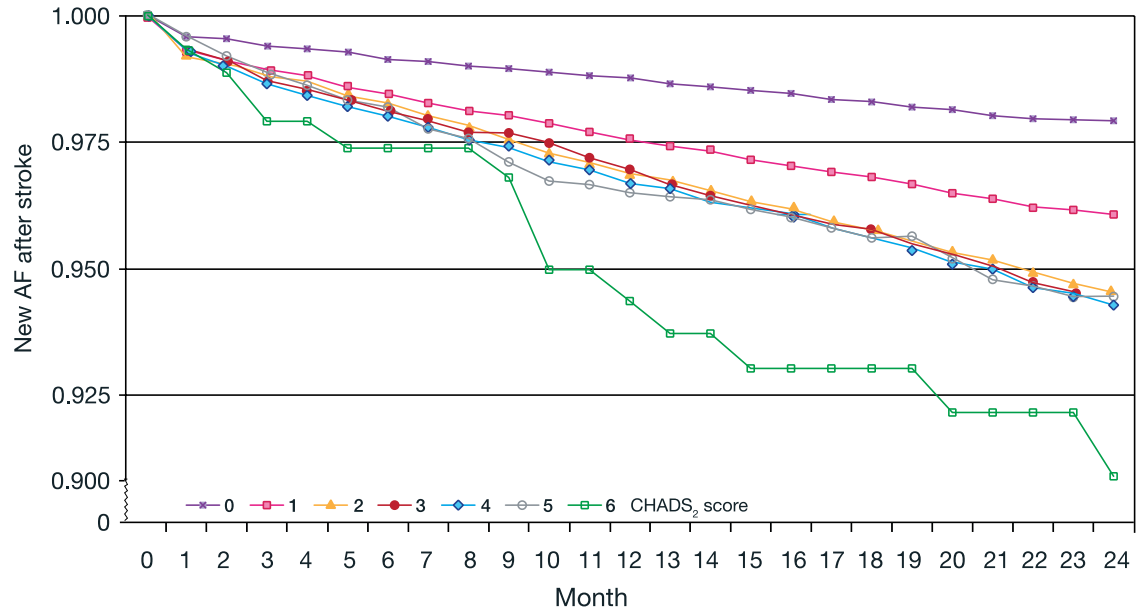

Figure 1. Kaplan-Meier curves for the detection of the first-ever atrial fibrillation after stroke by $CHADS_2$ score. Abbreviation: AF, atrial fibrillation.

Cho et al.[9] used magnetic resonance imaging to find a high proportion (39.4%) of unrecognized cerebral infarcts in patients with first-ever stroke, with an even higher proportion of 58.3% in 36 patients with high cardioembolic risk, 31 of whom had AF. One review suggested that a previous stroke or TIA is an important predictor of further stroke in patients with AF, which underlines the value of a medical history and assessment of the heart rhythm.[10] The likelihood of being hospitalized with AF was lower after hemorrhagic stroke, indicating that the comorbidity pattern differs in strokes of different origin.

Thus, it seems reasonable to screen for AF in the clinical evaluation of a stroke patient. In an earlier study, we reported the mortality of patients admitted with stroke while in AF or in SR, in relation to the $CHADS_2$ score on admission.[11] Whereas patients with documented AF had a higher risk of dying, high $CHADS_2$ scores were even more predictive in patients without AF. An increasing risk score in patients without known AF seems to be predictive of the chance of finding the first-ever episode of AF as well as of the risk of death. Among patients with not yet known AF are the ones with not yet detected AF, those just about to have their first episode and those who are not at risk of AF. It is reasonable to believe that a risk score, eg, the $CHADS_2$, could be of value in identifying the risk of a subsequent documentation of AF. Because we found a correlation between the $CHADS_2$ score and the first-ever documented AF after stroke, this simple score may help to get attention to important cardiovascular risk factors of stroke and death, which might encourage to a change in current practice.

Delayed detection of AF has been reported in spite of monitoring by repeated ECGs after ischemic stroke.[12] Serial ECG recordings significantly improved detection of AF in acute stroke 2.6-fold,[13] and ambulatory 7-day ECG monitoring detected AF in 5.7% of patients with normal ECG and 24-hour Holter recordings.[14] There is evidence that long-term ECG recording provides important information in relation to stroke. In A Prospective Study of the Clinical Significance of Atrial Arrhythmias Detected by Implanted Device Diagnostics (the TRENDS study), the atrial tachyarrhythmia burden was studied in patients with implanted pacemakers or defibrillators who had $\geq$1 risk factors. Their age had to be $\geq$65 years, otherwise the risk factors were those included in the $CHADS_2$ score. The results suggested that the thromboembolic risk is a quantitative function of the arrhythmia burden, and a burden of $\geq$5.5 hours of AF on any given day seemed to double the thromboembolic risk from 1.1% to 2.4% over a mean follow-up period of 1.4 years.[15] In a subgroup analysis of the TRENDS study, new atrial tachyarrhythmia was found in 28% of 163 patients over a mean follow-up period of 1.1 $\pm$ 0.7 years.[16] In a similar study, the Italian AT500 Registry investigators found that AF episodes longer than 1 day were independently associated with embolic events.[17]

Another approach would be to ask the question whether the present risk scores, eg, the $CHADS_2$ score, are also useful in predicting risk in patients without documented AF. It would be reasonable to assume that patients with higher risk scores would suffer a higher risk of having AF and also that AF would develop sooner in patients with a higher, as compared with a lower, risk score. Indeed, our analysis confirmed that with increasing risk scores, a substantial number of patients have their first AF documented in hospital <1 month after being admitted for stroke (Figure 1).

Haft and Teichholz reported that of 932 patients with ischemic stroke, 299 had documented AF, almost half of them paroxysmal. Of the 299 patients, 39.8% did not have AF on the day of admission, and 19.3% had AF only on another day remote from the stroke admission.[18] In an attempt to predict which of the stroke patients

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Table 2. Incidence per 1000 Person-Years and Hazard Ratios of AF After Stroke

	No. of Patients	No. with AF	Days at Risk	Incidence/1000 y	RR	95% CI	RR[1a]	95% CI	RR[2b]	95% CI
C (CHF)										
No	52 972	2432	43 891 162	20.22	1.00		1.00		1.00	
Yes	4664	337	2 651 748	46.39	2.22	1.98–2.48	1.89	1.68–2.12	1.83	1.63–2.06
H (HT)										
No	26 608	1054	21 753 369	17.71	1.00		1.00		1.00	
Yes	31 028	1715	24 789 541	25.29	1.42	1.32–1.53	1.38	1.28–1.49	1.36	1.26–1.47
A75 (age ≥75 y)										
No	26 539	910	24 675 067	13.48	1.00		1.00		1.00	
Yes	31 097	1859	21 867 843	31.07	2.26	2.08–2.44	2.13	1.97–2.31	2.39	2.06–2.77
									3.52	3.07–4.04
									4.34	3.72–5.06
D (DM)										
No	45 501	2230	37 116 918	21.96	1.00		1.00		1.00	
Yes	12 135	539	9 425 992	20.90	0.95	0.86–1.04	0.88	0.80–0.97	0.88	0.80–0.97
S (stroke)										
No	43 272	2056	35 540 442	21.14	1.00		1.00		1.00	
Yes	14 346	713	11 002 468	23.69	1.11	1.02–1.21	0.99	0.91–1.08	0.96	0.88–1.05
Sex										
F	27 761	1443	21 877 385	24.11	1.00		1.00		1.00	
M	29 875	1326	24 665 525	19.65	0.82	0.76–0.88	0.94	0.87–1.02	0.97	0.90–1.05
$CHADS_2$ score										
0	9048	226	8 571 052	9.64	1.00					
1	17 258	774	14 504 221	19.50	2.00	1.73–2.33				
2	14 335	810	11 244 789	26.33	2.69	2.32–3.11				
3	8853	499	6 657 935	27.39	2.79	2.38–3.26				
4	5847	332	4 197 717	28.91	2.93	2.47–3.47				
5	1993	111	1 221 588	33.21	3,32	2.64–4.16				
6	302	17	145 608	42.67	4.16	2.54–6.80				

Abbreviations: AF, atrial fibrillation; CHF, congestive heart failure; CI, confidence interval; DM, diabetes mellitus; F, female; HT, hypertension; M, male; RR, relative risk.
[a]RR^1: C, H, A75, D, S, and sex included in the model.
[b]RR^2: C, H, age 4 categories, D, S, and sex included in the model.

were likely to have/develop AF and thus might benefit from prolonged monitoring, Haft and Teichholz used the $CHADS_2$ "backward" and concluded that hypertensive patients with many of the characteristic risk factors (CHF, age ≥75 years, DM, coronary artery disease, and ECG findings of enlarged left atria, systolic dysfunction, and left ventricular enlargement) are at high risk of developing AF and an ischemic stroke. Similarly, a new way of estimating the risk score for developing AF in the general population was proposed from the Framingham Heart Study.[19] Another score, a Score of the Targeting of Atrial Fibrillation (STAF), was presented by Suissa et al.[20] Both these new scores need to be prospectively validated.

Study Limitations

Large register data provide high numbers of patients and events, but the trade-off is the level of detail and accuracy of diagnoses as compared with specific prospectively designed

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Table 3. Incidence per 1000 Person-Years and Hazard Ratios of AF After Hemorrhagic Stroke

	No. of Patients	No. with AF	Days at Risk	Incidence/1000 y	RR[a]	95% CI	RR[1b]	95% CI
C (CHF)								
No	7557	145	5 437 116	9.73	1.00		1.00	
Yes	330	11	155 211	25.87	2.61	1.41–4.83	2.15	1.16–4.01
H (HT)								
No	3984	65	2 702 956	8.79	1.00		1.00	
Yes	3903	91	2 889 371	11.51	1.32	0.96–1.81	1.33	0.96–1.84
A75 (age ≥75 y)								
No	4174	62	3 455 690	6.56	1.00		1.00	
Yes	3713	94	2 136 637	16.08	2.43	1.76–3.35	2.53	1.82–3.53
D (DM)								
No	6746	134	4 833 573	10.13	1.00		1.00	
Yes	1141	22	758 754	10.60	1.05	0.67–1.64	0.95	0.60–1.50
S (stroke)								
No	6205	119	4 540 882	9.58	1.00		1.00	
Yes	1682	37	1 051 445	12.86	1.33	0.92–1.92	1.12	0.77–1.63
Sex								
F	3734	68	2 523 210	9.85	1.00		1.00	
M	4153	88	3 069 117	10.48	1.07	0.78–1.47	1.30	0.94–1.80
$CHADS_2$ score								
0	1648	17	1 331 204	4.67	1.00			
1	2772	55	2 062 120	9.75	2.08	1.21–3.58		
2	1679	38	1 130 772	12.28	2.62	1.48–4.64		
3	1013	26	642 719	14.79	3.13	1.70–5.77		
4	610	17	344 879	18.02	3.81	1.95–7.47		
5	148	3	72 272	15.17	3.16	0.93–10.80		
6	17	0	8361	0.00				

Abbreviations: AF, atrial fibrillation; CHF, congestive heart failure; CI, confidence interval; DM, diabetes mellitus; F, female; HT, hypertension; M, male; RR, relative risk.
[a]RR: unadjusted.
[b]RR^1: C, H, A75, D, S, and sex included in the model.

studies. In an observational register study like ours, the diagnoses can not be ascertained apart from what is registered by the caregivers at the time of the admission or discharge from hospital.

The Riks-Stroke register is based on a protocol with a fixed setup that is aimed to be feasible to administer in the acute admission phase of stroke patients. For example, HT is, according to the Riks-Stroke protocol, defined by treatment for the disease and not by digital values of blood pressure. Comorbidities mainly retrieved from the National Hospital Discharge Registry can vary in validation according to how they were confirmed at the time of diagnosis. The Riks-Stroke data have a very high validity for diagnoses such as myocardial infarction or stroke, but information can be missing for conditions that are often treated in primary-care settings (eg, DM and HT). However, this potential bias was reduced by the combination of information from the Riks-Stroke register and the National Hospital Discharge Registry.

Though the $CHADS_2$ score estimates the risk of patients with AF getting a stroke, some strokes that occurred may not have been caused by AF, and at higher $CHADS_2$ scores the risk of stroke may have been increased also in the absence of AF. However, the true presence or absence of AF in

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Table 4. Incidence per 1000 Person-Years and Hazard Ratios of AF After Ischemic Stroke

	No. of Patients	No. with AF	Days at Risk	Incidence/1000 y	RR[a]	95% CI	RR[1b]	95% CI
C (CHF)								
No	42 883	2155	36 546 725	21.52	1.00		1.00	
Yes	4040	309	2 371 594	47.56	2.13	1.89–2.40	1.84	1.63–2.08
H (HT)								
No	21 283	921	18 111 814	18.59	1.00		1.00	
Yes	25 640	1543	20 806 505	27.11	1.45	1.33–1.57	1.40	1.29–1.52
A75 (age ≥75 y)								
No	21 381	814	20 305 243	14.65	1.00		1.00	
Yes	25 542	1650	18 613 076	32.40	2.16	1.99–2.35	2.03	1.87–2.22
D (DM)								
No	36 539	1972	30 670 952	23.50	1.00		1.00	
Yes	10 384	492	8 247 367	21.80	0.92	0.84–1.02	0.86	0.78–0.96
S (stroke)								
No	35 020	1828	29 487 199	22.66	1.00		1.00	
Yes	11 903	636	9 431 120	24.65	1.08	0.99–1.8	0.97	0.89–1.07
Sex								
F	22 601	1286	18 362 377	25.60	1.00		1.00	
M	24 322	1178	20 555 942	20.95	0.82	0.76–0.89	0.94	0.87–1.02
$CHADS_2$ score								
0	7108	199	6 966 135	10.44	1.00			
1	13 644	675	11 796 446	20.91	1.98	1.69–2.32		
2	11 905	728	9 590 001	27.75	2.61	2.23–3.05		
3	7360	447	5 689 858	28.71	2.69	2.77–3.18		
4	4917	297	3 654 171	29.71	2.77	2.32–3.32		
5	1724	102	1 092 172	34.13	3.13	2.46–3.97		
6	265	16	129 536	45.15	4.03	2.42–6.71		

Abbreviations: AF, atrial fibrillation; CHF, congestive heart failure; CI, confidence interval; DM, diabetes mellitus; F, female; HT, hypertension; M, male; RR, relative risk.
[a]RR: unadjusted.
[b]RR[1]: C, H, A75, D, S, and sex included in the model.

patients like ours would have to be assessed prospectively with continuous long-term ECG recording.

Conclusion

In patients admitted for stroke and in SR at the time of admission, hospitalization with a new diagnosis of AF is not uncommon. The number is likely to greatly underestimate the true number of patients with new or undetected AF. In patients with ischemic stroke, AF should be actively looked for and the patient risk assessed by means of, for example, of the $CHADS_2$ score, so that treatment can be directed against underlying risk factors.

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