Atrial Fibrillation Diagnosis Timing, Ambulatory ECG Monitoring Utilization, and Risk of Recurrent Stroke

Gregory Y. H. Lip, MD; Tina D. Hunter, PhD; Maria E. Quiroz, MD; Paul D. Ziegler, MS; Mintu P. Turakhia, MD, MAS

Background—The risk of recurrence after an initial ischemic stroke or transient ischemic attack (TIA) may be impacted by undiagnosed atrial fibrillation (AF). We therefore assessed the impact of AF diagnosis and timing on stroke/TIA recurrence rates in a large real-world sample of patients.

Methods and Results—Using commercial claims data (Truven Health Analytics MarketScan), we performed a retrospective cohort study of patients with an index stroke or TIA event recorded in years 2008 through 2011. Patients were characterized by baseline oral anticoagulation, CHADS₂, and CHA₂DS₂-VASc scores, AF diagnosis and timing with respect to the index stroke, and presence or absence of post-index ambulatory cardiac monitoring. The primary outcome was the recurrence of an ischemic stroke or TIA. Of 179,160 patients (age 67±16.2 years; 53.7% female), the Kaplan-Meier estimate for stroke/TIA recurrence within 1 year was 10.6%. Not having oral anticoagulation prescribed at baseline and having AF first diagnosed >7 days post-stroke (late AF) was highly associated with recurrent stroke/TIA (hazard ratio, 2.0; 95% confidence interval, 1.9–2.1). Among patients with at least 1 year of follow-up, only 2.6% and 9.7% had ambulatory ECG monitoring in the 7 days and 12 months post-stroke, respectively.

Conclusions—AF diagnosed after stroke is an important hallmark of recurrent stroke risk. Increasing the low utilization of cardiac monitoring after stroke could identify undiagnosed AF earlier, leading to appropriate oral anticoagulation treatment and a reduction in stroke/TIA recurrence.

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Key Words: arrhythmias, cardiac □ atrial fibrillation □ electrocardiography, ambulatory □ recurrence □ retrospective studies □ stroke
WHAT IS KNOWN

• The cause of ischemic stroke is not identified in up to 40% of cases.
• This may be due to variability in the type and duration of monitoring for atrial fibrillation (AF) after stroke, especially when AF is paroxysmal and harder to detect.

WHAT THE STUDY ADDS

• In a retrospective commercial claims cohort of 180,000 US patients with stroke, not having oral anti-coagulation prescribed at time of stroke and having AF first diagnosed ≥7 days post-stroke resulted in doubling the risk of stroke.
• Only 2.6% and 9.7% of stroke patients had ambulatory ECG monitoring in the 7 days and 12 months post-stroke; new AF was diagnosed more post-stroke when ambulatory ECG monitoring was performed.
• Ambulatory cardiac monitoring is used infrequently after stroke, but could lead to detection and treatment of undiagnosed AF to reduce stroke recurrence.

Methods

Data Source

The data source utilized for this retrospective cohort study was administrative claims data from the Truven Health Analytics MarketScan Commercial Claims and Encounters and Medicare Supplemental Databases, which contain data on over 180 million patients since 1995. These databases contain fully integrated patient-level health-care utilization data from a US population of employees, spouses, and dependents who are covered by employer-sponsored private health insurance. They also include retirees with Medicare supplemental coverage that is paid for by employers.11

Patient Selection

The study population included patients with an index ischemic stroke or TIA between January 2008 and December 2011, identified by International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) codes of 435.x, 436, 433.x1, or 434.x1.12–14 Patients with evidence of a stroke before the index stroke diagnosis, including ICD-9-CM codes 438.x for late effects of stroke or V12.54 for history of stroke, were excluded. Continuous health plan enrollment was required for a minimum of 1 year before a patient’s first recorded stroke to allow sufficient data to categorize the patient with respect to risk factors and also to increase the likelihood that this index stroke was the patient’s first stroke event. Because of the difficulty in distinguishing healthcare utilization for follow-up of an index stroke from utilization due to a second stroke, only strokes with inpatient or emergency department (ED) utilization were included.

Survival Population

Patients who met the inclusion and exclusion criteria for this study were defined as the survival population as a result of their use in all statistical survival modeling. This population had no required period of minimum enrollment after their index stroke, thus their duration of follow-up varied. Survival modeling methodology properly takes into account the varying drop-off in population size because of loss of follow-up, allowing the use of the largest sample size and all available follow-up information, and thus avoiding a potential source of survival bias.

12-Month Analysis Population

A subset of the survival population, meeting an additional requirement of at least 1 year of follow-up enrollment, was defined as the 12-month analysis population. This population was utilized for all summary statistics to allow a uniform and interpretable follow-up period for calculation of unadjusted yearly rates.

Primary Exposure Variables

Three types of risk factors for stroke recurrence were analyzed in this study: (1) the category of AF/OAC risk, a combination of AF diagnosis and timing with OAC utilization status at baseline (with OAC or no OAC); (2) index stroke characteristics, utilized as proxies for severity level; and (3) CHADS2 and CHA2DS2-VASc risk scores, as summaries of risk due to comorbid conditions. To create the primary risk classifications, each patient was assigned to 1 of 3 categories, as follows: (i) no AF diagnosis seen within ≥12 months of the index stroke (no AF), (ii) AF first diagnosed within 12 months before or within 7 days after the index stroke (early AF), or (iii) AF first diagnosed ≥7 days after the index stroke (late AF). This AF timing category was then combined with baseline OAC status, as determined by a record of OAC utilization in the 12 months before the index stroke, to create an AF/OAC risk classification variable with 6 categories.

Covariates

Index stroke/TIA severity was categorized into 3 levels: occlusion of cerebral or precerebral arteries with infarction (stroke), acute but ill-defined cerebrovascular disease, and TIA. Patients with multiple diagnoses on the index day were categorized according to the highest recorded level. Additional markers of stroke severity were separate indicators for inpatient hospitalization and ED utilization on the day of the index stroke diagnosis, at least one of which was required for inclusion. CHADS2 and CHA2DS2-VASc risk scores were calculated for each patient based on their sex and age at the time of their index stroke/TIA and on recorded diagnoses of the component comorbid conditions within the year immediately prior. The CHADS2 score included 1 point each for evidence of congestive heart failure, hypertension, age ≥75 years, and diabetes mellitus, with 2 points for the index stroke. Similarly, the CHA2DS2-VASc score included 1 point each for evidence of congestive heart failure, hypertension, age 65 to 74 years, diabetes mellitus, and vascular disease, with 2 points for age ≥75 years and 2 points for the index stroke. As defined, all patients had minimum CHADS2, and CHA2DS2-VASc risk scores of ≥2 due to their index stroke.15,16 Finally, 2 additional classification variables were created by crossing AF/OAC risk with CHADS2 and CHA2DS2-VASc risk scores.

Outcomes

The primary outcome of interest, stroke recurrence within 1 year, was defined by ICD-9-CM diagnosis codes combined with an inpatient hospitalization or ED visit, to conform to the definition used for index strokes. Strokes occurring within 7 days after the index stroke diagnosis or during the initial inpatient hospitalization were excluded to ensure that all second strokes, as captured, were new events. Overall stroke recurrence rates, as well as stroke recurrence by CHADS2, and CHA2DS2-VASc risk scores, were summarized for the 12-month analysis population.

The overall incidence of new AF, first detected after the index stroke, was also of interest. Baseline prevalence of AF in the stroke population was defined by an ICD-9-CM diagnosis code 427.31 or antiarrhythmic drug utilization in the year before the index stroke. Thus, patients with new AF were defined as the population of patients with evidence of AF in the year after the index stroke, but with no evidence in the year prior. Both baseline and new AF were summarized for the 12-month analysis population as a whole, as well as by CHADS2 and CHA2DS2-VASc risk scores.

We also secondarily examined the incidence and type of ambulatory cardiac monitoring utilization in the year after index stroke.4 This monitoring incidence was ascertained via records of Current
Statistical Models
Survival analysis methods were used to model the time from the index ischemic stroke/TIA event to a recurrence in the survival population. These methods correctly incorporate censoring information for those patients with incomplete follow-up. Kaplan-Meier models were used to derive product limit estimates for ischemic stroke recurrence rates at each level of the AF/OAC/CHADS<sub>2</sub> and AF/OAC/CHA<sub>2</sub>DS<sub>2</sub>-VASc risk classification variables. Thus, Kaplan-Meier estimates are univariate estimates based on a single predictor variable that includes category, for each mutually exclusive and collectively exhaustive combination of AF, OAC, and risk score levels.

We used multivariable Cox regression to estimate the hazard ratios for stroke recurrence within 1 year at each level of CHA<sub>2</sub>DS<sub>2</sub>-VASc score, AF/OAC risk category, index stroke severity, and inpatient or ED utilization on the day of the index stroke diagnosis. Each hazard ratio represents the recurrence risk associated with the particular level of the predictor variable compared with the reference level of that same predictor, after adjusting for all remaining predictors in the model. In other words, the hazard ratio can be interpreted as the relative risk of a stroke recurrence within 1 year for a patient with the particular risk factor level compared with a patient with the reference value of the same risk factor, given that both patients have the same levels of every remaining risk factor in the model. Patient characteristics that comprise the CHA<sub>2</sub>DS<sub>2</sub>-VASc score were not also included separately in the multivariable model to avoid collinearity.

All data used to perform this analysis were deidentified, accessed in compliance with the Health Insurance Portability and Accountability Act, and therefore exempt from Institutional Review Board review under 45 CFR 46.101(b)(4). A request to review this claim of exemption was submitted to the New England Institutional Review Board and exemption was obtained (New England Institutional Review Board No. 13-398). All analyses were performed using SAS version 9.2 (SAS Institute Inc, Cary, NC).

Results
There were 179,160 patients (age 67±16.2 years; 53.7% female) who met the criteria for inclusion in the study cohort (survival population), with a subset of 79,062 (age 67±15.7 years; 53.8% female) having a minimum of 1 year of follow-up after their index stroke (12-month analysis population; Figure).

Patient characteristics were similar across the 2 primary populations, but with a slightly lower proportion of strokes versus TIA in the 12-month analysis population than in the survival population. The lowest CHA<sub>2</sub>DS<sub>2</sub> and CHA<sub>2</sub>DS<sub>2</sub>-VASc scores in these populations were values of 2 due to index stroke. Two-thirds of the populations had a CHA<sub>2</sub>DS<sub>2</sub> risk score of 3 or 4, and three-quarters had a CHA<sub>2</sub>DS<sub>2</sub>-VASc risk score between 3 and 6 (Table 1).

The overall baseline prevalence of diagnosed AF was 13.7%, with higher rates as risk scores increased. The overall baseline utilization of OAC medications was 9.2%, also increasing with risk. New AF was detected in the year after the index stroke in 6.6% of the 12-month analysis population, varying from 3.0% to 10.5% in subsets with increasing risk scores. The overall rate of recurrent stroke within the year after index stroke was 9.7%, increasing from 5.5% to 16.4% by risk category (Table 2).

The prevalence of ambulatory cardiac monitoring within the year after the index stroke was 9.7%, compared with 4.4% in the year prior. Thus, the increase in monitoring prevalence attributable to stroke was only 5.3%. Patients with a stroke recurrence had a slightly higher monitoring rate (13.3%) than patients without recurrent stroke (9.3%) in the year after the index stroke, reflecting the totality of the monitoring after the index stroke and any follow-up monitoring after the recurrence that also occurred within a year of the index stroke. Only 2.6% of patients had post-stroke monitoring initiated within a week after the index stroke (Table 3). As expected, new AF was diagnosed in more patients with ambulatory cardiac monitoring than in patients without this additional monitoring (17.0% versus 5.5%; P<0.0001).

Kaplan-Meier models showed higher estimates of 1-year stroke recurrence for patients with AF than for patients without AF, particularly when the AF was not detected until later. Patients with no AF or early AF had only small differences in recurrence estimate profiles, but patients with late AF had substantially higher recurrence rates if they were not already on OAC at baseline. Regardless of the category of AF detection and OAC utilization, stroke recurrence rates increased steadily with both CHADS<sub>2</sub> and CHA<sub>2</sub>DS<sub>2</sub>-VASc risk scores. Models of AF/OAC/CHADS<sub>2</sub> and AF/OAC/CHA<sub>2</sub>DS<sub>2</sub>-VASc categories both showed high levels of significance for the categorizations, with log-rank P values <0.0001. The Kaplan-Meier product limit estimate for 1-year stroke recurrence in the overall population was 10.6% (Table 4).
The Cox regression model showed that CHA$_{DS_2}$-VASc score, the combination of AF detection and OAC utilization, stroke type and healthcare utilization at index stroke were all highly significant independent predictors of recurrent stroke. Hazard ratios for stroke recurrence within 1 year ranged from 1.2 to 3.0, with increasing CHA$_{DS_2}$-VASc score.

Among the categories of AF diagnosis and baseline OAC utilization, patients with late AF and no record of baseline OAC usage had the highest hazard ratio for stroke recurrence within 1 year relative to patients with neither AF diagnosis nor OAC utilization (hazard ratio 2.0; 95% CI 1.9–2.1). Acute, ill-defined cerebrovascular disease conferred a hazard ratio for stroke recurrence within 1 year of 1.2 relative to TIA, whereas occlusion and infarction of cerebral or precerebral arteries (stroke) resulted in a hazard ratio for stroke recurrence within 1 year of 1.5. Inpatient hospitalization and ED utilization resulted in equal increases in risk of stroke recurrence, with hazard ratios of 1.4 each (Table 5).

### Discussion

In this study, our principal finding was that belatedly diagnosed AF is associated with increased risk of recurrent stroke. Indeed, patients with late AF and no record of baseline OAC usage have the highest hazard ratio relative to patients with neither AF diagnosis nor OAC utilization. We also found that only a small percentage of the ischemic stroke population receives any ambulatory monitoring within the year after their index stroke.

The impact of AF on stroke recurrence rates cannot be overstated. Kamel et al$^{17}$ followed a prospective cohort of 5575 hospitalized stroke patients and reported an 18.9% one-year Kaplan-Meier estimate of recurrent stroke rate for patients with new AF diagnosed in the year after discharge versus 4.5% for all other patients, including those with AF diagnosed before or at the index stroke hospitalization. Ischemic stroke was also associated with a substantially increased risk of incident AF, particularly among individuals with higher CHADS$_2$ or CHA$_{DS_2}$-VASc scores.

Many additional patients with AF may remain undetected at 1 year after the index stroke because of low rates of ambulatory cardiac monitoring in asymptomatic patients and the lack of sensitivity of traditional monitoring techniques to detect paroxysmal AF. AF detection rates rise with the frequency and duration of intermittent monitoring, yet remain substantially inferior to continuous monitoring, as shown by sampling from continuous readings to simulate various monitoring strategies in patients with implanted cardiac devices.$^{18,19}$ In the current study, only 6.6% of the total 12-month analysis population had new AF in the year after stroke, which is the equivalent of a 7.6% rate in the subset of patients without baseline AF. This newly detected AF resulted from only a 9.7% rate in the subset of patients without baseline OAC usage.

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Studies that report detection of new AF in cryptogenic stroke after longer duration cardiac monitoring report higher rates than those seen in this study, as well as higher rates than seen in control cohorts with standard of care or shorter duration monitoring.$^{9,20,21}$ In particular, the CRYSTAL AF (Cryptogenic Stroke and Underlying Atrial Fibrillation)
trial discovered acutely undetected AF within 12 months after cryptogenic stroke in 12.4% of patients monitored via implantable loop recorder versus only 2.0% of controls with conventional follow-up.20 Favilla et al10 found a 14% rate of AF in a cohort of consecutive patients monitored by 28-day mobile cardiac outpatient telemetry after cryptogenic stroke or TIA. Similarly, Flint et al8 reported an 11% rate of new AF after cryptogenic stroke with 30-day ECG loop recording. Interestingly, 55% of this new AF was not detected until after day 10 of the recording, with 31% first detected within days 11 to 20 and 24% first detected within days 21 to 30. Indeed, it is possible that a significantly higher rate of new AF would have been detected in the current study population if a higher rate and longer duration of cardiac monitoring had been utilized. Further study is required to determine whether more rigorous post-stroke arrhythmia monitoring can lead to increased AF detection and OAC utilization, thus resulting in a reduction of stroke recurrence.

The overall 1-year rate of recurrent stroke in this study was estimated to be 10.6% based on Kaplan-Meier methods that utilized the entire survival population, and the observed rate was 9.7% within the subgroup of patients with a full year of follow-up. The observed rate may be lower because of the requirement of 1-year follow-up, which necessarily precludes mortality due to stroke recurrence. The true recurrence rate, including fatal recurrences, may even be higher than 10.6% because survival methodology cannot fully compensate for a strong correlation between follow-up time and likelihood of recurrence. Specifically, strokes that were immediately fatal would not be captured because of the requirement for a patient to survive long enough to incur inpatient or ED utilization at the time of the event. This conservative bias toward low estimated rates may be exacerbated in the higher risk patient subgroups, where stroke recurrence rates are highest.

Finally, detection of AF is alone unlikely to improve outcomes unless it is linked to care structure and care processes.
that improve utilization of evidence-based treatment. Many studies have consistently shown suboptimal rates of anticoagulation use in AF patients across multiple healthcare systems, including use of aspirin monotherapy in patients with CHADS$_2$ and CHA$_2$DS$_2$-VASc scores $\geq$2. The American Heart Association Get With The Guidelines-Stroke hospital-based quality improvement program has been shown to improve OAC prescription for secondary stroke prevention.24

**Limitations**

This study had several limitations related to the dependence on information available in claims data to define both outcomes and risks. Risk factors were limited to diagnosis and procedure data available via administrative medical coding. Lifestyle factors, such as smoking history and exercise habits, were unavailable. Additional risks, like obesity, have relevant diagnosis codes but are severely underreported.25 There may also be other confounding variables, including frailty and other comorbidities outside the CHA$_2$DS$_2$-VASc score.

Foremost among the data limitations are those related to the definition of stroke events and the lack of information on death occurring outside an inpatient hospitalization. Because the definition of stroke used in this study, both the mildest strokes, not associated with inpatient or ED treatment, and the most serious strokes, resulting in death before an inpatient or ED visit, are excluded. Mortality data from 2011 have shown that $\approx$57% of all stroke death occurs outside the hospital setting, thus suggesting that the stroke recurrence rates seen in this study are substantially lower than actual rates. In addition, early recurrences, within 1 week of the index stroke or during hospitalization for the index event, were not captured. Johnston et al26 found that 5.3% of TIA patients evaluated in the ED experienced a stroke within 2 days, whereas Petty et al27 found 2.9% of patients with ischemic stroke had recurrences within 7 days. Because early recurrences account for a large proportion of total 1-year recurrences, the inability to distinguish second events within an index hospitalization could be another factor in the underestimation of recurrence rates based on claims data.

Utilization of OAC as a risk factor in this study was limited to baseline usage, so it is unknown how the existence and timing of any new post-index OAC utilization may have impacted stroke recurrence. The relationships between the timing of patients’ first OAC treatment, any new AF diagnoses, use or nonuse of cardiac monitoring, and any stroke recurrences are likely quite complex and would require further study to elucidate. Patient adherence to OAC therapy and maintenance of international normalized ratio within the therapeutic target range (for those taking warfarin) are additional unknown factors that may influence stroke recurrence risk. We did not consider differences in outcomes between patients treated with warfarin or NOACs because the data source for this analysis included claims from 2008 to 2011. For an analysis to differentiate NOACs, especially one that would not be confounded by trends in uptake of NOACs, more contemporary data would be needed.

Similarly, the timing and duration of the ambulatory cardiac monitoring that was seen in this study could not be ascertained nor could the results of the monitoring. In particular, it is unclear whether the higher rate of monitoring seen in patients with stroke recurrence versus patients without recurrence (13.3% versus 9.3%) was simply a matter of patients with more risk factors receiving more diagnostic testing or whether the increase in monitoring occurred as a consequence

<table>
<thead>
<tr>
<th>Table 4. Kaplan–Meier Product Limit Estimates of Stroke Recurrence Rates Within 1 Year: Survival Population (N=179160)</th>
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<tbody>
<tr>
<td><strong>Risk Score</strong></td>
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<tr>
<td>n</td>
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<tr>
<td>CHADS$_2$ score</td>
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<tr>
<td>2</td>
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<td>4</td>
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<tr>
<td>5</td>
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<tr>
<td>6</td>
</tr>
<tr>
<td>CHA$_2$DS$_2$-VASc score</td>
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<tr>
<td>2</td>
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<td>3</td>
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</table>
of the stroke recurrence. In addition, the choice of a 7-day post-stroke cutoff for defining early versus late AF diagnosis may be confounded by other factors that affect length of stay, resulting in misclassification. Finally, our study population of all ischemic stroke patients would naturally include patients with known nonembolic causes for whom long-term monitoring would not be typical.

Despite the limitations of this study, it is a reasonable assumption that the resulting biases are not likely to be differential across risk cohorts, thus allowing valid interpretation of the incremental effects of various risks. The AF/OAC combination categories add valuable information to the current literature as they provide a level of detail not previously available. The identical hazard ratios seen for patients with early AF, with and without previous OAC utilization, after adjusting for risk scores, seem to suggest that these patients have been properly managed relative to their risk level. In contrast, the higher hazard ratios associated with late AF suggest that early and more aggressive diagnostic measures may be appropriate, particularly because late AF in the absence of previous OAC imparts the highest hazard of any AF/OAC combination.

Conclusions

In patients with ischemic stroke or TIA, a new diagnosis of AF occurring >7 days post-stroke is associated with increased risk of recurrent stroke. On the basis of the low utilization of ambulatory cardiac monitoring seen in this ischemic stroke population, increased utilization would likely lead to additional and more timely AF diagnosis. Earlier AF detection, in turn, could increase the number of patients receiving appropriate OAC treatment, potentially reducing their risk of recurrent stroke.

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Sources of Funding

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Disclosures

Dr Lip has served as a consultant for Bayer/Jensen, Merck, Sanofi, Bristol-Myers Squibb/Pfizer, Daiichi-Sankyo, Biotronik, Medtronic, Portola, and Boehringer Ingelheim and has been on the speaker’s bureau for Bayer, Bristol-Myers Squibb/Pfizer, Boehringer Ingelheim, Daiichi-Sankyo, Medtronic, Roche, and Sanofi Aventis. Dr Hunter is an employee of CTI Clinical Trial and Consulting Services, Inc., which is a paid consultant to Medtronic. Dr Quiroz and P. D. Ziegler are employees of Medtronic. Dr Turakhia is a consultant to Medtronic and St. Jude Medical and has received honoraria from St. Jude Medical.

Table 5. Cox Regression Model Results for Stroke Recurrence Survival: Survival Population (N=179,160)

<table>
<thead>
<tr>
<th>Predictor Category</th>
<th>Hazard Ratio (95% Confidence Limits)</th>
<th>χ² P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHA2DS2-VASc=3 (vs 2)</td>
<td>1.2 (1.1, 1.3)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>CHA2DS2-VASc=4 (vs 2)</td>
<td>1.5 (1.4, 1.7)</td>
<td>&lt;0.0001</td>
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<tr>
<td>CHA2DS2-VASc=5 (vs 2)</td>
<td>1.8 (1.7, 2.0)</td>
<td>&lt;0.0001</td>
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<tr>
<td>CHA2DS2-VASc=6 (vs 2)</td>
<td>2.0 (1.9, 2.2)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>CHA2DS2-VASc=7 (vs 2)</td>
<td>2.4 (2.2, 2.6)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>CHA2DS2-VASc=8 (vs 2)</td>
<td>2.6 (2.3, 2.8)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>CHA2DS2-VASc=9 (vs 2)</td>
<td>3.0 (2.6, 3.5)</td>
<td>&lt;0.0001</td>
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<tr>
<td>No AF, with OAC (vs no AF or OAC)</td>
<td>1.1 (1.0, 1.2)</td>
<td>0.0042</td>
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<tr>
<td>Early AF, no OAC (vs no AF or OAC)</td>
<td>1.3 (1.2, 1.3)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Early AF, with OAC (vs no AF or OAC)</td>
<td>1.3 (1.2, 1.3)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Late AF, no OAC (vs no AF or OAC)</td>
<td>2.0 (1.9, 2.1)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Late AF, with OAC (vs no AF or OAC)</td>
<td>1.6 (1.3, 1.8)</td>
<td>&lt;0.0001</td>
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<tr>
<td>CVA (vs TIA)</td>
<td>1.2 (1.1, 1.2)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Stroke (vs TIA)</td>
<td>1.5 (1.4, 1.5)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Inpatient hospitalization on index stroke date</td>
<td>1.4 (1.3, 1.4)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>ED utilization on index stroke date</td>
<td>1.4 (1.3, 1.4)</td>
<td>&lt;0.0001</td>
</tr>
</tbody>
</table>

AF indicates atrial fibrillation; CVA, cerebrovascular disease; ED, emergency department; OAC, oral anticoagulation; and TIA, transient ischemic attack.

References


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