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Use of Oral Anticoagulant Therapy in Older Adults with Atrial Fibrillation after Acute Ischemic Stroke

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Abstract

Objective—To explore barriers to anticoagulation among older atrial fibrillation (AF) patients at high risk for stroke and identify opportunities where interventions might increase use of oral anticoagulants (OAC).

Design—Retrospective cohort study

Setting—Two large community-based AF cohorts

Participants—1405 patients (mean age 79 years) with ischemic stroke surviving hospitalization.

Measurements—Using structured chart review, we identified reasons for non-use of OACand assessed one-year post-stroke survival. Logistic regression identified correlates of OAC non-use.

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Authors' Contributions

Dr. McGrath contributed to the design of the study, interpretation of data, and drafting and revision of the manuscript. Dr. Go contributed to acquisition and interpretation of the data and provided critical review of the manuscript. Dr. Chang contributed to interpretation of the data and drafting and revision of the manuscript. Ms. Borowsky contributed to interpretation of the data and drafting and revision of the manuscript. Dr. Fang provided critical review of the manuscript Dr. Reynolds contributed to acquisition and interpretation of the data and provided critical review of the manuscript. Dr. Singer contributed to the design of the study, interpretation of data, and drafting and revision of the manuscript All authors have approved the final version of the manuscript.

Sponsor's Role

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Results—The median CHA_2DS_2-VASc score was 5, yet 44% of patients were not prescribed OAC at discharge. The most frequent (non-mutually exclusive) physician reasons for non-prescription of OAC included fall risk (26.7%), poor prognosis (19.3%), bleeding history (17.1%), patient/family refusal (14.9%), older age (11.0%) and dementia (9.4%). Older age (OR 8.96, 95% CI 5.01–16.04 for age ≥85 vs. age <65 years) and increased disability (OR 12.58, 95% CI 5.82–27.21 for severe vs. no deficit) were the most important independent predictors of non-use of OAC. By one year, 42.5% of those not receiving OAC at discharge had died versus 19.1% of those receiving OAC (p<0.0001), far higher than recurrent stroke rates.

Conclusion—Despite very high stroke risk, over 40% of patients were not discharged on OAC. Dominant reasons included fall risk, poor prognosis, older age, and dementia. These patients' elevated 1-year mortality rate confirmed their high level of comorbidity. Future work to improve outcomes and clinical decisions regarding anticoagulation in this patient population should focus on: mitigation of fall risk, better assessment and decision tools for determining risk/benefit in individual patients, and determining whether newer anticoagulants are safer in complex elderly and/or frail patients.

Keywords

Ischemic stroke; atrial fibrillation; oral anticoagulants; decision-making

Introduction

Prior ischemic stroke is one of the most important risk factors for recurrent ischemic stroke in patients with atrial fibrillation (AF).[1] Oral anticoagulant (OAC) therapy can reduce the risk of ischemic stroke by two-thirds in AF patients with prior ischemic stroke.[2] Despite this, a large proportion of patients with AF are not prescribed OAC following ischemic stroke.[3] There is a lack of understanding of the reasons why OAC therapy is not prescribed for such patients at very high risk of recurrent ischemic stroke. Previous studies have primarily included lower stroke risk patients without prior stroke[4] and have been limited by small sample sizes[4–6]. Greater insights into non-use of OAC therapy in high-risk secondary prevention populations may enable targeted interventions to increase appropriate use of OAC therapy in suitable candidates, including AF patients without prior stroke but who are at otherwise high stroke risk. In this study, we describe the reasons for non-prescription of OAC therapy following acute ischemic stroke in two large community-based cohorts of patients with AF.

Methods

Study Design

We report on the clinical course of all patients sustaining an ischemic stroke during follow-up of two separate cohorts of patients with AF, the ATRIA (Anticoagulation and Risk factors in Atrial Fibrillation) and ATRIA-CVRN (Anticoagulation and Risk factors in Atrial Fibrillation Cardiovascular Research Network).

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Population

The first cohort, the ATRIA nonvalvular AF cohort has been described in detail previously.[7] In brief, members of Kaiser Permanente of Northern California between July 1, 1996, and December 31, 1997 aged ≥18 years old with either 2 or more outpatient AF diagnoses (ICD-9 code 427.31) or 1 outpatient AF diagnosis with ECG validation, were included, resulting in a 13,559 member cohort. Patients with mitral stenosis, or an aortic or mitral valve replacement were excluded. Follow-up continued through September 2003. Clinical data were collected from inpatient, outpatient, laboratory, pharmacy and administrative databases as well as a longitudinal diabetes registry.[8, 910] The current study focuses on cohort members who sustained an ischemic stroke during follow-up. Potential stroke events were identified via hospitalization and billing databases using ICD-9 codes for ischemic stroke in the primary discharge position (ICD-9 codes: 433.00-.01, 433.10-.11, 433.20-.21, 433.30-.31, 434.00-.01, 434.10-.11, 434.90-.91, and 436). Medical records of potential events were abstracted using a formal protocol with each event adjudicated by two physicians with a third available to resolve disagreements. In rare cases a consultant neurologist provided the final diagnosis. Patients who presented to non-Kaiser institutions with stroke were identifiable in Kaiser Permanente databases. A valid IS was defined as the sudden onset of a neurologic deficit fitting a vascular distribution persisting for at least 24 hours and not explained by other etiologies. The modified Rankin (mRankin) score[11] of functional disability at discharge was estimated from medical chart notes. Such estimated mRankin scores are highly correlated with post-hospitalization mortality rates.[12] Post-stroke mortality was ascertained via medical chart review, hospital databases, health plan member reporting, Social Security Administration files and the California state death certificate registry.[13] The sole OAC prescribed was warfarin. Warfarin use at the time of admission was determined from medical chart review. Warfarin prescription at the time of hospital discharge was determined from medical chart review, supplemented by a validated warfarin use algorithm assessing warfarin use following hospitalization.[7]

The second study cohort ATRIA-CVRN, has also been described in detail previously[14]. Briefly, the ATRIA-CVRN cohort consists of 33,247 patients from Kaiser Permanente Northern California and Southern California aged ≥21 years with incident AF or atrial flutter first diagnosed between January 2006 and June 2009 and confirmed by ECG or physician diagnosis in the electronic medical record. A valid diagnosis of AF included ≥1 inpatient diagnosis or ≥2 outpatient diagnoses. ATRIA-CVRN included patients with mitral stenosis or a valve replacement in the mitral or aortic positions (1.5% of the cohort). Emergency Department visits for stroke not resulting in hospital admission were included as ATRIA-CVRN outcome events. We adopted the same approach as for ATRIA for reviewing charts, determining mRankin score and warfarin use following hospitalization or Emergency Department visit, and for validating ischemic stroke events and death. Follow-up continued through June 2009.

We confined our analysis to patients alive at hospital or Emergency Department discharge following acute ischemic stroke. For the current study, the date of diagnosis of the first ischemic stroke in the cohort was considered the patient's index date.

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Outcome Measures

The primary outcome was prescription of warfarin at the time of hospital discharge following acute ischemic stroke. Patients for whom use of warfarin was planned after discharge were counted as having been discharged on warfarin (Figure 1). Secondary outcomes included time to death and recurrent ischemic stroke following discharge for the index stroke.

Covariates

We included variables hypothesized to be associated with OAC use following ischemic stroke: 1) ischemic stroke risk factors, including prior ischemic stroke, history of heart failure, hypertension, age, diabetes mellitus, vascular disease (coronary artery and peripheral artery disease), female sex and renal impairment; and 2) potential contraindications to use of OAC, including dementia, prior gastrointestinal or intracranial hemorrhage, post-stroke mRankin disability score, as well as race. Age and race were obtained from administrative databases. For the ATRIA cohort, the remaining covariates were obtained from structured chart review. For the ATRIA-CVRN cohort, disability was obtained from chart review but the remaining covariates were obtained from outpatient and inpatient diagnostic codes.[7, 14, 15]

For patients not discharged on OAC, medical record reviewers recorded the specifically stated or clinically apparent reason(s) why OAC was not prescribed from a list of reasons provided to the reviewer in both the ATRIA and ATRIA-CVRN cohorts. If necessary, a free text field could be used by the reviewer for reasons not listed (see table 3 for list of reasons). In addition, an option indicated a plan to prescribe warfarin at some period post discharge. Six hundred and nineteen patients were discharged off warfarin, of whom 95 did not have an explicitly documented nor apparent clinical reason for nonprescription of warfarin at discharge. In addition, 22 patients did not have a documented history of AF in the medical chart during the stroke admission. Although all 22 met study entry criteria for AF, the absence of mention of AF in the record indicated that anticoagulation for AF was not part of the physicians' discharge decision. As a result, we included 502 patients with clearly documented reasons for nonuse of warfarin on discharge in the analysis of reasons why OAC was not prescribed at discharge.

Statistical Analysis

A similar percentage of patients were prescribed warfarin at hospital discharge in the two cohorts (43% in the ATRIA cohort and 46% in the ATRIA-CVRN cohort) and so the results of the two cohorts were pooled to enhance statistical power. No patients were shared between the two cohorts. For descriptive analyses, χ^2 tests compared categorical variables and student's *t*-tests compared continuous variables. Univariate and multivariable logistic regression models assessed the likelihood of not prescribing OAC therapy on discharge given the presence of clinical features. Warfarin status following discharge was missing in only 54 (3.7%) of patients (Figure 1). These patients were excluded from the analysis. We included variables in the multivariable models based on clinical and statistical ($P<0.05$) significance. Warfarin use at the time of admission for ischemic stroke was included in the analyses. Unadjusted Kaplan-Meier curves were generated for time to recurrent ischemic

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stroke and time to death, according to OAC therapy status on discharge, and statistical significance was assessed using the logrank test. For all analyses, a two-sided P-value <0.05 was considered to be statistically significant. All analyses were conducted using SAS statistical software, version 9.4 (SAS Institute Inc., Cary, NC).

The study was approved by the institutional review boards of the collaborating institutions. Waiver of informed consent was obtained due to the nature of the study.

Results

In the combined ATRIA and ATRIA-CVRN cohorts (n=46,806), a total of 1647 (3.5%) patients were admitted with acute ischemic stroke, 1459 (88.6%) of whom were discharged alive, 897 patients from the ATRIA cohort and 562 from the ATRIA-CVRN cohort (Figure 1). Warfarin status at discharge was known for 1405 (96.3%). The majority were age 75 years or older (72.6%), caucasian (80.4%) and women (54.0%). A large proportion of patients had significant comorbidities, including 30.4% with diabetes, 78.1% with hypertension, 32.7% with coronary disease, and 37.9% with heart failure. (Table 1) Because of the patients' comorbidities and having sustained a stroke, the AF ischemic stroke risk scores were very high with median (IQR) values as follows: ATRIA: 10 (9–11) (range 0–15) , CHA_2DS_2-VASc: 5 (5–6), (range 0–9); and $CHADS_2$: 4 (4–5), (range 0–6). Fifty-one percent were discharged with major or severe disability.

Forty-four percent (619/1405) of patients were not discharged on OAC therapy. Discharge off OAC therapy was much more likely among patients who were not on OAC at admission: 59.6% (566/949) of patients who were not on OAC therapy on admission versus 11.6% (53/456) who were on OAC therapy on admission (P<0.0001). A higher proportion of patients with major or severe disability were not discharged on OAC therapy (56.1%) compared to those with no or mild disability (31.6%) (P<0.0001). Seventy-three percent of patients not discharged on OAC therapy were prescribed aspirin (Table 1).

There were strong independent associations of older age, dementia, and disability on non-use of OAC therapy at discharge. On multivariable analysis, the odds ratio (OR) for non-use of OAC at discharge was 3.25 (95% CI 1.79–5.89) for age 65–74, 3.43 (95% CI 1.98–5.94) for age 75–84, and 8.96 (95% CI 5.01–16.04) for age 85 compared to age <65 years. The OR was 1.69 (95% CI 1.12–2.57) for diagnosed dementia, and 1.39 (95% CI 0.77–2.51) for minor disability, 2.78 (95% CI 1.53–5.05) for major disability, and 12.58 (95% CI 5.82–27.21) for severe disability compared to no disability. Large associations were also seen for patients with prior GI or intracranial hemorrhage. Even after controlling for multiple clinical features, patients who were admitted off OAC were far more likely to also be discharged off OAC (OR 11.25, 95% CI 7.95–15.92) (Table 2).

Reasons for non-use of oral anticoagulant therapy

The most commonly cited reasons for non-prescription of OAC therapy on discharge included a perceived increased risk of falls (26.7%), poor prognosis (19.3%), prior history of bleeding (17.1%), patient or family refusal (14.9%), older age (11.0%), poor cognitive status (9.4%, n=47) and risk of hemorrhagic conversion of ischemic stroke (8.8%, n=44) (Table 3).

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In all, 72% (360/502) of patients not receiving OAC at discharge had one or more of the following long-term strong contraindications cited: risk of falls, poor prognosis/comfort care only, prior history of bleeding, patient or family refusal, and dementia/poor cognitive status. We excluded “increased age” and “risk of hemorrhagic conversion” as not strong long-term contraindications.

Post-discharge death or recurrent ischemic stroke

Non-prescription of OAC therapy on discharge was strongly associated with subsequent mortality. Among those patients not receiving OAC at discharge, 21% had died by 30 days post-admission versus 4.6% of those discharged on OAC (Figure 2a). By one year, the Kaplan-Meier estimate for mortality was 42.5% of those not receiving OAC at discharge versus 19.1% of those receiving OAC at discharge ($p<0.0001$ comparing overall survival curves). The rates of recurrent ischemic stroke were much smaller than those for mortality and were moderately higher among patients not receiving OAC at discharge (2.1% vs 1.7% at 30 days; 7.7% versus 4.9% at 1 year) ($p=0.071$ comparing unadjusted survival curves over one year follow-up) (Figure 2b). Among patients not receiving OAC at discharge, those categorized as contraindicated because of risk of falls, poor prognosis/comfort care only, prior history of bleeding, patient or family refusal, or dementia/poor cognitive status had a 30-day mortality rate of 26%. By one year, nearly one-half (49%) had died.

Discussion

Atrial fibrillation patients who have had an acute ischemic stroke are at the highest risk of a recurrent ischemic stroke.[14] Nonetheless, over 40% of acute IS patients in our study were discharged without OAC therapy. Impressively, of patients who suffered an ischemic stroke while not on anticoagulation, almost 60% were discharged still off OAC therapy. This large proportion of non-use of warfarin in these high stroke risk patients occurred in a health care system with excellent supports for management of warfarin therapy through dedicated anticoagulation management services.[8] Further, review of medical charts made clear that physicians were aware that OAC was indicated to prevent stroke in patients with AF. Our results demonstrate that strong contraindications dominate the anticoagulation decision in many older and/or debilitated patients with AF, even those at the highest risk for future ischemic stroke. The most commonly cited ongoing reasons for non-use of OAC therapy on discharge included perceived increased risk of falls, poor prognosis, prior bleeding, patient/family refusal, and dementia, as well as the less specific contraindication of “increased age.” Fully 72% (360/502) of patients not receiving OACs at discharge had one or more of these cited contraindications as the basis for the decision. Our multivariable analyses confirmed the strong independent associations of increased age, disability, prior bleeding, as well as dementia inhibiting prescription of OACs at hospital discharge. Interestingly, non-use of OAC therapy at admission remained a major determinant of non-use at discharge, even after accounting for other features related to OAC at discharge. This finding indicates that the pre-admission contraindications still dominated the OAC decision at discharge and suggests that other unmeasured factors added to the documented contraindications. The main reasons cited for non-use of OACs were highly related to mortality and, indeed, over 40% of patients discharged off OAC died by one year. Notably, the rate of recurrent stroke at one year in

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patients discharged off OAC was 7.7%, indicating that the vast majority of these patients died from non-stroke related comorbidities. Such patients would have had little opportunity to benefit from the stroke preventive effects of OAC.

The most common reasons for not using OAC in our study have also been cited in other studies. [16–19] It is worth considering whether they should serve as strong contraindications and whether they can be mitigated. Certainly, poor prognosis, if assessed accurately, is a reasonable contraindication; a short remaining lifespan would make benefit from OAC unlikely. Prior bleeding with risk of recurrence is another common strong contraindication for OAC. While the expected stroke preventive benefit from OAC treatment outweighs the harm from nearly all extracranial hemorrhages, most patients do not re-start OAC after a major bleeding event.[20]

The most commonly cited reason for non-prescription of OAC therapy in our cohort was an increased risk of falls. Physicians are concerned that anticoagulants will aggravate trauma following falls, particularly head trauma.[21] Indeed, a recent large, database study highlighted the high incidence of anticoagulant-associated intracranial hemorrhage, fall-related and otherwise, among older U.S. veterans with AF and another recent study reported a mortality rate of 6% for AF patients on OAC following a ground level fall.[22, 23] In contrast, one older modeling study has estimated that an individual patient would have to fall up to 295 times per year before the risks of anticoagulation outweigh the benefits.[24] In any case, physician reluctance to use OAC in patients who are at high risk of falling is understandable. Formal fall risk assessment and interventions to reduce fall risk might increase the use of OACs in frail elders. [25, 26]

Old patients with AF are less likely to be treated with OAC despite good evidence that they gain substantial net benefit from anticoagulants.[27, 28] Bleed risk clearly increases with age but so does the risk of ischemic stroke and the potential benefits of OAC.[28–30] “Advanced age” as a contraindication may be a synonym for frailty. However, for robust elders, age alone should not be considered a valid contraindication to OAC therapy.

Cognitive impairment was a reason for non-use of OAC therapy in 9% of patients. Previous studies have reported similar underuse of OAC therapy in patients with cognitive impairment.[16, 31] Use of anticoagulant therapy in this population can be challenging. However, in the ACTIVE-W trial, Mini Mental State Examination score was not associated with increased risk of vascular events or major hemorrhage.[32] Such findings indicate that warfarin therapy, and presumably newer anticoagulants, can be administered to patients with dementia under appropriate supervision.

The proportion of AF patients treated with OAC has not increased substantially in recent years despite the introduction of novel anticoagulants that are easier to take and have a reduced risk of intracranial hemorrhage[33] as well as the substantial attention to AF stroke prevention in lay and professional media.[34–36] In a recent report from an AF registry based in cardiology practices, less than half of high-risk patients received OAC[37]. A recent Swedish study from administrative databases reported similarly low rates of OAC uptake in patients with AF after ischemic stroke; only 35% of patients received OAC within 3 months

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of discharge. Our study demonstrates that, even among AF patients at the highest risk of ischemic stroke, there are large subgroups with major and complex contraindications to anticoagulant therapy consistent with the predominantly older age of patients with AF.[38]. While some of these contraindications may be addressable in individual patients, going forward it is likely that a significant fraction of AF patients will remain untreated with anticoagulants.

Our study benefits from its large size, a detailed chart review protocol that included questions explicitly addressing contraindications to OAC use at discharge, follow-up for stroke and death post-discharge, all within well-studied community-based, cohorts of patients with AF with high quality ascertainment of use of anticoagulants. A real-time survey exploring physicians' reasons for not prescribing OAC therapy would have been preferable to our retrospective chart review. However, such a study would be difficult to implement on a large scale and at risk for a poor response rate. Finally, our data reflect OAC decisions before the era of novel anticoagulants. It is conceivable that some patients not treated with warfarin might now be treated with a novel agent, although recent prescription data suggest that novel anticoagulants are replacing warfarin but not increasing the proportion of AF patients treated with anticoagulants.[35] Novel anticoagulants led to fewer intracranial hemorrhages in randomized trials versus warfarin.[33, 39] However, these trials were less likely to enroll the very old, frail, and fall-prone. As a result, the relative safety of novel anticoagulants in such individuals with AF is currently not clearand is an important area for future investigation.[22, 33, 39, 40]

CONCLUSION

Despite the very high risk of recurrent stroke faced by AF patients who have suffered an acute ischemic stroke, over 40% of our study patients were not discharged on OAC therapy. The dominant reasons for non-use of OAC were risk of falls, poor prognosis/comfort care only, prior history of bleeding, patient or family refusal, older age, and dementia/poor cognitive status. These data suggest that more work is needed in order to improve outcomes in this high risk patient population in order to improve outcomes and individual care decisions regarding anticoagulation. Future work should focus on strategies to mitigate fall risk, develop and validated formal assessment and decision tools for determining risk/benefit in individual patients, and determining whether newer anticoagulants are safer in complex elderly and/or frail patients.

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	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Employment or Affiliation		✓		✓		✓		✓	
Grants/Funds		✓	✓			✓		✓	
Honoraria		✓		✓		✓		✓	
Speaker Forum		✓		✓		✓		✓	
Consultant		✓		✓		✓		✓	
Stocks		✓		✓		✓		✓	
Royalties		✓		✓		✓		✓	
Expert Testimony		✓		✓		✓		✓	
Board Member		✓		✓		✓		✓	
Patents		✓		✓		✓		✓	
Personal Relationship		✓		✓		✓		✓	

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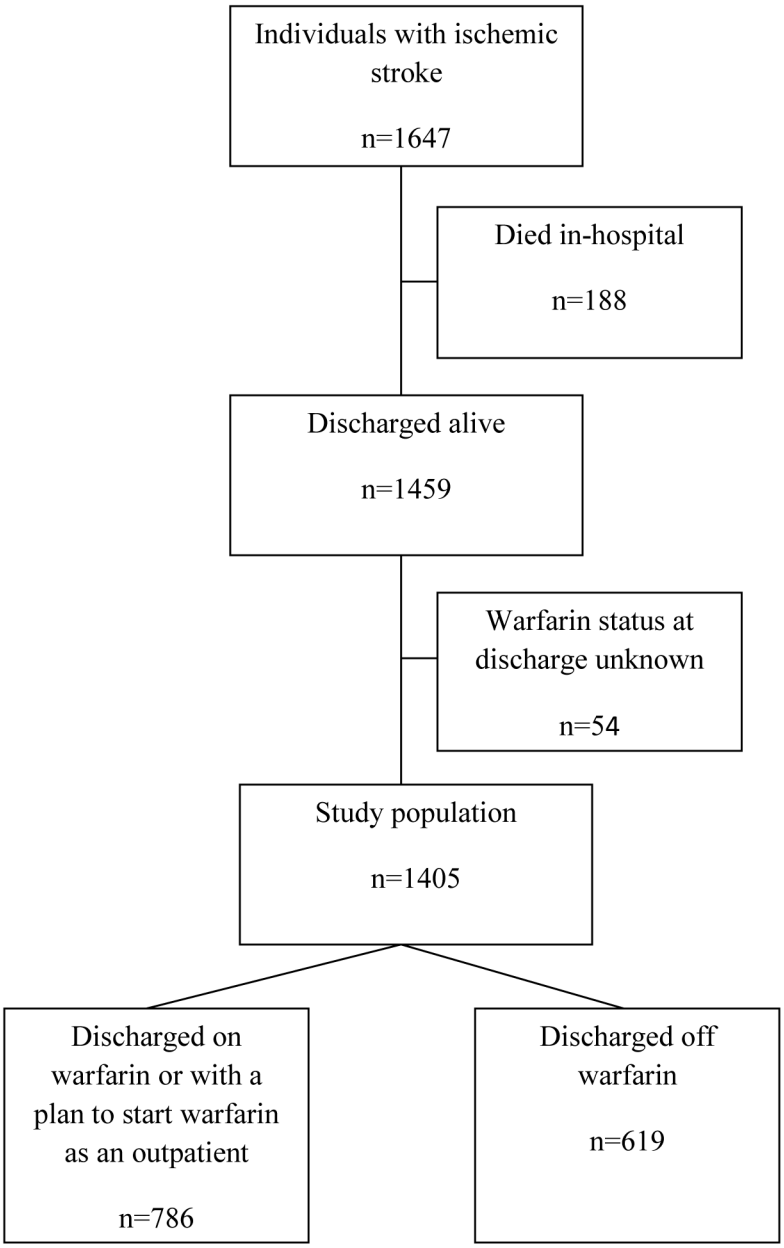

Figure 1.
Flowchart of Ischemic Stroke Patients in ATRIA and ATRIA-CVRN

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Figure 2A

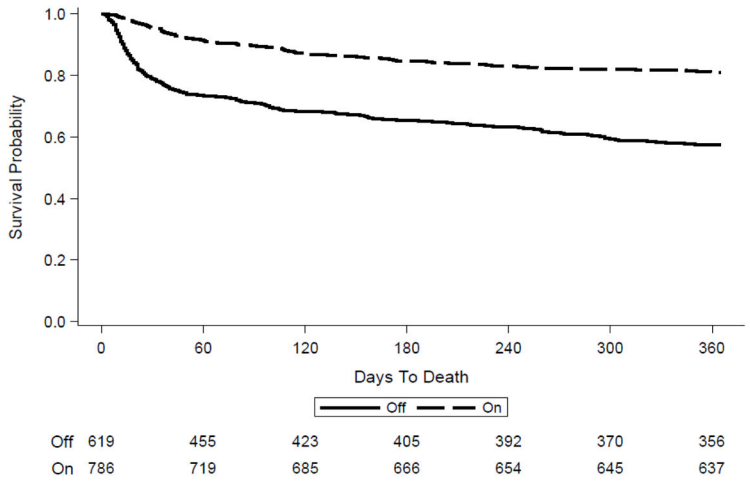

Figure 2B

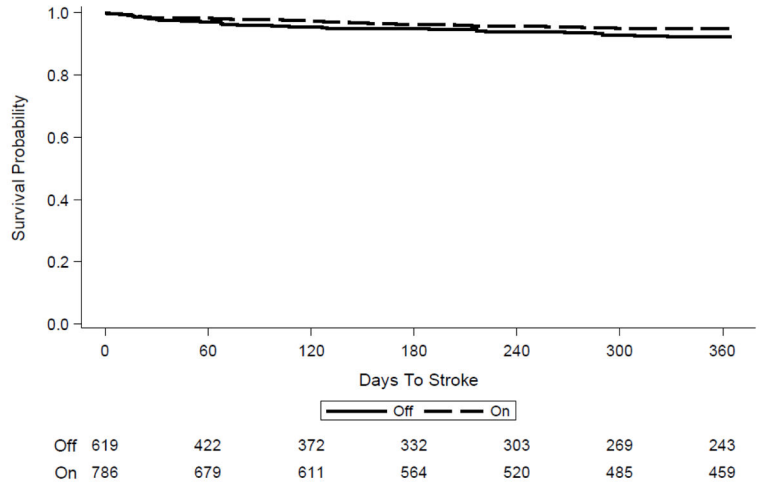

Figure 2.

Figure 2a. Mortality according to Anticoagulant Therapy on Discharge

Figure 2b. Recurrent Stroke according to Anticoagulant Therapy on Discharge

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Table 1

Baseline Features of Patients with AF and IS Discharged Alive with Known Warfarin Status[a]

Variable	All patients	OAC at discharge	No OAC at discharge
N (%)	1405	786	619
Age, mean (SD), years	79 (9)	76 (9)	82 (9)
Age <65 years	132 (9.4)	109 (13.9)	23 (3.7)
Age 65–74 years	253 (18.0)	168 (21.4)	85 (13.7)
Age 75–84 years	616 (43.8)	383 (48.7)	233 (37.6)
Age ≥ 85 years	404 (28.8)	126 (16.0)	278 (44.9)
Women	759 (54.0)	404 (51.4)	355 (57.4)
White race	1130 (80.4)	626 (79.6)	504 (81.4)
Diabetes mellitus	427 (30.4)	251 (31.9)	176 (28.4)
Hypertension	1097 (78.1)	635 (80.8)	462 (74.6)
Coronary artery disease	460 (32.7)	268 (34.1)	192 (31.0)
Chronic heart failure	532 (37.9)	293 (37.3)	239 (38.6)
Peripheral artery disease	124 (8.8)	75 (9.5)	49 (7.9)
Renal impairment[b]	328 (23.3)	159 (20.2)	169 (27.3)
Diagnosed dementia	195 (13.9)	67 (8.5)	128 (20.7)
Prior gastrointestinal hemorrhage	136 (9.7)	50 (6.4)	86 (13.9)
Prior intracranial hemorrhage	54 (3.8)	15 (1.9)	39 (6.3)
Warfarin use at admission	456 (32.5)	403 (51.3)	53 (8.6)
ATRIA score [c]			
7–9	528 (37.6)	333 (42.4)	195 (31.5)
10–11	594 (42.3)	337 (42.9)	257 (41.5)
12–15	283 (20.1)	116 (14.8)	167 (27.0)
Median score (IQR)	10 (9–11)	10 (9–11)	10 (9–12)
CHA_2DS_2VASc score[d]			
2–3	83 (5.9)	59 (7.5)	24 (3.9)
4–5	742 (52.8)	406 (51.7)	336 (54.3)
6–8	580 (41.3)	321 (40.8)	259 (41.8)
Median score (IQR)	5 (5–6)	5 (4–6)	5 (5–6)
$CHADS_2$ score[e]			
2–3	306 (21.8)	196 (24.9)	110 (17.8)
4	591 (42.1)	308 (39.2)	283 (45.7)
5–6	508 (36.2)	282 (35.9)	226 (36.5)
Median score (IQR)	4 (4–5)	4 (4–5)	4 (4–5)
Aspirin prescribed at discharge	689 (49.0)	240 (30.5)	449 (72.5)
Disability at discharge[f]			
No disability (mRankin 0)	81 (5.8)	59 (7.5)	22 (3.6)
Minor (mRankin 1–2)	593 (42.2)	402 (51.1)	191 (30.9)
Major (mRankin 3–4)	575 (40.9)	290 (36.9)	285 (46.0)

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Variable	All patients	OAC at discharge	No OAC at discharge
Severe (mRankin 5)	142 (10.1)	25 (3.2)	117 (18.9)

[a] Warfarin status at discharge was missing for 54 (3.7%) of patients.

[b] estimated glomerular filtration rate <45 ml/min/1.73m^2 or end-stage renal disease

[c] ATRIA score components: Stroke, Age, Female, Diabetes mellitus, Congestive heart failure, Hypertension, Proteinuria, and eGFR<45ml/min/1.73m^2 or end stage renal disease, range 0–15.

[d] CHA_2DS_2VASc score components: Congestive heart failure, Hypertension, Age, Diabetes mellitus, Stroke, Vascular disease, Age and Sex category (female), range 0–9.

[e] $CHADS_2$ score components: Congestive heart failure, Hypertension, Age, Diabetes mellitus, Stroke, range 0–6.

[f] Data were missing for disability at discharge in 14 (1.0%) patients.

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Table 2

Clinical Features associated with Non-use of OAC on Discharge following IS

Variable	Percent not discharged on OAC	Univariate OR (95% CI)	Multivariable OR (95% CI)
Age			
<65 years	17.4	reference	
65–74 years	33.6	2.40 (1.43–4.03)	3.25 (1.79–5.89)
75–84 years	37.8	2.88 (1.79–4.65)	3.43 (1.98–5.94)
≥ 85 years	68.8	10.46 (6.36–17.18)	8.96 (5.01–16.04)
Gender			
Male	40.9	reference	
Female	46.8	1.27 (1.03–1.57)	0.79 (0.60–1.05)
Diabetes mellitus			
No	45.3	reference	
Yes	41.2	0.85 (0.67–1.07)	1.20 (0.89–1.62)
Hypertension			
No	51.0	reference	
Yes	42.1	0.70 (0.54–0.90)	0.69 (0.50–0.95)
Coronary artery disease			
No	45.2	reference	
Yes	41.7	0.87 (0.69–1.09)	0.90 (0.67–1.20)
Chronic heart failure			
No	43.5	reference	
Yes	44.9	1.06 (0.85–1.31)	0.84 (0.63–1.12)
Peripheral artery disease			
No	44.5	reference	
Yes	39.5	0.81 (0.56–1.19)	0.72 (0.44–1.15)
Renal impairment			
No	41.8	reference	
Yes	51.5	1.48 (1.16–1.90)	1.38 (1.00–1.90)
Diagnosed dementia			
No	40.6	reference	
Yes	65.6	2.80 (2.04–3.84)	1.69 (1.12–2.57)
Prior gastrointestinal hemorrhage			
No	42.0	reference	
Yes	63.2	2.38 (1.65–3.42)	1.95 (1.25–3.04)
Prior intracranial hemorrhage			
No	42.9	reference	
Yes	72.2	3.45 (1.89–6.33)	3.76 (1.74–8.12)
No OAC at time of admission for ischemic stroke			
No	59.6	reference	
Yes	11.6	11.24 (8.21–15.39)	11.25 (7.95–15.92)
Disability at discharge[a]			

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Variable	Percent not discharged on OAC	Univariate OR (95% CI)	Multivariable OR (95% CI)
No disability	27.2	reference	
Minor	32.2	1.27 (0.76–2.14)	1.39 (0.77–2.51)
Major	49.6	2.64 (1.57–4.42)	2.78 (1.53–5.05)
Severe	82.4	12.55 (6.53–24.11)	12.58 (5.82–27.21)

[a]Disability at discharge was missing for 14 patients.

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Table 3

Physician Reasons for Non-prescription of OAC Therapy on Discharge[a]

Reason	All patients discharged off OAC N=502 n (%)
Fall risk	134 (26.7)
Poor prognosis/comfort care only	97 (19.3)
Prior bleed	86 (17.1)
Patient/family refusal	75 (14.9)
Increased age	55 (11.0)
Poor mental status/dementia	47 (9.4)
Risk of hemorrhagic conversion of IS	44 (8.8)
No AF captured during hospitalization, paroxysmal AF, or prior cardioversion of AF	35 (7.0)
Hemorrhagic conversion of IS	34 (6.8)
Current bleed	30 (6.0)
Increased risk of bleeding	17 (3.4)
Source of stroke thought to be non cardio-embolic and unrelated to AF	16 (3.2)
Warfarin status to be determined as an outpatient	16 (3.2)
Allergy or intolerance to warfarin	9 (1.8)
History of medication non-adherence	9 (1.8)
Elevated INR/difficulty controlling INR	6 (1.2)
Planned procedure/surgery/dentistry	2 (0.4)
Underlying coagulopathy	2 (0.4)
Other[b]	13 (2.6)

[a]Patients could have more than one reason cited for non-prescription of OAC therapy at discharge. 345 (69%) patients had reasons for non-use of OAC specifically stated in the medical chart. For 157 (31%), reasons were clinically apparent but not specifically stated in the medical chart.

[b]In ATRIA, specific reasons listed under ‘other’ included: ‘improving exam’, ‘visual disturbance’, ‘no evident benefit to anticoagulation’, ‘not a good candidate’, ‘not an anticoagulation candidate’ and ‘rare episodes of paroxysmal AF’. In ATRIA-CVRN, reasons listed under ‘other’ included: ‘outpatient physicians had previously decided not to anticoagulate’ and ‘aspirin alone recommended by neurology consult for unknown reasons’.