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An Emergency Department Intervention to Increase Warfarin Use for Atrial Fibrillation

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Abstract

Background—Emergency Department (ED) encounters represent lost opportunities to facilitate anticoagulation for stroke prevention in atrial fibrillation (AF). However, screening of warfarin eligibility in the ED may not be feasible. Thus, we evaluated whether a practical quality improvement (QI) initiative increased post-discharge warfarin use in ED patients with AF.

Methods—This quasi-experimental study was conducted in a single academic health system. Eligible subjects were consecutive patients with AF identified by EKG during an ED evaluation, who were discharged from the ED or the subsequent hospitalization off warfarin. The study consisted of data collection during two time periods: 1) pre-intervention (10/2009 - 4/2010), serving as a baseline, and 2) intervention (6/2010 - 12/2010). The intervention consisted of a mailing to the subjects and their primary care physicians. The primary outcome was the proportion of subjects taking warfarin 1 month following ED presentation. Differences between the proportion of pre-intervention and intervention subjects taking warfarin and warfarin or aspirin were compared with χ^2 tests.

Results—At 1 month, 111/204 (55%) of the eligible pre-intervention and 90/160 (56%) of the eligible intervention group patients participated. There was no difference between the pre-intervention and intervention groups in the proportion of subjects taking warfarin at one month (12% vs. 9%, $p=0.54$), or the proportion of subjects taking either aspirin or warfarin at 1 month (72% vs. 75%, $p=0.59$).

Conclusions—This practical stroke prevention QI initiative was not associated with an increase in warfarin use among ED patients with AF.

Emergency physicians (EP) must provide problem-focused, efficient care to overcome the continued problems of emergency department (ED) overcrowding and long wait times.[1] Nevertheless, the ED provides an opportunity to screen for potential catastrophic conditions

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that may be unrelated to patients' presenting complaints. The key to quality improvement (QI) in the ED is finding a screening process and intervention mechanism that requires virtually no additional EP or nursing staff time. We applied this framework to the study of patients presenting to the ED who were found to have atrial fibrillation (AF).

AF is the most common sustained heart rhythm abnormality, affecting over 2.2 million Americans and is expected to increase to 5.6 million by the year 2050.[2, 3] AF is a potent independent risk factor for stroke, increasing the risk of stroke by approximately 5-fold.[2] Despite warfarin's impressive 64% relative risk reduction in cardioembolic stroke, it is significantly underutilized.[4, 5] Prior work at our institution showed that over half of patients with AF seen in the ED are not receiving anticoagulation and anticoagulation is rarely initiated in this setting.[6, 7] Therefore, we designed and tested a practical, stroke prevention, QI initiative to increase post-discharge warfarin use in ED patients identified with AF.

Methods

This quasi-experimental study was conducted in a single academic health system. The study was divided into two phases: pre-intervention (October 2009–April 2010) and intervention (June 2010–December 2010).

Patients

Eligible subjects were consecutive patients evaluated in the ED with AF identified by EKG, who were not on warfarin therapy at the time of discharge from the ED or subsequent hospitalization. Exclusion criteria included being under the age of 18, pregnant, homeless, incarcerated, or requiring a foreign language interpreter. To reduce future EP and nursing staff burden, we included all patients with AF rather than attempting to screen for warfarin eligibility. Evaluation of warfarin contraindications in an emergency setting is challenging without the benefit of extensive medical records and gait assessment, and therefore would be impractical if this QI program were to be disseminated.

Intervention

The intervention was designed to provide feedback to the patient's primary care physician (PCP) about the ED visit. The intervention consisted of a plain language informational sheet mailed to the patients at a median of 8 days (interquartile range (IQR) 6–13 days) following their ED encounter. It notified the patients of their AF, provided information about AF as a risk factor for stroke, and described the roles of warfarin and aspirin in stroke prevention. Finally, it encouraged discussing these issues with their PCP.

The patients' PCPs were identified from the medical record or if not listed (n=1) every attempt was made to identify the patients' PCP, including contacting the patient. PCPs were both mailed and faxed a copy of the patient's ED EKG and a copy of the information sheet mailed to the patient. The PCP was also sent an informational sheet providing information on the CHADS₂ stroke risk scoring system to guide the appropriate use of warfarin and aspirin.[8]

Outcomes Measures and Covariates

A telephone interview assessed warfarin and aspirin use 1- and 6-months post-ED encounter. All outcome measures were selected *a priori*. The primary outcome was the proportion of subjects taking warfarin 1 month post-ED encounter. The secondary outcomes were warfarin or aspirin use 1 month and warfarin use 6 months post-ED encounter. At the 1-month interview, subjects were queried on contraindications to warfarin. Demographics,

admission status, and comorbidities obtained from the medical record were used to calculate CHADS₂ scores. [8] Subjects with a chief complaint of palpitations, tachycardia or shortness of breath were categorized as presenting for an AF-related complaint.

Sample Size and Statistical Analysis

Power was calculated *a priori* based on an estimate of AF patients seen in the ED during a 6 month pre-intervention and 9 month intervention period (although 7 months was used for each phase in the actual study) using a chi square test of proportions and the following assumptions: a conservative estimate of 50% warfarin initiation in the pre-intervention group, two-sided test, and an alpha of 0.05. Based on this calculation, with at least 51 subjects in the pre-intervention group and 77 in the intervention group, we estimated a power of at least 90% to detect a 30% absolute difference in 1 month post-ED encounter warfarin use between the preintervention and intervention phases.[6]

Descriptive statistics were used to assess subject demographics, comorbidities, and hospital admission (yes vs. no and missing). Differences between the proportion of pre-intervention and intervention subjects taking warfarin and warfarin or aspirin were compared with χ^2 tests 1 and 6 months post-ED encounter. Statistical analysis was performed using Stata 11.0 (StataCorp, College Station, Texas). The study was approved by the University of Michigan Institutional Review Board.

Results

During the 14 month enrollment period, 1,005 patients had an EKG with AF. Of these, 364 (36%) were not taking warfarin and thus were eligible to participate in the 1 and 6-month interviews (figure 1). At 1-month follow-up, 55% (111/204) of the preintervention group subjects and 56% (90/160) of the intervention group subjects participated. At 6 months, 84/204 (41%) of the pre-intervention and 80/160 (50%) of the intervention group subjects participated. Subjects were younger than those who did not participate, but there was no significant difference in gender. Over half (64%) of the subjects presented with a chief complaint unrelated to AF. Most (86%) were admitted to the hospital. No significant differences between pre-intervention and intervention groups were identified for subject gender, race, age, or CHADS₂ score (table 1). Fifty six patients (25%) of the subjects had a CHADS₂ ≥ 2 and were without self-reported warfarin contra-indications.

There was no statistically significant difference between pre-intervention and intervention groups in the proportion of subjects taking warfarin at 1 month, taking either aspirin or warfarin at 1 month, or taking warfarin at 6 months (table 2). There was no significant difference in the proportion of subjects who reported warfarin contraindications (38% vs. 40%, $p=0.79$) between the groups. The most commonly reported contraindications were history of bleeding (22%) and doctor advised against warfarin (21%).

Discussion

This practical stroke prevention QI initiative was not associated with an increase in warfarin use among ED subjects with AF who were not taking warfarin at the time of their ED encounter. Our results extend the findings of prior warfarin related QI initiatives in other medical settings to the novel venue of the ED. These other studies, including an audit and feedback intervention and a pharmacist-led intervention, targeting hospitalized patients with AF were also unsuccessful in improving the proportion of patients treated with warfarin (although aspirin use was increased).[9, 10]

The importance of testing intervention such as the current QI initiative is highlighted by The Department of Health and Human Services' recently launched "Million Hearts Initiative," to prevent 1 million heart attacks and strokes over the next 5 years through a focus on "implementing proven, effective, inexpensive interventions" [11]. Although this QI initiative was ineffective, we believe that the ED remains a novel location to identify patients who may benefit from warfarin therapy, given that over a third of the patients in the current study with AF were not on warfarin at the time of the ED encounter, and to test inexpensive interventions that can be easily disseminated and implemented if shown to be successful. For example if successful, our intervention would require only personnel with limited skills to prepare and send weekly mailings. Striking the balance between efficient interventions and enough contact to determine eligibility for warfarin remains a challenge in busy EDs. However as payment models change to Accountable Care Organizations, increased hospital attention will likely be directed toward stroke prevention.

Reporting of negative results is important both to limit publication bias and to inform future interventions.[12] Several possible reasons for the failure of our QI initiative exist. The intervention may have been ineffective and higher intensity approaches may be necessary. However, more likely, the negative results of our study are because the majority of subjects were not likely warfarin candidates. As in a recent, large anticoagulation trial,¹ over half of the subjects had a CHADS₂ score less than 2 suggesting that warfarin was not mandatory for some subjects. Furthermore, when combining CHADS₂ scores ≥ 2 and self-reported warfarin contra-indications, we determined that only 25% of the subjects were warfarin candidates. Due to the small number of warfarin candidates in our population and the possibility of inaccurate warfarin contra-indications, we did not perform a sub group analysis to assess the effect of the intervention among warfarin candidates. Among pre-intervention subjects, we cannot exclude that the 1 month call may have prompted them to discuss their AF with their PCP and thus would affect the results of the 6 month outcome (non-primary).

Finally, we unexpectedly found that 86% of subjects were admitted to the hospital. We suspect that most of these patients received a thorough evaluation for warfarin eligibility in both the pre-intervention and intervention groups and thus reduced the potential impact of the intervention. Due to small sample size, we were unable to repeat the analysis on the subset of subjects who were discharged home from the ED. If the intervention were to be tested in another ED, we would recommend careful attention to the proportion of patients shown to have atrial fibrillation in the ED who are warfarin candidates and discharged to home from the ED.

Additional limitations warrant discussion. This was not a randomized, controlled trial and thus was subjected to external trends in warfarin use across the two study periods. The study was performed at a single academic health system. We did not perform a process evaluation to assess how many PCPs received and acted on the intervention materials. We did not query lovenox, dabigatran which was FDA approved for the last 2 months of the study, or other anticoagulant use. We believe that future QI initiatives should query anticoagulation alternatives to warfarin as they become more widely used in practice.

Conclusion

In conclusion, this ED-based, low-cost, practical stroke prevention QI initiative did not increase warfarin use. Future studies using the ED to screen for high risk, incidental conditions must consider EP and nursing staff time burden, ED admission practices and the intervention impact.

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Figure 1.
Subject selection and follow-up among patients with atrial fibrillation identified in the ED.

Table 1

Demographics, comorbidities, and hospital admissions among patients with atrial fibrillation identified in the ED

Variable	Pre-Intervention (n=125) n (%)	Intervention (n=97) n (%)	P value
Age mean (standard deviation)	66 (17)	69 (15)	0.08
Male	69 (55)	56 (58)	0.71
Caucasian	111 (89)	89 (92)	0.65
History of Atrial Fibrillation	64 (51)	57 (59)	0.26
Hypertension	67 (54)	56 (58)	0.54
Diabetes	32 (26)	21 (22)	0.49
Coronary Artery Disease	33 (26)	19 (20)	0.24
Congestive Heart Failure	18 (14)	19 (20)	0.30
Stroke/Transient ischemic attack	6 (5)	6 (6)	0.65
End Stage Renal Disease	4 (3)	3 (3)	0.96
Cancer	33 (26)	23 (24)	0.65
Chronic Obstructive Pulmonary Disease	6 (5)	2 (2)	0.28
Dementia	2 (2)	9 (9)	<0.01
CHADS ² Score 2	48 (38)	46 (47)	0.18
Sent from a Nursing Home	1 (1)	5 (5)	0.047
Admitted to hospital	103 (82)	88 (91)	0.08
Self-reported warfarin contra-indications	47 (38)	39 (40)	0.79

Table 2

Outcomes at 1 and 6 months post-ED encounter for pre-intervention and intervention subjects.

	Pre-intervention %	Intervention %	P value
Warfarin at 1 month	12	9	0.54
Warfarin at 6 months	17	16	0.92
Warfarin or aspirin at 1 month	72	75	0.59