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The Atrial Fibrillation Therapies after ER visit: Outpatient Care for Patients with Acute AF - The AFTER 3 Study

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Abstract

Background: Visits to the emergency room (ER) for atrial fibrillation/flutter (AF) are common, but follow-up care is rarely systematically organized and is often delayed.

Purpose: We conducted a pilot program to develop a systematic, protocol-based system of care for patients presenting to the ER with a primary diagnosis of AF.

Methods: Consecutive patients presenting to the ER with ECG-documented AF at an urban teaching hospital were treated according to a guideline-based care protocol, including a patient toolkit at ER discharge, and systematic referral to a rapid access AF clinic. Consenting patients received questionnaires on AF knowledge, patient satisfaction, and the AFEQT questionnaire at first visit and three-month follow-up.

Results: Of the 321 patients with AF, 244 (76%) were discharged from the ER and 166 (68%) were referred to the AF clinic for urgent follow-up. Among 166 referred, 144 (87%) were seen, within a median 10.5 days (IQR 6-16.5 days); 128 (89%) patients agreed to participate in the study and 81% received a toolkit in the ER. The mean age of patients seen in AF clinic was 63.6±13.2 years and 59% were male. Eighty-seven percent were aware of their diagnosis, stroke risk (82%), possible complications (90%), treatment options (86%) and benefits of adherence (86%). Severity of Atrial Fibrillation class was > 2 in 51% at baseline; AFEQT scores increased from baseline (56.4±25.5) to three months post-ER visit (76.4±20.0), a moderately large improvement in QOL ($p<0.0001$). Seventy eight percent of patients with CHA2DS2-VASc score > 1 were treated with an oral anticoagulant.

Conclusions: A systematic program to improve patient transition of care from the ER to community clinic was associated with prompt, guideline-based care, and high levels of patient disease awareness. Quality of life scores improved substantially between the index ER visit and 3 months post-visit.

Introduction

Atrial fibrillation (AF) is the most common sustained arrhythmia worldwide and is associated with considerable morbidity and mortality.[1,2] The main cause of increased mortality associated with AF is the risk for thromboembolic stroke, which can be substantially reduced by appropriate stroke prevention therapy with systemic anticoagulation.[3,4]

Patients with AF are diagnosed in many clinical situations, ranging from asymptomatic AF discovered during a routine clinical evaluation, to symptomatic AF presenting at an outpatient facility or an emergency room (ER). The ER is a common place to present, making the ER a prime location to focus efforts that can intervene in the course of illness. According to Canadian and International Guidelines, among patients for whom AF is the primary reason for the ER visit, the majority do not require hospital admission, and can safely be discharged from the ER to their place of residence.[5-7] Recent studies indicate that 70-85% of such patients can be safely discharged, however discharge rates vary widely.[8] In the province of Ontario (population of 13 million),[9] between 2002 and 2010 there were approximately 20,000 visits per year to an ER with a primary diagnosis of AF, representing almost 16,000 individual patients. The province-wide discharge rate was approximately 60%.[10]

Some studies suggest that these patients may receive incomplete, inconsistent, or fragmented care in follow-up, and that the proportion of these patients receiving evidence-based stroke prevention treatment on discharge from the ER is undesirably low.[11] Furthermore, there are rarely standardized transition of care systems that ensure timely and appropriate follow-up care following ER discharge, as well as

Disclosures:
None.

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Table 1: Patient Baseline Characteristics at ER and AF Clinic

Demographics	N=128
Age, years (mean ± SD)	63.6 ± 13.2
Male – no (%)	76 (59%)
ER Symptoms	
Chest Pain – no (%)	25 (20%)
Dyspnea – no (%)	48 (38%)
Fatigue/Effort Tolerance – no (%)	26 (20%)
Palpitations – no (%)	90 (70%)
Syncope/Presyncope – no (%)	27 (21%)
Past Medical History – no (%)	
Known AF/Atrial Flutter (prior to current ER visit)	72 (56%)
Heart Failure	4 (3%)
Hypertension	59 (46%)
Diabetes Mellitus	22 (17%)
Stroke/TIA	10 (8%)
CAD	15 (12%)
Significant valvular heart disease	3 (2%)
Valve surgery	2 (2%)
Myocardial Infarction	6 (5%)
Left ventricular systolic dysfunction	2 (2%)
CABG / PCI	12 (9%)
Prior major bleeding	1 (1%)
Substance abuse including ETOH and street drugs	8 (6%)
Initial ECG in ER - Type – no (%)	
AF	100 (78%)
Atrial Flutter	20 (16%)
Sinus Rhythm*	8 (6%)
Final ECG in ER - Type – no (%)	**N=96†**
AF	33 (34%)
Atrial Flutter	5 (5%)
Sinus Rhythm	58 (60%)
CHADS2 – no. (%)	
0	51 (40%)
1	37 (29%)
≥2	40 (31%)
Rheumatic Heart Disease/Mitral Valve Replacement	3 (2%)
CHA2DS2-VASc – no. (%)	
0	22 (17%)
1	34 (27%)
≥2	72 (56%)
AF Clinic Appointment	**N=125**
Time from ER to AF Clinic – days (median, IQR) (N=128)	10.5 (5.5-18)
Seen by:	
Nurse Practitioner – no. (%)	101 (81%)
EP Fellow/Resident – no. (%)	9 (7%)
Physician only – no. (%)	15 (12%)
AF Type – no. (%)	**N=128**
Newly documented	56 (44%)
Paroxysmal AF	32 (25%)
Persistent AF	25 (20%)
Long standing persistent AF	5 (4%)
Atrial Flutter	10 (8%)
SAF Class (mean±SD, Range) (N=83)	1.8 ±1.0 (0-4)
Rhythm at AF Clinic Visit – no. (%)	**N=127**
AF	39 (31%)
Atrial Flutter	6 (5%)
Sinus Rhythm	78 (61%)
Other	4 (3%)

*All patients had documented AF/Atrial Flutter in the ER, †Some patients never had a second ECG in the ER
AF – Atrial fibrillation; BP – Blood Pressure; CABG/PCI – Coronary artery bypass graft/ Percutaneous coronary intervention; CAD – coronary artery disease; COPD – chronic obstructive pulmonary disease; ECG – electrocardiogram; EP – Electrophysiology; ER – Emergency Department; ETOH – ethyl alcohol; INR – International normalized ratio; RN- Registered Nurse; Rx – prescription; SAF– Severity of Atrial Fibrillation; TIA – transient ischemic attack

standardized patient information and instructions.

The main purpose of the AFTER3 Study was to evaluate and verify feasibility of a comprehensive program of outpatient care for patients with AF as their primary ER diagnosis, consisting of a care pathway and patient toolkit. Secondary outcomes include guideline-indicated oral anticoagulant use and quality of life measures at AF clinic follow-up and at 3 months. We hypothesize that this comprehensive program will be feasible and provide optimal outpatient care for patients with AF identified in the ER.

Material And Methods

Patient Eligibility

All study participants over the age of 18 years with atrial fibrillation or atrial flutter (AF) as a primary diagnosis of the ER visit (as defined by the ER treating physician), symptoms consistent

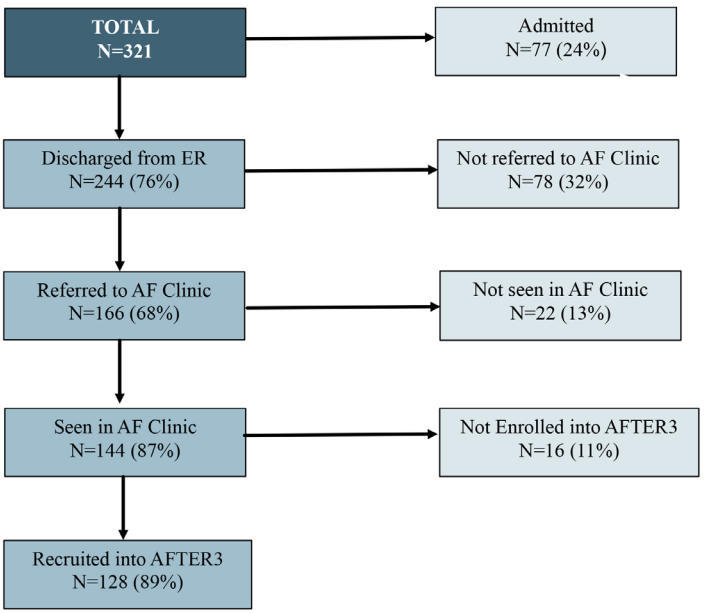

Figure 1: AFTER3 Patient Recruitment (March 2012 - August 2013)

Admitted – Patients admitted to hospital; Discharged from ED – Patients discharged home from the ED; Not referred – Patients not referred to the AF Clinic; Referred to AF Clinic – Referrals were faxed/copied and placed in ED binder and patient was given an appointment at ED discharged; Not seen in AF Clinic – Patients cancelled their appointment or were no shows; Seen in AF Clinic – Patients who came for their scheduled AF Clinic appointment; Not Enrolled into AFTER3 – Patient declined, limited English, met exclusion criteria; Recruited into AFTER3 – Patients who met inclusion criteria and were recruited into the AFTER3 Study

with AF (no minimum duration was specified), documented AF on a 12-lead ECG, either first or recurrent AF presentation and subsequent discharge from the ER were eligible to participate in the trial. Exclusion criteria included patients with no fixed address, cardiogenic shock, "Do Not Resuscitate (DNR) status", Class IV congestive heart failure (CHF) symptoms with documented CHF (chest X-Ray, physical exam), unstable angina or myocardial infarction (ischemic ST changes, chest pain suggesting myocardial ischemia, ± abnormal troponin),[12] patients requiring hospitalization and/or serious co-morbidity (terminal cancer, severe COPD, life expectancy < 1 year, dialysis or severe renal failure). The study was approved by the St. Michael's Hospital Research Ethics Board.

Development of Toolkit

Researchers from St. Michael's Hospital and the Centre for Innovation in Complex Care at the University Health Network, including patient and GP/specialist collaboration, developed five patient education brochures:

1) Introduction to AF.
2) AF treatment options.
3) AF – How to decrease your risk of stroke.
4) What do I do if I think I am having an AF episode.
5) AF – What you need to know about cardioversion.

All of the brochures were reviewed and approved by a Patient Education Specialist from Li Ka Shing Knowledge Institute at St Michael's Hospital. It was recommended that all patients with documented AF should be given a toolkit at ER discharge.

ER Recruitment and Referral Process

Two AF referral processes were implemented sequentially in the ER. Initially, a fax referral form to be completed by the ER physician for anyone who presented with AF was created and triaged by a Nurse Practitioner for early follow-up. However, a 6-month review of the implementation process showed that 27% of patients were not referred to the rapid response AF clinic. Most patients discharged from the ER were either referred to their general practitioner or cardiologist or had unclear referrals without documented early follow-up.

As a result, the referral process was modified. Each patient was provided with a pre-booked appointment in the AF clinic within 7 days of the ER visit. An AF clinic referral binder was implemented to include pre-filled appointment dates that were collected by research staff daily. An appointment slip was provided to each patient at ER discharge along with a patient toolkit. Patients were advised to contact the AF clinic if they were not contacted within 5 business days with an appointment.

At the initial AF clinic visit, patients were seen by a nurse practitioner and a cardiac electrophysiologist. A systematic approach was employed to assess potential causes of AF, symptoms, quality of life, and stroke risk. A treatment plan was developed for each patient, which included either a rate- or rhythm-control strategy and stroke prevention therapy according to Canadian Cardiovascular Society guidelines.[13] Immediately following this process, participants who were found to meet all study inclusion criteria were approached by a research co-ordinator for participation in the AFTER3 Study. A copy of the signed consent form was provided to study participants.

At baseline, participants completed the AF Effect on Quality of Life (AFEQT) Questionnaire, which is an 18-item AF specific validated questionnaire,[14] as well as an additional questionnaire that was divided into 5 parts:

(1) Knowledge questions about AF after receiving the patient education toolkit in the ER,

(2) Attitudes regarding AF,[15]

(3) Follow-up care after ER discharge with a GP or cardiologist, and subsequent visits to the ER,

(4) ER Consultation Satisfaction Questionnaire[16] and

(5) ER visit satisfaction.

After 3 months, participants were contacted (via telephone, mail and/or in person) and asked to complete the AFEQT questionnaire and answer questions regarding their understanding of AF and any treatment obtained for AF.

Data Analysis and Statistics

A convenience sample of 15 months of recruitment was chosen, estimating 150 patients referred to the AF clinic. Descriptive analyses of enrolled patients presenting to the ER with AF and seen in the AF clinic was performed. Patient characteristics were compared between two different groups by unpaired t-test for continuous variables and Fisher's exact test for categorical variables. P-values <0.05 were considered statistically significant. All statistical analyses were performed using GraphPad Prism version 6 for Windows

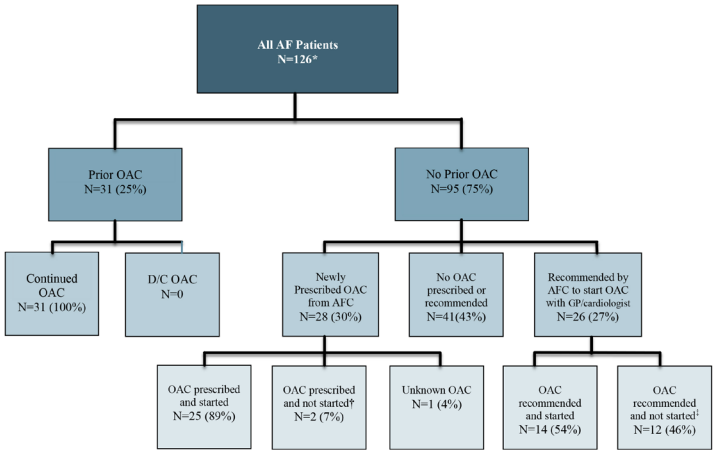

Figure 2A: Stroke Prevention Treatment in the AF Clinic (N=128)

*N=126 (data is missing for 2 patients), † 1 started ASA, ‡ 1 started ASA
AF – Atrial fibrillation; OAC – oral anticoagulant; D/C – Discharged; AFC – Atrial Fibrillation Clinic; GP – General Practitioner

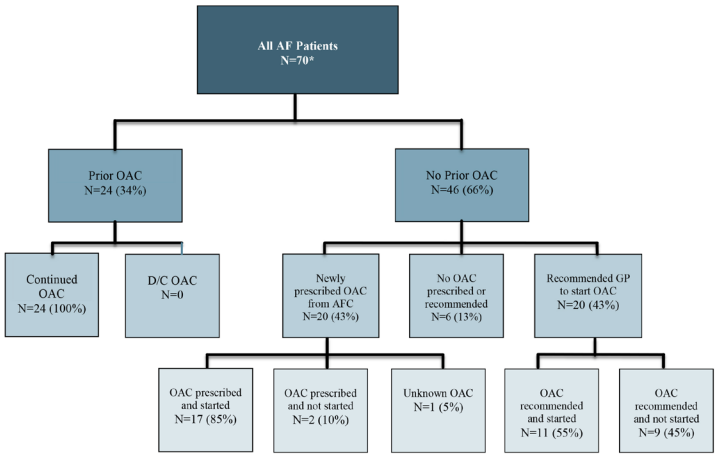

Figure 2B: Stroke Prevention Treatment in the AF Clinic with a CHA2DS2-VASc≥2 (N=72)

* CHA2DS2-VASc≥2 (N=72) – (data is missing for 2 patients), AF – Atrial fibrillation; OAC – oral anticoagulant; D/C – Discharged; AFC – Atrial Fibrillation Clinic; GP – General Practitioner

Table 2A: OAC Status by CHADS2 Score of patients with known Atrial Fibrillation on ER Arrival (N=72)

CHADS2 Score	Any OAC (n=17)	Warfarin (n=11)	NOAC (n=6)
0 (n=29)	1 (3%)	0 (0%)	1 (3%)
1 (n=20)	7 (35%)	5 (25%)	2 (10%)
≥2 (n=23)	9 (39%)	6 (26%)	3 (13%)

OAC – Oral anticoagulant; ER – Emergency Department; NOAC – New oral anticoagulant

(GraphPad Software, San Diego, CA, USA).

Results

During the study period from March 29, 2012 to August 23, 2013, a total of 321 patients presented to the ER with AF. Twenty-four percent were admitted to hospital. Of the discharged patients, 166 (68%) were referred to the AF clinic; 144 (87%) of those were seen in the AF clinic, and 128 (89%) patients were recruited into the AFTER3 study (Figure 1).

Baseline ER characteristics of enrolled patients are shown in Table 1. The mean patient age was 63.6±13.2 years old (males 59%). The most common presenting ER symptom was palpitations (70%), with most symptoms starting within the previous 48 hours (71%). Fifty-six percent had a prior history of AF. The initial documented rhythm was atrial fibrillation in 78% and atrial flutter in 16% of cases. Sinus rhythm was present on the initial ECG in 6% of cases. The initial mean ventricular rate was 123.9±35.5 bpm. With respect to stroke risk, 31% had a $CHADS_2$ score ≥ 2 and 56% had a CHA_2DS_2-VASc score ≥ 2. Among the 23 patients presenting to the ER with prior known AF and a $CHADS_2$ score ≥ 2, nine (39%) were on an oral anticoagulant; only five (46%) of the 11 patients with AF and on warfarin had an INR in therapeutic range (2.0-3.0) (Table 2a-b).

In the ER, 21 (16%) patients underwent electrical cardioversion and 49 (38%) patients underwent an attempt at pharmacologic cardioversion. Overall, 56 (58%) and 37 (39%) patients were prescribed beta-blockers or calcium channel blockers, respectively, at discharge. Eighty-one percent received a patient toolkit when they were discharged from the ER.

Among the 78 (32%) patients seen in the ER with AF who were not referred to the AF clinic, 62 (79%) were asked to follow-up with their family physician or cardiologist, while 16 (21%) had no specific follow-up documented. Characteristics between patients not referred and those referred to the AF clinic appeared to be similar. Patients with no specific follow-up or specialist referral were less likely to be seen by a cardiologist or arrhythmia specialist (67%), compared to those referred to the AF clinic (87%). The median time from the ER visit to follow-up with their cardiologist was 33.0 days (IQR 18.5-134.5).

The characteristics of enrolled patients seen during their AF clinic visit are shown in Table 1. The median time from ER visit to AF clinic visit was 10.5 (IQR 5.5-18) days, with the majority of patients seen primarily by the nurse practitioner in conjunction with a cardiologist (81%). This was the first ER presentation of AF in 44% of patients. The mean Severity of Atrial Fibrillation (SAF) class.[17,18] was 1.8±1.0. At the time of their first clinic visit, 61% of patients were in sinus rhythm. Three-quarters of all patients seen in the AF clinic were not currently receiving oral anticoagulation therapy (Figure 2a). Oral anticoagulation therapy was newly prescribed or recommended in 30% and 27% of patients, respectively. When anticoagulation therapy was recommended in the AF clinic, only 54% of patients were actually started on an oral anticoagulant by their family physician or cardiologist at 3 months. In patients with a CHA_2DS_2-VASc≥2 seen in AF clinic, 66% were not currently taking an oral anticoagulant. Of these patients, oral anticoagulation was newly prescribed in 43% and recommended in 43% of patients. In the remaining 13% (n=6), no anticoagulation was prescribed for various reasons (Figure 2b). When anticoagulation therapy was recommended in the AF clinic, only 55% of patients were actually started on an oral anticoagulant by their family physician or cardiologist at 3 months.

Results of patient questionnaires regarding AF knowledge, attitudes and quality of life are summarized in Table 3. Over 80% of patients were aware of their diagnosis (87%), increased stroke risk (82%) and possible complications (90%). Most patients were aware that AF could affect quality of life (95%) and that treatment could improve symptoms (86%). There was a significant and moderately large improvement in AFEQT scores,[14] from baseline values of 56.4±25.5 to 76.4±20.0 at 3 months (p<0.0001).

At 3 months after the initial AF clinic visit, follow-up data was obtained in 101 patients (79%). Three patients dropped out of the study, 2 patients died and we were unable to contact 22 patients. Only 62% of patients had seen their family physician since their AF clinic visit and 15% had a repeat visit to the ER for AF. Overall, 93% were satisfied or very satisfied with their understanding of AF and 93% were aware that AF can increase stroke risk.

Discussion

In this study we found that a systematic program to improve transitions of care from the ER to outpatient community care was associated with prompt, guideline-based care, and substantial patient satisfaction. The predominantly nurse-practitioner-led AF clinic resulted in high oral anticoagulant use in guideline-indicated patients, and patients reported improved quality of life at 3 months, compared to the baseline AF clinic visit. The study also demonstrated the feasibility of a process to organize a systematic and rapid "turn-around" referral to a dedicated AF service following ER discharge.

In many clinical settings, particularly after emergency care, a systematic, protocol driven, pattern of care which includes patient education, organized and structured follow-up, and rapid access to expert care, results in improved outcomes compared to "usual care".[19] In the intermediate term, for example, a systematic protocol-driven pattern of care delivered by nurse practitioners was superior to "usual care" delivered by specialist cardiologists, in a randomized

Table 2B: OAC Status by CHADS2 Score of patients with known Atrial Fibrillation at ER Discharge (N=72)

CHADS2 Score	Any OAC (n=17)	Warfarin (n=11)	NOAC (n=6)
0 (n=29)	1 (3%)	0 (0%)	1 (3%)
1 (n=20)	7 (35%)	5 (25%)	2 (10%)
≥2 (n=23)	9 (39%)	6 (26%)	3 (13%)

OAC – Oral anticoagulant; ER – Emergency Department; NOAC – New oral anticoagulant

Table 2C: INR Value in patients on Warfarin with known Atrial Fibrillation on ER arrival (n=11)

	Total N=11		
	INR < 2	INR 2 – 3	INR > 3
Prior Warfarin	3 (27%)	5 (46%)	3 (27%)

INR – International normalized ratio; ER – Emergency Department

Table 3: AFEQT Overall Scores (N=103)

AFEQT Overall Scores	
Baseline - mean±SD, range (N=103)	56.4±25.5 (7.4 – 100)
3 Months - mean±SD, range (N=103)	76.4±20.0 (20.4 – 100)
Overall Δ AFEQT Score	20.0±22.9 (-45.4 – 69.4)*

*The two-tailed p<0.0001, Baseline and 3 months by paired t-test
Scale 0 – 100; higher scores indicate better QOL
AFEQT - Atrial Fibrillation Effect on QualiTy-of-Life; N/A – Not Applicable; Δ - Delta

controlled trial in the Netherlands.[20] In other studies, follow-up with a cardiologist or specialist was associated with a decreased odds of making a return ER visit and follow-up with a family physician decreased the risk of death.[11,21] This highlights the importance of having a systematic process to ensure adequate and timely follow-up.

A high proportion of patients presenting to the ER have inadequate or absent guideline-indicated stroke prevention therapies despite a prior diagnosis of AF.[22] Similar findings have been shown in studies of patients with prior known AF, and in patients presenting with stroke.[23] In our study, a high proportion of patients with guideline-indication for anticoagulation for stroke prevention were discharged from the ER on inadequate stroke prevention. There may be several potential explanations for this finding. First, since patients were being referred and promptly seen in the AF clinic, the decision of whether anticoagulation should be started and the most appropriate anticoagulant to use may have been left up to the specialist physicians in the AF clinic as the interim stroke risk is perceived to be low. Second, it may be possible that ER physicians are concerned about starting an anticoagulant in patients in whom follow-up cannot be certain, and who may therefore be at risk of bleeding and relatively unsupervised in the early period following hospital discharge. It is also possible that there may be physician knowledge gaps in stroke risk stratification and therapy.

In this study we also found a low rate of warfarin prescription by family physicians following an explicit recommendation from the AF clinic to start therapy with warfarin. This barrier was not present when the anticoagulation was started in the AF clinic, usually with a direct acting oral anticoagulant. Warfarin was not always started directly in the AF clinic due to concern about incomplete early follow-up without an opportunity for early follow-up of INRs in the community. It is not clear why there was a low rate of warfarin prescription by family physicians, but possible reasons include that they never received the AF clinic recommendations, patients did not see family physicians within the study period or there was "therapeutic inertia" with respect to treatment recommendation. Regardless of the reason, in order to minimize this from occurring, it seems reasonable that patients should be directly given a prescription at the time of the AF clinic encounter.

Distribution of a patient "toolkit", including educational pamphlets on AF, stroke and stroke prevention, treatment options and letters to family physicians at the time of ER discharge was found to be feasible and resulted in excellent patient satisfaction and adequate patient knowledge about AF and its potential consequences. This contrasts with studies suggesting a lack of patient awareness of stroke risks and details of their illness in most patients with AF.[24] Even though 41% of patients had AF prior to the index ER visit, and thus presumably had a prior opportunity to be educated about the illness, the systematic process was associated with a clinically important improvement in quality of life. It is reasonable to ascribe this improvement, at least in part, to the patient toolkit and information, as well as the prompt follow-up and in-person education and treatment provided in the AF clinic.

There was somewhat inconsistent and incomplete referral of all eligible patients from the ER, possibly due to physicians forgetting, being too busy to complete the referral process or difficulty in identifying the most efficient process for referring patients to the AF clinic. We tested several strategies, including an ER physician completed checklist which was hand delivered, mailed or faxed to the AF clinic; pre-scheduled appointments in a dedicated appointment book which were both given to patients and collected by the AF clinic; and an electronic email/fax based-referral system. In our study, the most effective referral method was a combination of pre-scheduled appointments given to patients and an electronic-based referral system, which resulted in an increased proportion of referrals for patients presenting to the ER with AF. The attrition at all steps in the process, including incomplete referral, patients declining to be seen in the clinic, and a small, non-participation rate all remain important barriers to the wide scale adoption of this program. It is our belief that the most effective and least disruptive referral will need to be decided after discussion between the ER physicians and the referral destination, adapting the process to local needs and resources.

The principal limitation of the current study is its observational nature and it is unclear if "conventional" treatment such as specialist referral would have led to similar improvements in guideline-based therapies and patient satisfaction. Although the best way to study this AF clinic intervention would have been via a randomized trial, this study does highlight the significant gaps in "real-world" practice care and that significant improvements can be achieved through systematic referral to an AF clinic. This was also a single-centre study at an urban academic institution, so generalizability of results to other settings is unknown.

Conclusion

The AFTER3 program shows that it is feasible to provide a systematic "protocolized" suite of interventions designed to provide optimal outpatient care for patients with AF identified in the ER. This type of intervention seems reasonable to subject to a randomized clinical trial compared to usual care, to test whether this process actually leads to improved outcomes.

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