

Title: An Atrial Fibrillation Transitions of Care Clinic Improves Atrial Fibrillation Quality Metrics

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Brief Title: Specialized Atrial Fibrillation Clinic Improves Quality Metrics

Social Media Summary: Atrial Fibrillation Specialized Clinic Improves Quality Metrics and Screening for Atrial Fibrillation Risk Factors

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Structured Abstract:

Objectives: To assess whether an atrial fibrillation-specific clinic is associated with improved adherence to American College of Cardiology (ACC)/American Heart Association (AHA) clinical performance and quality measures for adults with atrial fibrillation (AF) or atrial flutter.

Background: There are significant gaps in care of patients with AF, including under prescription of anticoagulation and treatment of AF risk factors. An AF specialized clinic was developed to reduce admissions for AF but may also be associated with improved quality of care.

Methods: This retrospective study compared adherence to ACC/AHA measures for patients who presented to the emergency department for AF between those discharged to a typical outpatient appointment and those discharged to a specialized AF transitions clinic run by an advanced practice provider and supervised by a cardiologist. Screening and treatment for common AF risk factors was also assessed.

Results: The study enrolled 78 patients into the control group and 160 patients into the intervention group. Patients referred to the specialized clinic were more likely to have stroke risk assessed and documented (99% vs 26%, $p<0.01$), be prescribed appropriate anticoagulation (97% vs 88%, $p=0.03$), and be screened for co-morbidities such as tobacco use (100% vs 14%, $p<0.01$), alcohol use (92% vs 60%, $p<0.01$), and obstructive sleep apnea (90% vs 13%, $p<0.01$), as well as less likely to be prescribed an inappropriate combination of anticoagulant and antiplatelet medications (1% vs 9%, $p<0.01$).

Conclusions: An AF specialized clinic was associated with improved adherence to ACC/AHA clinical performance and quality measures for adult patients with AF.

Keywords: Atrial Fibrillation, Quality Improvement, Anticoagulation

Condensed Abstract:

Atrial fibrillation is the most common dysrhythmia, yet there are significant gaps in care. This retrospective study compared adherence to ACC/AHA quality and performance measures for patients presenting to the emergency department in atrial fibrillation between those who were referred to a specialized atrial fibrillation clinic and those who underwent the standard of care. Patients referred to the specialized clinic were more likely to have stroke risk assessed, be prescribed appropriate anticoagulant and antiplatelet medications, and be screened and treated for common atrial fibrillation risk factors.

Abbreviations:

AF: Atrial Fibrillation

ED: Emergency Department

ACC: American College of Cardiology

AHA: American Heart Association

OSA: Obstructive Sleep Apnea

CPAP: Continuous Positive Airway Pressure

BMI: Body Mass Index

PM: Performance Measure

QM: Quality Measure

SAF: Severity of Atrial Fibrillation

Introduction:

Atrial fibrillation (AF) is the most common dysrhythmia, yet there are significant gaps in the quality of care. Prescription rates for anticoagulant medications in appropriate patients are low with various studies finding the rate to be between 19-81%.(1-4) Inappropriate anticoagulant prescriptions may also be common with 12% of people with CHA₂DS₂-VASc scores of 0 taking anticoagulants for AF.(5) In addition, there has been greater emphasis on common, yet undertreated, risk factors associated with incidence and severity of AF, such as obstructive sleep apnea, alcohol use, and tobacco use.(6-11) As a result, the AHA/ACC/HRS updated guidelines for management of AF now recommend routine screening and treatment for these risk factors in addition to their previously published quality and performance measures.(12,13) Because of the complexity of AF management, there have been calls to create more comprehensive and integrated AF programs, similar to successful programs developed for coronary artery disease and congestive heart failure.(14-16)

An AF specialized clinic was developed at the University of North Carolina Hospital System in 2015 to help reduce the number of inappropriate admissions and improve the quality of care for AF.(17) In this study, we sought to determine whether referral to a specialized AF clinic improved adherence to ACC/AHA clinical performance and quality recommendations for the treatment of AF compared to the standard of care.

Methods:

Patients included in this study were those who presented to the emergency department (ED) at the University of North Carolina with a primary diagnosis of AF or atrial flutter, were hemodynamically stable, and had low to moderate AF symptom severity so were amenable to

potential discharge to the specialized AF clinic as previously defined by our novel AF treatment strategy.(17) Patients were considered hemodynamically stable if their average heart rate was <130 beats per minute and mean arterial pressure (MAP) was >55 mmHg with or without rate-controlling medication.(17) Low to moderate symptom burden was defined as a Severity of Atrial Fibrillation (SAF) score ≤ 3 .(18) A historical control group of similar patients who presented between January 2015 and September 2015 prior to the wide availability of the specialized AF clinic was used. All patients who were included in the control group would have qualified for the specialized AF clinic based on meeting the above hemodynamic qualifiers, as well as a physician's review of the ED documentation. Per the treatment protocol, patients were excluded if the ED documented additional reasons for admission other than AF. In particular, patients were excluded from the control group if they were admitted for a heart failure exacerbation, defined as having signs of decompensated heart failure (orthopnea, paroxysmal nocturnal dyspnea, dyspnea on exertion), symptoms of decompensated heart failure (lower extremity edema, crackles on lung auscultation, elevated jugular venous distension), or were administered intravenous diuretics.

Patients who underwent the standard of care were either admitted to the hospital or discharged from the ED with cardiologist or primary care follow up. The intervention group were patients who presented between July 2015 and November 2017 who were referred from the ED to a local AF specialty clinic, with appointments typically scheduled in 48-72 hours. The AF "transitions" clinic was staffed by a nurse practitioner or clinical pharmacist with supervision by a cardiologist or electrophysiologist. Control patients were excluded if they did not have outpatient follow up within forty-five days of ED or inpatient discharge. Intervention patients were excluded if they did not follow up at the initial transition clinic appointment upon ED

discharge. The visit time for a transition clinic appointment was 60 minutes. For the control cohort, a primary care visit was typically 20 minutes, a return cardiology appointment was 25 minutes, and a new patient cardiology appointment was 50 minutes.

The main outcomes variables were the percentage of patients that met the twelve inpatient and the ten outpatient quality and performance measures outlined by the American College of Cardiology (ACC)/American Heart Association (AHA) Task Force Report on Clinical Performance and Quality Measures for AF and Atrial Flutter.(13) The inpatient and outpatient quality and performance measures are listed in tables 2 and 3 respectively. For the intervention patients, none of which were admitted, the inpatient quality and performance measures are based on the care they received in the ED. For the control patients, the care they received from the ED through hospital discharge was included when determining whether they met the inpatient measures. A patient met performance Measure 1, documentation of CHA₂DS₂-VASc score, if the value was documented in the ED note, the admission history and physical, or the discharge summary for the patient encounter. Patients were excluded from Performance Measures 2 and 5, anticoagulation prescriptions, if they had CHA₂DS₂-VASc <2, a medical contraindication to anticoagulation, or refused anticoagulation. Performance measure 3, documentation of PT/INR, was determined by whether a PT/INR check was documented in the discharge summary or in the patient discharge instructions. An in-house shared decision making tool was included as part of the initial protocol, however it has since been replaced with the ACC shared decision making tool (<https://www.cardiosmart.org/SDM/Decision-Aids/Find-Decision-Aids/Atrial-Fibrillation>). However, Quality measure 10 and 18, shared decision making, were not tabulated as there was poor documentation of this practice and assessment of this performance measure could not be objectively determined.

The percentage of patients who were screened for obstructive sleep apnea (OSA) and assessed for OSA compliance was also tabulated at the outpatient visit. Screening of OSA was performed by the STOP questionnaire.(19) Compliance with OSA was assessed by whether the patient reported using their continuous positive airway pressure (CPAP) machine. For patients who endorsed drinking alcohol or using tobacco products, the percentage who were counseled on reduction of these risk factors was tabulated. The AF clinic has a variety of disease-specific protocols, including weight management. Based on the patient's body mass index and other medical co-morbidities, patients are offered referral to local weight management programs. However, what percentage of patients took advantage of this referral was not tabulated.

Demographics and co-morbidities were gathered by chart review.

Univariate statistics were used to examine frequency distributions for categorical variables and means, standard deviations, and shapes of distributions for continuous variables. Bivariable analyses were done by Chi-square analyses for categorical variables and student's t-test for continuous variables.

Results:

During the study periods, 78 control patients and 160 transition clinic patients were included in the study. A diagram of the inclusion and exclusion process can be seen in Figure 2. The average age was 67 and 65 years respectively for the control and intervention groups ($p=0.26$). The breakdown in sex of the cohort was similar between the two groups (50% vs 56% male, $p=0.41$). Both cohorts were predominately Caucasian, although there was larger percentage of Caucasians in the control group compared to the intervention group (86% vs 76%, $p=0.12$). The majority of patients in both cohorts were overweight (BMI >25) with 64% in the

control group and 76% in the intervention group ($p=0.13$). The patients in the control group were more likely to carry a previous diagnosis of atrial fibrillation compared to the intervention group (54% vs 38%, $p=0.02$) and to have a history of congestive heart failure with reduced ejection fraction (12% vs 4%, $p=0.04$). The average CHA₂DS₂-VASc for the control group was 2.9 compared to 2.3 for the intervention group. In the control group, 72% of patients were hospitalized for an average length of stay of 1.3 days. Per the novel management protocol, none of the intervention patients were hospitalized. The remaining demographics for the two cohorts are detailed in table 1.

Of the inpatient measures, performance measures 1, 2, and 7 had statistically significant differences between the two cohorts. The intervention group were more likely to have their CHA₂DS₂-VASc score documented during their inpatient stay (63%, vs 44%, $p<0.01$). The control group had significantly higher rates of appropriate anticoagulation prescribed (86% vs 33%, $p<0.01$). For performance measure 7, inappropriate prescription of antiplatelet and oral anticoagulation in patients without vascular disease, there was a lower rate of inappropriate management in the intervention group (3% vs 12%, $p=0.01$). The remaining inpatient performance and quality measure are listed in table 2.

For the outpatient performance and quality measures, the AF transition clinic patients had higher rates of CHA₂DS₂-VASc score documentation (PM4) (99% vs 26% $p<0.01$), and appropriate anticoagulation prescriptions (PM5) (97% vs 88%, $p=0.03$), as well as a lower rate of inappropriate prescriptions of anticoagulation and antiplatelet (QM16) (1% vs 9%, $p<0.01$). The remaining outpatient performance and quality measures are listed in table 3.

The transition clinic was more likely to assess and intervene on other co-morbidities that contribute to AF. For the intervention group, a higher number were counseled on reduction in

alcohol use (92% vs 60%, $p<0.01$) and tobacco cessation (100% vs 14%, $p<0.01$). For patients with a new diagnosis of AF, a higher proportion of the intervention group were screened for OSA (90% vs 13%, $p<0.01$). For those with pre-existing OSA, a higher proportion of the intervention group was assessed for CPAP compliance (100% vs 10%, $p<0.01$).

In the control group, the outcomes were compared between patients that saw their primary care physician and a cardiologist. There was no statistically significant difference between these two groups.

A sensitivity analysis was performed that included intervention patients that did not follow up. The only statistically significant change in the outcomes measures was in PM5, anticoagulation prescriptions. The intervention group had a prescription rate of 94% compared to 87% for the control group, however this was no longer statistically significant with $p=0.07$, from 0.03 in the original analysis. There were no other differences in the sensitivity analysis. The data from the sensitivity analysis can be viewed in the supplementary materials.

The demographics and co-morbidities of intervention patients who failed to follow up was compared to those that did to attempt to identify any risk factors that may predict no shows, however there were no significant differences between the two groups, including rates of alcohol and drug use.

Discussion:

The primary finding of our study is that a novel care pathway including a specialized AF clinic was associated with improved rates of several important quality and performance measures for AF management compared to the standard of care. Patients seen in the specialized AF clinic were more likely to be properly assessed and treated for stroke prophylaxis, including CHA₂DS₂-

VASc score documentation. The intervention patients were also less likely be prescribed inappropriate anticoagulation and antiplatelet therapy. In addition, providers in the specialized AF clinic were more likely to evaluate and treat important AF-related comorbidities such as OSA and tobacco and alcohol abuse.

Two previous studies have evaluated specialized outpatient AF programs, although their scope differed from ours. Stewart et al created a program for AF patients discharged from the hospital in which nurse-driven home visits were set up at discharge.(20) This program was effective in preventing hospitalizations, but did not evaluate disease-specific management, such as anticoagulation rates and risk factor modifications. Similarly, Hendriks et al created a nurse-driven protocol in the ambulatory setting that showed reduced cost of care.(21) To our knowledge, this is the first study to evaluate the effects of a specialized AF clinic on ACC/AHA recommended quality and performance measures and comorbidity management.

An advantage of our transition clinic is its wide generalizability across various settings. A nurse-practitioner driven AF clinic can be instituted at a variety of cardiology practices in diverse settings, avoiding the need to recruit and hire additional cardiologists. The patients in this study were recruited from the emergency department, but this clinic could also be used for referrals by primary care physicians who diagnose patients with AF in their own clinics.

There are important implications of our study. We demonstrate that a nurse-practitioner or clinical pharmacist led specialized AF “transitional” clinic can not only reduce inappropriate AF admissions as we previously demonstrated but can also improve AF quality of care.(17) Such an intervention can be implemented without a significant increase in resources or significant change in routine practice. Notably, “inpatient” appropriate anticoagulation use was reduced in the intervention group explicitly by design of our intervention. We recommended that ED

providers defer anticoagulation and antiplatelet therapy recommendations to the AF specialty clinic appointment (typically on the next business day) where a detailed shared-decision discussion could be had. Overall appropriateness of stroke prophylaxis management was increased in the intervention group.

There are several limitations of this study. It was not feasible for patients to be randomized to the control or intervention groups. However, the populations were quite similar in their baseline demographics and comorbidities. The patients in both cohorts were predominately Caucasian and may not reflect more diverse populations. Additionally, instituting a change in the routine pathway of care for AF patients required training of ED providers on triage, management, and early referral for patients. The ED providers at this single academic institution were very receptive to this protocol. However, it is unclear if this protocol would translate to any hospital ED. Further studies need to be performed to see whether this protocol could be expanded to other emergency departments, cardiology practices, and hospital systems.

Another limitation is that the appointment times differed between the two cohorts. However we view this as a strength of our program. The clinic visit is driven by a protocol enacted by an advanced practice provider or clinical pharmacist which allows for complex clinical discussions to occur in one visit as opposed to over many visits over a much longer period of time. An additional difference between the two groups is the time to follow up, 2-3 days for the intervention group compared to up to 45 days for the control group. Patients may be more adherent and amenable to treatment when follow up is closer. However, the authors view this also as a strength of the protocol as studies have shown that early follow up is associated with a decrease in morbidity, mortality, and hospitalization.(22,23) Additionally, seeing patients early after an ED visit may help reinforce positive behaviors. The time period for the control

patients and intervention periods differed so other secular trends may have contributed to the differences between the two cohorts.

In conclusion, a nurse-practitioner or clinical pharmacist-driven atrial fibrillation clinic was associated with improved adherence to ACC/AHA quality and performance measures for the management of atrial fibrillation. Comprehensive atrial fibrillation clinics may be a viable option to improve the comprehensive care of patients with atrial fibrillation.

Perspectives:

Atrial fibrillation (AF) is the most common dysrhythmia, yet there are significant gaps in care. Our study shows that treatment in a specialized AF clinic was associated with improved adherence to ACC/AHA quality and performance measures and screening of common AF risk factors. Specialized clinics may be a systems-based solution to providing comprehensive care for AF patients. Further studies are needed to see whether this model is generalizable to different healthcare settings.

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Figure Legends:

Figure 1: Patients referred to the specialized AF clinic were more likely to have stroke risk appropriately documented and be screened for common AF risk factors including obstructive sleep apnea, alcohol use, and tobacco use, and less likely to be inappropriately prescribed anticoagulation with antiplatelet medications. (Central Illustration)

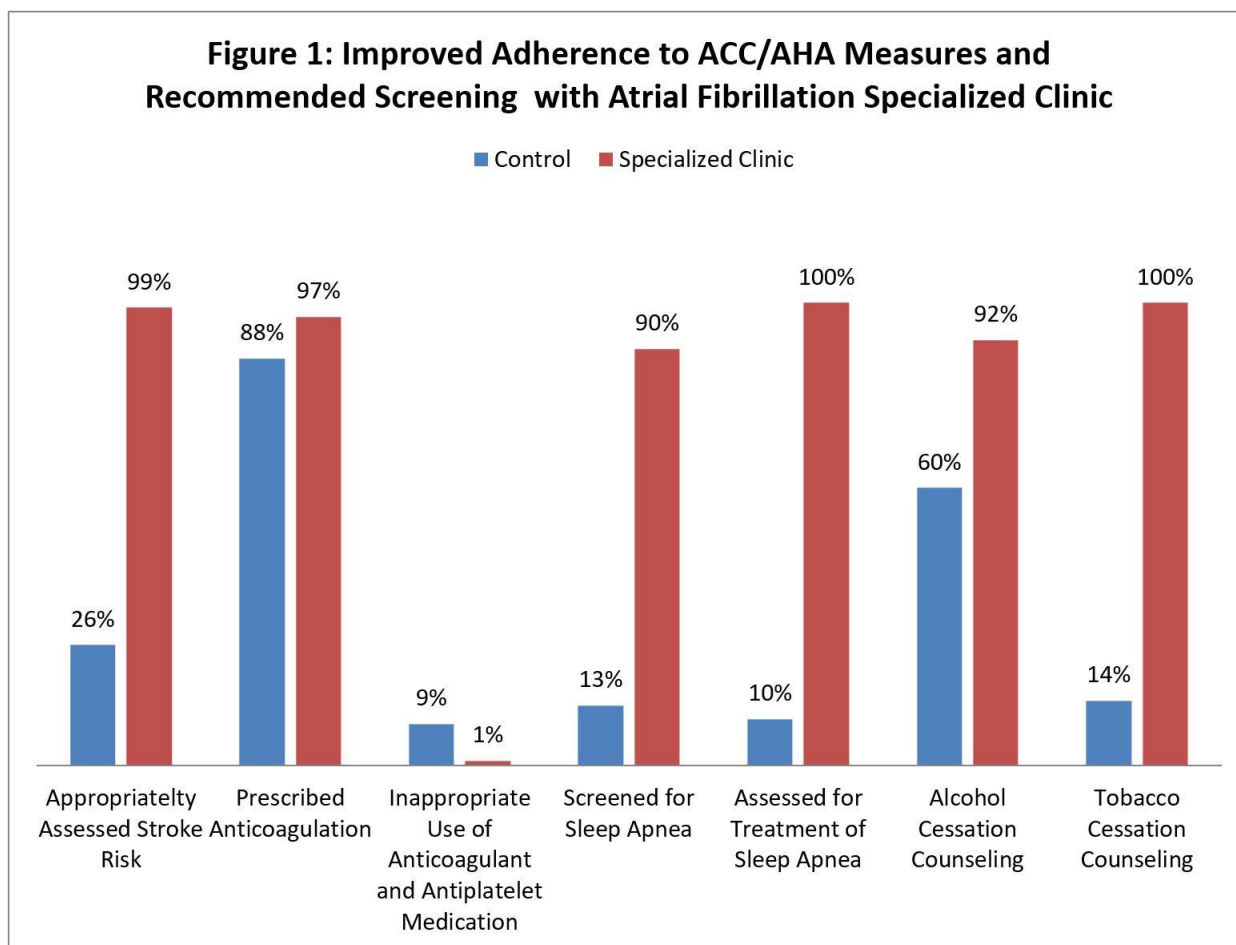
Figure 2: For the control group, 175 patients were coded as having a primary diagnosis of atrial fibrillation (AF) in the emergency department, however 80 were excluded because they had an additional reason for hospitalization (atrial fibrillation was erroneously charted as primary diagnosis) or because they were admitted as high risk AF per our protocol. Of the remaining 95 patients, 17 were excluded for not having a follow up appointment. All of the 78 patients that were included in the control group would have qualified for the atrial fibrillation clinic at the time of their emergency department (ED) visit. For the intervention group, 178 patients were referred to the clinic with 160 showing up for their appointment. * Signifies the patients included in the sensitivity analysis.

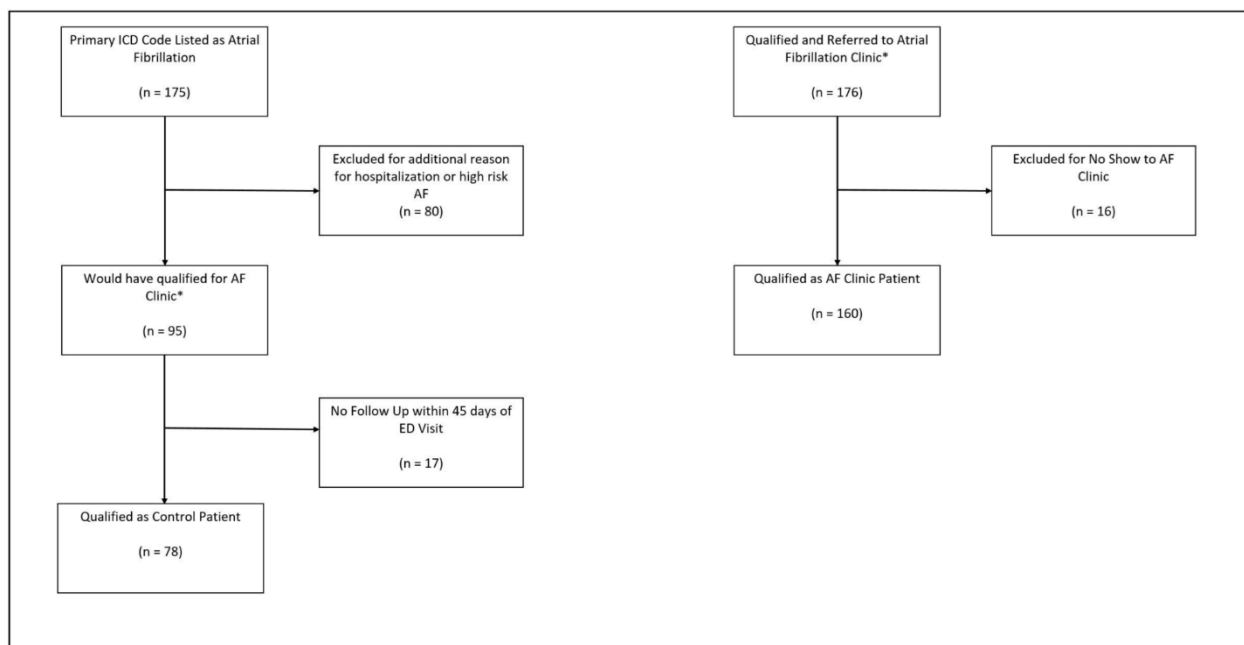
Figure 3: Atrial Fibrillation Transitions of Care Triage Protocol

Figure 4: Atrial Fibrillation Transitions of Care Reference Sheet

Table 1: Patient Characteristics				
		Control Group	ED/Specialized Clinic	p value
N		78	160	
Age				
	Mean (Range)	67 (22-92)	65 (25-100)	0.26
	St Dev	14	15	
Sex				
	M (%)	39 (50%)	89 (56%)	0.41
Race				
	Non-Hispanic Caucasian (%)	67 (86%)	121 (76%)	0.12
	African American (%)	6 (8%)	27 (17%)	
	Hispanic (%)	3 (4%)	3 (2%)	
	Other (%)	2 (3%)	9 (6%)	
Provider Follow Up				
	Cardiology	55	N/A	
	Primary Care	23		
Body Mass Index (BMI)				
	<18.5 (%)	2 (3%)	3 (2%)	0.32
	18.5-24.9 (%)	26 (33%)	36 (23%)	
	25.0-29.9 (%)	22 (28%)	54 (34%)	
	>30.0 (%)	28 (36%)	67 (42%)	
Co-Morbidities				
	Previous Atrial Fibrillation Diagnosis (%)	42 (54%)	61 (38%)	0.02
	Hypertension (%)	58 (74%)	106 (66%)	0.20
	Type 2 DM (%)	12 (15%)	29 (18%)	0.60
	Hyperlipidemia (%)	32 (41%)	48 (30%)	0.09
	Obstructive Sleep Apnea (%)	9 (12%)	18 (11%)	0.95
	Alcohol Use (%)	43 (55%)	88 (55%)	0.99
	Heavy Alcohol Use (%)	11 (14%)	22 (14%)	0.94
	Current Tobacco Abuse (%)	7 (9%)	12 (8%)	0.69
	Chronic Obstructive Pulmonary Disease (%)	4 (5%)	4 (3%)	0.29
	Hyperthyroidism (%)	1 (1%)	4 (3%)	0.53

	Hypothyroidism (%)	8 (10%)	19 (12%)	0.81
	Congestive Heart Failure Reduced Ejection Fraction (%)	9 (12%)	7 (4%)	0.04
	Congestive Heart Failure Preserved Ejection Fraction (%)	7 (9%)	6 (4%)	0.10
	Coronary Artery Disease (%)	13 (17%)	19 (12%)	0.31
	Mechanical Valve (%)	0 (0%)	0 (0%)	N/A
	CHA ₂ DS ₂ -VASc (avg)	2.9	2.3	0.03
	HASBLED (avg)	1.0	1.2	0.39
Hospitalization/Emergency Department Representation				
	Percentage Hospitalized	56 (72%)	N/A	N/A
	Average Length of Hospitalization in Days (Range)	1.3 (1-18)	N/A	N/A
	Representation to ED within 30 days	4 (5%)	4 (3%)	0.29





ATRIAL FIBRILLATION (AFIB, AF) TRANSITIONS OF CARE TRIAGE PROTOCOL



PATIENT PRESENTS TO ED WITH AF

LOW RISK AF PATIENT

- No other illness requiring hospitalization
- Conversion to sinus rhythm OR mild symptoms of AF (CCS – SAF ≤ 2)
- HR ≤ 110 and MAP ≥ 55 with/without rate control meds

DISPOSITION:

AF transitions of care follow-up

MODERATE RISK AF PATIENT

- No other illness requiring hospitalization
- Conversion to sinus rhythm OR moderate symptoms of AF (CCS – SAF ≤ 3)
- HR ≤ 130 and MAP ≥ 55 with/without rate control meds

DISPOSITION:

- AF transitions of care follow-up
- OR**
- ED/ Observation Unit cardioversion and AF transitions of care follow-up

HIGH RISK AF PATIENT

- Other illness requiring hospitalization
- Severe symptoms of AF (CCS – SAF = 4)
- Recent syncope
- HR > 130 despite rate control meds or MAP < 55
- Physician discretion

DISPOSITION:

- ED / Observation Unit cardioversion and AF transitions of care follow-up
- OR**
- Admit

Table 2: Inpatient Performance and Quality Measures					
	Control Group	N	ED*/Specialized Clinic	N	p value
PM 1 CHA ₂ DS ₂ -VASc Risk Score Documented	44%	78	63%	160	<0.01
PM 2 Anticoagulation Prescribed	86%	56	33%	82	<0.01
Excluded from PM2	22	22	78	78	
CHA ₂ DS ₂ -VASc < 2	16		54		
Medical Rationale	1		13		
Patient Exception	5		11		
PM 3 PT/INR Planned Follow Up Documented Prior to Discharge for Warfarin Treatment	29%	17	9%	11	0.20
QM 1 Beta Blocker Prescribed when LVEF ≤40	80%	5	83%	6	0.89
QM 2 ACE Inhibitor or Angiotensin-Receptor Blocker Prescribed LVEF ≤40	80%	5	100%	6	0.25
QM 3 Inappropriate Prescription of Antiarrhythmic Drugs Prior to Discharge to Patients with Permanent Atrial Fibrillation for Rhythm Control	N/A	0	N/A	0	N/A
QM 4 Inappropriate Prescription of Dofetilide or Sotalol Prior to Discharge in Patients with Atrial Fibrillation and End-Stage Kidney Disease or on Dialysis Prior to Discharge	N/A	0	N/A	0	N/A
QM 5 Inappropriate Prescription of Direct Thrombin or Factor Xa Inhibitor Prior to Discharge in Patients with Atrial Fibrillation and Mechanical Heart Valve	N/A	0	N/A	0	N/A
QM 7 Inappropriate Prescription of Antiplatelet and Oral Anticoagulation Therapy for Patients Who Do Not Have Coronary Artery Disease and/or Vascular Disease	12%	78	3%	160	0.01
QM 8 Inappropriate Prescription of Nondihydropyridine Calcium Channel Blocker in Patients with Reduced Ejection Fraction Heart Failure	10%	10	14%	7	0.79
QM 9 Patients Who Underwent Atrial Fibrillation Catheter Ablation Who Were Not Treated With	N/A	0	N/A	0	N/A

Anticoagulation Therapy During or After Procedure					
QM 10 Shared Decision Making Between Physician and Patient in Anticoagulation Prescription Prior to Discharge [†]	N/A	0	N/A	0	N/A
QM 6 deleted in response to new data in 2018; *All inpatient statistics are from ED care as no patients from the experimental arm were admitted per the protocol; † QM 10 unable to objectively define this quality measure across control and interventional group					

Table 3: Outpatient Performance and Quality Measures, Rates of Screening for and Treating Comorbidities, and 30-day Repeat ED visits					
	Control	N	Specialized Clinic	N	p value
Quality and Performance Measures					
PM 4 CHA ₂ DS ₂ -VASc Risk Score Documented	26%	78	99%	160	<0.01
PM 5 Anticoagulation Prescribed	88%	55	97%	74	0.03
Excluded from PM5	23	23	86	86	
CHA ₂ DS ₂ -VASc < 2	16		53		
Medical Rationale	3		17		
Patient Exception	4		16		
PM 6 Monthly INR for Warfarin Treatment	89%	18	100%	14	0.20
QM 11 Beta Blocker Prescribed when LVEF ≤40	100%	5	83%	6	0.33
QM 12 Inappropriate Prescription of Antiarrhythmic Drugs Prior to Discharge to Patients with Permanent Atrial Fibrillation for Rhythm Control	N/A	0	N/A	0	N/A
QM 13 Inappropriate Prescription of Dofetilide or Sotalol Prior to Discharge in Patients with Atrial Fibrillation and End-Stage Kidney Disease or on Dialysis	N/A	0	N/A	0	N/A
QM 14 Inappropriate Prescription of Direct Thrombin or Factor Xa Inhibitor Prior to Discharge in Patients with Atrial Fibrillation and Mechanical Heart Valve	N/A	0	N/A	0	N/A
QM 16 Inappropriate Prescription of Antiplatelet and Oral Anticoagulation Therapy for Patients Who Do Not Have	9%	78	1%	160	<0.01

Coronary Artery Disease and/or Vascular Disease					
QM 17 Inappropriate Prescription of Nondihydropyridine Calcium Channel Blocker in Patients with Reduced Ejection Fraction Heart Failure	10%	10	17%	6	0.79
QM 18 Shared Decision Making Between Physician and Patient in Anticoagulation Prescription*	N/A	0	N/A	0	N/A
Screening for and Treating Co-Morbidities					
Alcohol Intake Reduction Information Given to Patients Who Reported Drinking Alcohol	60%	43	92%	88	<0.01
Tobacco Cessation Information Given to Current Tobacco Users	14%	7	100%	10	<0.01
Screened for Obstructive Sleep Apnea after New Diagnosis of Atrial Fibrillation	13%	32	90%	92	<0.01
Assessed for CPAP Compliance in Patients with Known Obstructive Sleep Apnea	10%	10	100%	18	<0.01
Repeat ED visits in 30 days for AF					
ED Repeat Visits in 30 days for AF	5%	78	3%	160	0.29
QM 15 deleted in response to new data in 2018; QM 18* unable to objectively define this quality measure across control and interventional group					

Supplementary Table 1: Patient Characteristics Sensitivity Analysis				
		Control Group	ED/Specialized Clinic	p value
N		95	176	
Age				
	Mean (Range)	67 (22-92)	65 (25-100)	0.26
	St Dev	14	16	
Sex				
	M (%)	45 (47%)	98 (56%)	0.19
Race				
	Non-Hispanic Caucasian (%)	80 (84%)	136 (77%)	0.31
	African American (%)	10 (11%)	28 (16%)	
	Hispanic (%)	3 (3%)	3 (2%)	
	Other (%)	2 (2%)	9 (5%)	
Body Mass Index (BMI)				
	<18.5 (%)	2 (3%)	3 (2%)	0.19
	18.5-24.9 (%)	33 (35%)	40 (23%)	
	25.0-29.9 (%)	25 (26%)	60 (34%)	
	>30.0 (%)	35 (37%)	72 (41%)	
Co-Morbidities				
	Previous Atrial Fibrillation Diagnosis (%)	53 (56%)	71 (40%)	0.02
	Hypertension (%)	67 (71%)	115 (65%)	0.39
	Type 2 DM (%)	16 (17%)	32 (18%)	0.78
	Hyperlipidemia (%)	42 (44%)	52 (30%)	0.02
	Obstructive Sleep Apnea (%)	12 (13%)	19 (11%)	0.65
	Alcohol Use (%)	50 (53%)	93 (53%)	0.97
	Heavy Alcohol Use (%)	14 (15%)	23 (13%)	0.70
	Current Tobacco Abuse (%)	9 (9%)	12 (7%)	0.43
	Chronic Obstructive Pulmonary Disease (%)	8 (8%)	5 (3%)	0.04
	Hyperthyroidism (%)	1 (1%)	4 (2%)	0.47
	Hypothyroidism (%)	10 (11%)	22 (13%)	0.63
	Congestive Heart Failure Reduced	10 (11%)	7 (4%)	0.03

	Ejection Fraction (%)			
	Congestive Heart Failure Preserved Ejection Fraction (%)	7 (7%)	7 (4%)	0.23
	Coronary Artery Disease (%)	16 (17%)	21 (12%)	0.26
	Mechanical Valve (%)	0 (0%)	0 (0%)	N/A
	CHA ₂ DS ₂ -VASc (avg)	2.9	2.3	0.02
	HASBLED (avg)	1.0	1.1	0.69
Hospitalization/Emergency Department Representation				
	Percentage Hospitalized	67 (71%)	N/A	N/A
	Average Length of Hospitalization in Days (Range)	1.2 (1-18)	N/A	N/A

Supplementary Table 2: Inpatient Performance and Quality Measures Sensitivity Analysis					
	Control Group	N	ED*/Specialized Clinic	N	p value
PM 1 CHA ₂ DS ₂ -VASc Risk Score Documented	43%	95	63%	176	<0.01
PM 2 Anticoagulation Prescribed	86%	69	36%	90	<0.01
Excluded from PM2	26	26	86	86	
CHA ₂ DS ₂ -VASc < 2	20		60		
Medical Rationale	1		15		
Patient Exception	5		11		
PM 3 PT/INR Planned Follow Up Documented Prior to Discharge for Warfarin Treatment	26%	23	25%	12	0.94
QM 1 Beta Blocker Prescribed when LVEF ≤40	83%	6	83%	6	1
QM 2 ACE Inhibitor or Angiotensin-Receptor Blocker Prescribed LVEF ≤40	67%	6	100%	6	0.12
QM 3 Inappropriate Prescription of Antiarrhythmic Drugs Prior to Discharge to Patients with Permanent Atrial Fibrillation for Rhythm Control	N/A	0	N/A	0	N/A
QM 4 Inappropriate Prescription of Dofetilide or Sotalol Prior to Discharge in Patients with Atrial Fibrillation and End-Stage Kidney Disease or on Dialysis Prior to Discharge	N/A	0	N/A	0	N/A
QM 5 Inappropriate Prescription of Direct Thrombin or Factor Xa Inhibitor Prior to Discharge in Patients with Atrial Fibrillation and Mechanical Heart Valve	N/A	0	N/A	0	N/A
QM 7 Inappropriate Prescription of Antiplatelet and Oral Anticoagulation Therapy for Patients Who Do Not Have Coronary Artery Disease and/or Vascular Disease	14%	95	3%	176	<0.01
QM 8 Inappropriate Prescription of Nondihydropyridine Calcium Channel Blocker in Patients with Reduced Ejection Fraction Heart Failure	18%	11	14%	7	0.82
QM 9 Patients Who Underwent Atrial Fibrillation Catheter Ablation Who Were Not Treated With	N/A	0	N/A	0	N/A

Anticoagulation Therapy During or After Procedure					
QM 10 Shared Decision Making Between Physician and Patient in Anticoagulation Prescription Prior to Discharge [†]	N/A	0	N/A	0	N/A
QM 6 deleted in response to new data in 2018; *All inpatient statistics are from ED care as no patients from the experimental arm were admitted per the protocol; † QM 10 unable to objectively define this quality measure across control and interventional group					

	Control	N	Specialized Clinic	N	p value
PM 4 CHA ₂ DS ₂ -VAsC Risk Score Documented	21%	95	90%	176	<0.01
PM 5 Anticoagulation Prescribed	87%	68	95%	81	0.07
Excluded from PM5	23	23	95	95	
CHA ₂ DS ₂ -VAsC < 2	16		59		
Medical Rationale	3		20		
Patient Exception	4		16		
PM 6 Monthly INR for Warfarin Treatment	94%	18	94%	19	0.97
QM 11 Beta Blocker Prescribed when LVEF ≤40	100%	6	83%	6	0.30
QM 12 Inappropriate Prescription of Antiarrhythmic Drugs Prior to Discharge to Patients with Permanent Atrial Fibrillation for Rhythm Control	N/A	0	N/A	0	N/A

QM 13 Inappropriate Prescription of Dofetilide or Sotalol Prior to Discharge in Patients with Atrial Fibrillation and End-Stage Kidney Disease or on Dialysis	N/A	0	N/A	0	N/A
QM 14 Inappropriate Prescription of Direct Thrombin or Factor Xa Inhibitor Prior to Discharge in Patients with Atrial Fibrillation and Mechanical Heart Valve	N/A	0	N/A	0	N/A
QM 16 Inappropriate Prescription of Antiplatelet and Oral Anticoagulation Therapy for Patients Who Do Not Have Coronary Artery Disease and/or Vascular Disease	12%	95	1%	176	<0.01
QM 17 Inappropriate Prescription of Nondihydropyridine Calcium Channel Blocker in Patients with Reduced Ejection Fraction Heart Failure	19%	11	14%	7	0.82
QM 18 Shared Decision Making Between Physician and Patient in Anticoagulation Prescription*	N/A	0	N/A	0	N/A
QM 15 deleted in response to new data in 2018; QM 18* unable to objectively define this quality measure across control and interventional group					

	Control	N	Specialized Clinic	N	P value
Alcohol Intake Reduction Information Given to Patients Who Reported Drinking Alcohol	62%	50	88%	93	<0.01
Tobacco Cessation Information Given to Current Tobacco Users	11%	9	91%	11	<0.01
Screened for Obstructive Sleep Apnea after New Diagnosis of Atrial Fibrillation	11%	37	85%	98	<0.01
Assessed for CPAP Compliance in Patients with Known Obstructive Sleep Apnea	7%	14	95%	19	<0.01
ED Representation Rate	6%	95	3%	176	0.27