VIA MEDICA
ORIGINAL ARTICLE
2014, Vol. 21, No. 3, pp. 293–298
DOI: 10.5603/CJ.a2013.0089

ISSN 1897–5593

Atrial fibrillation practice patterns among cardiac electrophysiologists and cardiologists

Tonye Teme, Jeffrey J. Goldberger

Division of Cardiology, Department of Medicine, Feinberg School of Medicine, Northwestern University, Chicago, IL, United States

Abstract

Background: *Treatment paradigms for atrial fibrillation (AF) are highly variable. This study explores the management practices for AF between general cardiologists and electrophysiologists in an academic institution.*

Methods: *One hundred and eighty eight patients with AF who had primary outpatient evaluation by either a cardiologist (n = 94) or electrophysiologist (n = 94) in 2008 were selected from the Northwestern electronic medical record and included in the study. Chart review was used to determine the type of therapy, methods of monitoring AF, antiarrhythmic drug use patterns and outcome.*

Results: *Patients seen by cardiologists vs. electrophysiologists were older (70.3 ± 11.8 vs. 65.3 ± 10.3, p = 0.002) and had more diabetes (21.3% vs. 10.6%, p = 0.046), renal disease (29.0% vs. 9.2%, p = 0.001) and coronary artery disease (40.4% vs. 23.4%, p = 0.01). A rate control strategy was used more often (80.9% vs. 54.3%, p < 0.001), and antiarrhythmics were prescribed less (10.6% vs. 31.9%, p < 0.001) by cardiologists than electrophysiologists. Antiarrhythmic choices were amiodarone (33.3%), sotalol (20.0%), flecainide (13.3%), propafenone (13.3%), and dofetilide (23.3%) for electrophysiologists, and were limited to amiodarone (80%) and sotalol (20%) for cardiologists. After a mean follow-up of 14.0 ± 11.6 and 12.8 ± ± 11.1 months (p = 0.44) for patients managed by cardiologists and electrophysiologists, mortality was 13.8% and 6.4% (p = 0.09), respectively. Long-term ambulatory electrocardiogram monitoring was used more frequently by electrophysiologists (74.4%) than by cardiologists (55.6%, p = 0.15).*

Conclusions: *Practice patterns for treatment of AF significantly differ between electrophysiologists and cardiologists. Understanding specialist treatment patterns will help optimize individualized therapy for treatment of AF.* (Cardiol J 2014; 21, 3: 293–298)

Key words: practice patterns, management, atrial fibrillation

Introduction

Atrial fibrillation (AF) is the most common sustained cardiac arrhythmia with a prevalence of approximately 1–2% affecting up to 9% of adults older than 80 years [1]. AF is associated with significant morbidity and mortality [2]. There is a 5-fold increase in the risk of stroke [3], a decline in quality of life [4–6] and functional status [7–10]. The rate of AF-related hospitalizations is projected to rise 2–3 fold in the coming years [11].

Address for correspondence: Jeffrey J. Goldberger, MD, MBA, Northwestern University Feinberg School of Medicine, Division of Cardiology, 251 East Huron, Feinberg Pavilion, Chicago, IL 60611, USA, tel: 312-926-2148, fax: 312-926-2707, e-mail: j-goldberger@northwestern.edu

Received: 03.06.2013 Accepted: 16.06.2013

The 2 general approaches to the management of AF involve rate or rhythm control. Rate control focuses on controlling the ventricular response rate with atrioventricular nodal blocking agents and the concurrent use of anticoagulation, if indicated. Rhythm control is aimed at restoring and maintaining sinus rhythm using a plethora of options such as antiarrhythmic drugs and non-pharmacological approaches [12, 13].

Various studies have attempted to define optimal strategies for the management of AF. The AFFIRM study showed that rhythm control was not superior to rate control in terms of overall mortality, stroke and quality of life [14]. Although these findings were replicated in other studies [15–21], guidelines incorporate both approaches, which can be individualized based on variables such as age, symptoms, underlying cardiac abnormalities, medical co-morbidities and the type of AF (paroxysmal, persistent or chronic). The many options offered by these guidelines lead to varying treatment styles, which are based on physician training, experience, patient preference and even misconceptions [12, 13, 22].

This study explores the management practices for AF between general cardiologists and electrophysiologists in an academic institution. We postulated that there would be greater efforts at rhythm control among the electrophysiologists.

Methods

Study design

Using 2008 as the index year, we attempted to indentify 100 patients with AF who were treated by general cardiologists and 100 patients treated by electrophysiologists in the Northwestern outpatient clinic. Inclusion criteria were age > 40 years old and objective documentation of AF in the medical chart. A total of 236 patients were screened from an electronic data warehouse report. Forty-eight patients were excluded because only atrial flutter was noted or because of lack of objective documentation of AF.

Each chart was reviewed for demographic data and prior history of hypertension, stroke, diabetes mellitus, myocardial infarction, coronary artery disease, congestive heart failure and renal disease. Echocardiogram reports were reviewed for evidence of left atrial enlargement, left ventricular hypertrophy, aortic or mitral valve disease and left ventricular ejection fraction. Valvular disease (aortic insufficiency, aortic regurgitation, mitral stenosis or mitral regurgitation) was considered significant if it was reported to be moderate or severe on echocardiogram reports. Renal disease was considered present if the recorded glomerular filtration rate was < 60 mL/min.

The type of AF was classified as paroxysmal: self-terminating episodes of AF for up to 7 days; persistent: AF lasting more than 7 days and usually requiring some kind of antiarrhythmic therapy to restore sinus rhythm; and permanent: persistent AF lasting more than 1 year or failure to restore sinus rhythm despite multiple antiarrhythmic therapies.

Specific treatment parameters that were collected include referral source, type of therapy, specific antiarrhythmic drugs prescribed by the treating physician at the index visit and methods of monitoring AF. Follow-up information collected included absence of AF, use of catheter ablation, last documented rhythm, all-cause mortality, stroke/transient ischemic attack, and AF-related hospitalization.

Last documented rhythm is the rhythm recorded at the last office visit or last electrocardiogram (ECG). Methods of monitoring AF were grouped into 2 categories, ECG and long term monitoring. The latter includes 24-h Holter monitoring, event monitoring, and implantable devices that monitor AF.

Information on mortality was obtained from the social security death index. AF related hospitalizations included admissions for drug loading, cardioversion, or AF with rapid ventricular response rate.

The study was approved by the Northwestern University Institutional Review Board.

Data analysis

Categorical variables are expressed as absolute numbers and percentages; quantitative variables are expressed as mean ± standard deviation (SD). Proportions were compared using 2-proportion Z-test and continuous variables compared using T-test. A $p < 0.05$ was considered significant.

Results

There were 94 patients managed by cardiologists and 94 patients managed by electrophysiologists with a mean follow-up duration of 14.0 ± ± 11.6 and 12.8 ± 11.1 months, respectively. Table 1 shows the patient characteristics. The patients seen by the general cardiologists were older compared to those seen by the electrophysiologists (70.0 ± 11.8 vs. 65.3 ± 10.3 years, $p = 0.002$).

Table 1. Patient characteristics based on whether the patient was treated by a cardiologist or electrophysiologist.

Characteristics	Cardiologist (n = 94)	Electrophysiologist (n = 94)	P
Male	50 (53.2%)	68 (72.3%)	0.007
White	65 (69.2%)	77 (81.9%)	0.04
Age [years]	70.3 ± 11.8	65.3 ± 10.3	0.002
Body mass index [kg/m^2]	28.7 ± 7.4	29.9 ± 6.0	0.25
Active smoker	3 (3.2%)	3 (3.2%)	0.70
Hypertension	61 (64.9%)	53 (56.4%)	0.23
Diabetes mellitus	20 (21.3%)	10 (10.6%)	0.046
Hypercholesterolemia	59 (62.8%)	55 (58.5%)	0.55
Renal disease	27 (29.0%)	8 (9.2%)	0.001
History of stroke	9 (9.6%)	5 (5.3%)	0.27
Previous myocardial infarction	3 (3.2%)	3 (3.2%)	1.00
Coronary artery disease	38 (40.4%)	22 (23.4%)	0.01
Coronary artery bypass graft surgery	16 (17.0%)	6 (6.4%)	0.02
Congestive heart failure	11 (11.7%)	9 (9.6%)	0.64
Percutaneous coronary intervention	11 (11.7%)	7 (7.5%)	0.32
Left ventricular ejection fraction [%]	57.5 ± 8.8	55.7 ± 8.6	0.16
Left atrial enlargement	38 (41.3%)	27 (30.7%)	0.14
Valvular disease	46 (49.5%)	34 (38.6%)	0.14
Valve repair	16 (17.0%)	4 (4.3%)	0.008
Prior antiarrhythmic use:	21 (22.3%)	20 (21.3%)	0.86
Amiodarone	19 (20.2%)	6 (6.4%)	0.005
Sotalol	2 (2.1%)	6 (4%)	
Flecainide	0 (0%)	2 (2.1%)	
Propafenone	0 (0%)	8 (8.5%)	
Dofetilide	0 (0%)	1 (1.1%)	
Prior intervention:	10 (10.6%)	16 (17.0%)	0.20
Direct current cardioversion	8 (8.5%)	13 (13.8%)	0.25
Catheter ablation	0 (0%)	3 (3.2%)	

There was no significant difference in hypertension, prior stroke, or prior myocardial infarction between the two groups. Diabetes mellitus (21.3% vs. 10.6%, p = 0.046), renal disease (29.0% vs. 9.2%, p = 0.001), coronary artery disease (40.4% vs. 23.4%, p = 0.01) and coronary artery bypass surgery (17.0% vs. 6.4%, p = 0.02) were more common in the patients seen by cardiologists vs. electrophysiologists. More patients seen by cardiologists had been on amiodarone (19% vs. 6%, p = 0.005) prior to the index visit compared to electrophysiologists. Only 3 patients seen by electrophysiologists had had prior catheter ablations.

Referral sources to electrophysiologists were from "Cardiologists" (17%), "Primary care provider" (79.8%), "Self referrals" (2.1%) and "Cardiothoracic surgeon" (1.1%). In comparison, referral sources to cardiologists were 3.2%, 73.4%, 9.6% and 13.8%, respectively.

The type of AF varied between the two groups. While there was no significant difference in the proportion of patients with paroxysmal AF (55.3% vs. 60.6%, p = 0.46), there were more patients with persistent AF seen by electrophysiologists (31.9% vs. 13.8%, p = 0.003) and fewer patients with permanent AF (12.8% vs. 25.5%, p = 0.03). The median CHADS2 score was 2 for patients seen by cardiologists vs. 1 for patients seen by electrophysiologists.

Treatment parameters

Cardiologists employed a rate control strategy more often (80.9% vs. 54.3%, p < 0.001) than electrophysiologists. Consequently, antiarrhythmic drugs were prescribed less often (10.6% vs. 31.9%, p < 0.001). Cardiologists used fewer antiarrhythmic drugs (amiodarone: 80% and sotalol: 20%) vs. the broader array of antiarrhythmic drugs (amiodarone:

Table 2. Type of management.

	Cardiologist (n = 94)	Electrophysiologist (n = 94)	P
Rate control	76 (80.9%)	51 (54.3%)	< 0.001
Anti-arrhythmic:	10 (10.6%)	30 (31.9%)	< 0.001
Amiodarone	8 (80.0%)	10 (33.3%)	
Sotalol	2 (20.0%)	6 (20.0%)	
Flecainide	0 (0%)	4 (13.3%)	
Propafenone	0 (0%)	4 (13.3%)	
Dofetilide	0 (0%)	7 (23.3%)	

Table 3. Use of long-term monitoring by cardiologists and electrophysiologists.

	Cardiologist	Electrophysiologist	P
Rhythm control	**n = 18**	**n = 43**	
Long term monitoring:	10 (55.6%)	32 (74.4%)	0.15
Holter monitor	6 (33.3%)	17 (39.5%)	0.65
Event monitor	6 (33.3%)	20 (46.5%)	0.34
Implantable device	0 (0%)	1 (2.3%)	0.51
Rate control	**n = 76**	**n = 51**	
Long term monitoring:	26 (34.2%)	33 (64.7%)	0.0007
Holter monitor	19 (25.0%)	25 (49.0%)	0.005
Event monitor	7 (9.2%)	12 (23.5%)	0.027
Implantable device	0 (0%)	2 (3.9%)	0.082

33.3%, sotalol: 20%, flecainide: 13.3%, propafenone: 13.3%, and dofetilide: 23.3%) used by electrophysiologists (Table 2).

Of the 18 and 43 patients treated by cardiologists and electrophysiologists with a rhythm control strategy, the last documented rhythm was sinus in 83.3% and 83.7%, respectively. In these patients, long-term monitoring was used less by cardiologists (55.6% vs. 74.4%, p = 0.15) (Table 3). However, AF was detected in follow-up, among those treated with a rhythm control strategy, in 27.8% of patients treated by cardiologists and 65.1% of those treated by electrophysiologists (p = 0.008). Catheter ablation was used less (0% vs. 11.6%, p = 0.13) among cardiologists than among electrophysiologists.

Of the patients treated with a rate control strategy, long-term monitoring was used less by cardiologists (n = 76) compared to electrophysiologists (n = 51) (34.2% vs. 64.7%, p = 0.0007), respectively (Table 3).

At the last follow-up visit, more patients treated by cardiologists were treated with a rate control strategy (91.5% vs. 60.6%, p < 0.001) than at the index visit.

AF-related hospitalization did not differ between patients managed by cardiologists vs. electrophysiologists (38.3% vs. 40.4%, p = 0.88). All cause mortality was 13.8% among patients treated by cardiologists compared to 6.4% among patients treated by electrophysiologists (p = 0.09).

Discussion

This study shows significantly different practice patterns for treatment of AF between general cardiologists and electrophysiologists in a single academic practice. The most notable differences between the two groups are in treatment strategy, array of antiarrhythmic drugs used for treatment, and type of monitoring used. As this is not a randomized study and patient characteristics clearly differed between the two groups, it is not possible to make conclusions regarding outcomes, except to note that major differences were not observed. Importantly, these data represent practice patterns at this institution, and may not be representative of other institutions. As there is no dominant strategy for the treatment of AF, delineating these practice patterns can provide an important window into the

translation of medical information into practice patterns and could help set expectations for patients, referring doctors, and health care systems on what therapies each type of physician may offer.

Rate and rhythm control are both acceptable strategies for the treatment for AF. The most recent guidelines [12, 13] recommend an individualized approach to treatment based on variables such as patient's age, degree and frequency of symptoms, activity level and other cardiovascular comorbidities. It suggests that rate control may be appropriate in older patients with minor symptoms, while rhythm control can be used in patients with symptoms despite adequate rate control, and in young patients in whom catheter ablation may be an option. Indeed, in the present study, the patients seen by electrophysiologists were younger, with less cardiovascular comorbidity, perhaps explaining the greater use of rhythm control by electrophysiologists compared to cardiologists. While rhythm control may benefit patients with symptomatic AF, on a population basis, it does not improve survival [14–17, 21] nor quality of life [14, 16, 18, 21, 23] compared to rate control, highlighting the importance of individualizing therapy as indicated in the guidelines [13].

Notably, even among patients treated with a rhythm control strategy, the electrophysiologists used a broader array of antiarrhythmic drugs. This may reflect increased familiarity or comfort with antiarrhythmic drugs among electrophysiologists. Additionally, there are barriers to prescription of some antiarrhythmic drugs, such as dofetilide, which requires approval training prior to prescription.

Monitoring for AF during follow-up depends greatly on the goal of therapy [12, 13]. If the goal is to restore sinus rhythm, then more intense monitoring with long-term monitoring is appropriate [24–26]. On the other hand, if the goal is symptom control, less intensive monitoring may be adequate [24, 27]. Our study showed more intensive monitoring by electrophysiologists compared to cardiologists in patients treated with a rate control strategy. This practice may be useful for assessing the burden of AF in asymptomatic patients [24], guide ventricular rate control, anticoagulation therapy and to guide further decisions to cross over to a rhythm control strategy [28]. Intensive monitoring will affect the number of patients with documented AF during follow-up [24–28]. Furthermore, increased use of amiodarone, which is a moderately effective antiarrhythmic drug [29, 30], by cardiologists may have contributed to the lower proportion of documented AF on follow-up.

Limitations of the study

The major limitation of this study is that it reflects the practice patterns at one institution and cannot necessarily be generalized to other practices. Furthermore, it is a small, non-randomized study with potential referral bias based on different patient characteristics between the two groups.

Conclusions

In summary, physicians who are performing primary evaluations of patients with AF need to formulate a general treatment approach to AF individualized to their patient, understand the practice patterns of the physicians to whom they refer patients, and make informed decisions about which type of specialist may be most appropriate for their patient.

Conflict of interest: none declared

References

1. Go AS, Hylek EM, Phillips KA et al. Prevalence of diagnosed atrial fibrillation in adults: National implications for rhythm management and stroke prevention: The AnTicoagulation and Risk Factors in Atrial Fibrillation (ATRIA) Study. JAMA, 2001; 285: 2370–2375.
2. Benjamin EJ, Wolf PA, D'Agostino RB, Silbershatz H, Kannel WB, Levy D. Impact of atrial fibrillation on the risk of death: The Framingham Heart Study. Circulation, 1998; 98: 946–952.
3. Wolf PA, Abbott RD, Kannel WB. Atrial fibrillation as an independent risk factor for stroke: The Framingham Study. Stroke, 1991; 22: 983–988.
4. Thrall G, Lane D, Carroll D, Lip GY. Quality of life in patients with atrial fibrillation: A systematic review. Am J Med, 2006; 119: 448e441–419.
5. Perret-Guillaume C, Briancon S, Wahl D, Guillemin F, Empereur F. Quality of Life in elderly inpatients with atrial fibrillation as compared with controlled subjects. J Nutr Health Aging, 2010; 14: 161–166.
6. Dorian P, Jung W, Newman D et al. The impairment of health-related quality of life in patients with intermittent atrial fibrillation: Implications for the assessment of investigational therapy. J Am Coll Cardiol, 2000; 36: 1303–1309.
7. Ostermaier RH, Lampert S, Dalla Vecchia L, Ravid S. The effect of atrial fibrillation and the ventricular rate control on exercise capacity. Clin Cardiol, 1997; 20: 23–27.
8. Chung MK, Shemanski L, Sherman DG et al. Functional status in rate- versus rhythm-control strategies for atrial fibrillation: Results of the Atrial Fibrillation Follow-Up Investigation of Rhythm Management (AFFIRM) Functional Status Substudy. J Am Coll Cardiol, 2005; 46: 1891–1899.
9. Stulak JM, Dearani JA, Daly RC, Zehr KJ, Sundt TM, 3rd, Schaff HV. Left ventricular dysfunction in atrial fibrillation: Restoration of sinus rhythm by the Cox-maze procedure significantly improves systolic function and functional status. Ann Thorac Surg, 2006; 82: 494–500; discussion 500–491.

10. Pardaens K, Van Cleemput J, Vanhaecke J, Fagard RH. Atrial fibrillation is associated with a lower exercise capacity in male chronic heart failure patients. Heart, 1997; 78: 564–568.
11. Wattigney WA, Mensah GA, Croft JB. Increasing trends in hospitalization for atrial fibrillation in the United States, 1985 through 1999: Implications for primary prevention. Circulation, 2003; 108: 711–716.
12. Fuster V, Ryden LE, Cannom DS et al. ACC/AHA/ESC 2006 Guidelines for the Management of Patients with Atrial Fibrillation: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines and the European Society of Cardiology Committee for Practice Guidelines (Writing Committee to Revise the 2001 Guidelines for the Management of Patients With Atrial Fibrillation): developed in collaboration with the European Heart Rhythm Association and the Heart Rhythm Society. Circulation, 2006; 114: e257–e354.
13. Guidelines for the management of atrial fibrillation: The Task Force for the Management of Atrial Fibrillation of the European Society of Cardiology (ESC). Eur Heart J, 2010; 31: 2369–2429.
14. Wyse DG WA, Dimarco JP, Domanski MJ et al. The AFFIRM writing group. A comparison of rate control and rhythm control in patients with atrial fibrillation. N Engl J Med, 2002; 347: 1825–1833.
15. Van Gelder IC HV, Bosker HA, Kingma JH et al. A comparison of rate control and rhythm control in patients with recurrent persistent atrial fibrillation. (For the rate control versus electrical cardioversion for persistent atrial fibrillation study group). N Engl J Med, 2002; 347: 1834–1840.
16. Carlsson J, Miketic S, Windeler J et al. Randomized trial of rate--control versus rhythm-control in persistent atrial fibrillation: The Strategies of Treatment of Atrial Fibrillation (STAF) study. J Am Coll Cardiol, 2003; 41: 1690–1696.
17. Hagens VE, Crijns HJ, Van Veldhuisen DJ et al. Rate control versus rhythm control for patients with persistent atrial fibrillation with mild to moderate heart failure: Results from the RAte Control versus Electrical cardioversion (RACE) study. Am Heart J, 2005; 149: 1106–1111.
18. Hagens VE, Ranchor AV, Van Sonderen E et al. Effect of rate or rhythm control on quality of life in persistent atrial fibrillation. Results from the Rate Control Versus Electrical Cardioversion (RACE) study. J Am Coll Cardiol, 2004; 43: 241–247.
19. Roy D, Talajic M, Nattel S et al. Rhythm control versus rate control for atrial fibrillation and heart failure. N Engl J Med, 2008; 358: 2667–2677.
20. Opolski G, Torbicki A, Kosior DA et al. Rate control vs rhythm control in patients with nonvalvular persistent atrial fibrillation: the results of the Polish How to Treat Chronic Atrial Fibrillation (HOT CAFE) Study. Chest, 2004; 126: 476–486.
21. Hohnloser SH, Kuck KH, Lilienthal J. Rhythm or rate control in atrial fibrillation — Pharmacological Intervention in Atrial Fibrillation (PIAF): A randomised trial. Lancet, 2000; 356: 1789–1794.
22. McCabe JM, Johnson CJ, Marcus GM. Internal medicine physicians' perceptions regarding rate versus rhythm control for atrial fibrillation. Am J Cardiol, 2009; 103: 535–539.
23. Jenkins LS, Brodsky M, Schron E et al. Quality of life in atrial fibrillation: the Atrial Fibrillation Follow-up Investigation of Rhythm Management (AFFIRM) study. Am Heart J, 2005; 149: 112–120.
24. Ziegler PD, Koehler JL, Mehra R. Comparison of continuous versus intermittent monitoring of atrial arrhythmias. Heart Rhythm, 2006; 3: 1445–1452.
25. Beukema R, Beukema WP, Sie HT, Misier AR, Delnoy PP, Elvan A. Monitoring of atrial fibrillation burden after surgical ablation: Relevancy of end-point criteria after radiofrequency ablation treatment of patients with lone atrial fibrillation. Interact Cardiovasc Thorac Surg, 2009; 9: 956–959.
26. Hindricks G, Piorkowski C, Tanner H et al. Perception of atrial fibrillation before and after radiofrequency catheter ablation: Relevance of asymptomatic arrhythmia recurrence. Circulation, 2005; 112: 307–313.
27. Fitzmaurice DA, Hobbs FD, Jowett S et al. Screening versus routine practice in detection of atrial fibrillation in patients aged 65 or over: Cluster randomised controlled trial. BMJ, 2007; 335: 383.
28. Mittal S, Movsowitz C, Steinberg JS. Ambulatory external electrocardiographic monitoring: focus on atrial fibrillation. J Am Coll Cardiol, 2011; 58: 1741–1749.
29. Komatsu T, Tachibana H, Sato Y, Ozawa M, Nakamura M, Okumura K. Efficacy of amiodarone for preventing the recurrence of symptomatic paroxysmal and persistent atrial fibrillation after cardioversion. Circ J, 2007; 71: 46–51.
30. Roy D, Talajic M, Dorian P et al. Amiodarone to prevent recurrence of atrial fibrillation. Canadian Trial of Atrial Fibrillation Investigators. N Engl J Med, 2000; 342: 913–920.