Stroke prevention in patients with atrial fibrillation: The diagnosis and management of hypertension by specialists

Jeff S Healey MD MSc FRCPC, Sean Wharton MD PharmD FRCPC, Saif Al-Kaabi, Menaka Pai MD, Amir Ravandi MD, Girish Nair MBBS MD FRCPC, Carlos A Morillo MD FRCPC, Stuart J Connolly MD FRCPC

JS Healey, S Wharton, S Al-Kaabi, et al. Stroke prevention in patients with atrial fibrillation: The diagnosis and management of hypertension by specialists. *Can J Cardiol* 2006;22(6):485-488.

BACKGROUND: Hypertension is common in patients with atrial fibrillation (AF) and is an important cause of stroke.

OBJECTIVES: To determine how effectively hypertension is managed among specialist-treated outpatients with AF.

METHODS: Investigators reviewed the charts of patients with a diagnosis of AF cared for by medical specialists to determine the change in blood pressure, patterns of antihypertensive drug use and the role of the specialist in the management of hypertension.

RESULTS: Of 209 patients with AF, 118 had a history of hypertension or an office blood pressure greater than 140/90 mmHg. Blood pressure was measured at 73% of all visits. Hypertension was identified as an important problem in 57% of patients and antihypertensive therapy was either initiated or suggested in 77%. One year after the initial specialist visit, systolic blood pressure was significantly lower (140 ± 20 mmHg at one year versus 148 ± 23 mmHg initially; $P=0.015$); however, there was no change in diastolic blood pressure (80 ± 12 mmHg at one year versus 81 ± 16 mmHg initially; $P=0.602$) and only 50% of patients had a blood pressure less than 140/90 mmHg. In contrast, the percentage of patients receiving warfarin increased from 46% to 78% ($P=0.0001$).

CONCLUSIONS: In patients treated by specialists for AF, systolic blood pressure is significantly reduced during follow-up; however, 50% of patients continue to have suboptimal blood pressure control. In many patients, hypertension is not identified as an important comorbid illness and antihypertensive therapy is neither recommended nor initiated by the specialist. Greater specialist involvement in the identification and treatment of hypertension in patients with AF could lead to an important, additional reduction in stroke.

Key Words: Atrial fibrillation; Hypertension; Specialist care; Stroke

La prévention des accidents vasculaires cérébraux chez les patients atteints de fibrillation auriculaire : Le diagnostic et la prise en charge de l'hypertension par des spécialistes

HISTORIQUE : L'hypertension est courante chez les patients atteints de fibrillation auriculaire (FA) et est une importante cause d'accident vasculaire cérébral (AVC).

OBJECTIFS : Déterminer l'efficacité de la prise en charge de l'hypertension chez les patients atteints de FA traités par des spécialistes en consultations externes.

MÉTHODOLOGIE : Les chercheurs ont examiné le dossier des patients atteints de FA diagnostiquée traités par des médecins spécialistes pour déterminer les fluctuations de la tension artérielle, les profils d'utilisation d'antihypertensifs et le rôle des spécialistes dans la prise en charge de l'hypertension.

RÉSULTATS : Des 209 patients atteints de FA, 118 avaient des antécédents d'hypertension ou une tension en cabinet supérieure à 140/90 mmHg. La tension artérielle avait été mesurée dans 73 % de toutes les consultations. L'hypertension était perçue comme un problème grave chez 57 % des patients, et le traitement antihypertensif n'était ni entrepris ni suggéré chez 77 % d'entre eux. Un an après la première consultation auprès du spécialiste, la tension artérielle systolique avait considérablement baissé (140 ± 20 mmHg au bout d'un an par rapport à 148 ± 23 mmHg au départ; $P=0,015$). Cependant, la tension artérielle diastolique demeurait stable (80 ± 12 mmHg au bout d'un an par rapport à 81 ± 16 mmHg au départ; $P=0,062$), et seulement 50 % des patients avaient une tension artérielle inférieure à 140/90 mmHg. Par contre, le pourcentage de patients prenant de la warfarine était passé de 46 % à 78 % ($P=0,0001$).

CONCLUSIONS : Chez les patients dont la FA était traitée par des spécialistes, la tension artérielle systolique diminuait considérablement au suivi. Cependant, 50 % des patients continuaient de présenter un contrôle sous-optimal de la tension artérielle. De nombreux patients ne perçoivent pas l'hypertension comme une maladie comorbide importante, et le traitement antihypertenseur n'est ni recommandé ni proposée par le spécialiste. Une plus grande participation du spécialiste au dépistage et au traitement de l'hypertension chez les patients atteints de FA pourrait favoriser une réduction encore plus marquée des AVC.

McMaster University, Hamilton, Ontario

Correspondence: Dr Jeff S Healey, McMaster University, 237 Barton Street East, Hamilton, Ontario L8L 2X2. Telephone 905-577-8004, fax 905-521-8820, e-mail healey@hhsc.ca

Received for publication August 5, 2005. Accepted October 20, 2005

Stroke prevention is a major goal in the treatment of patients with atrial fibrillation (AF) (1,2). In patients with AF and an additional risk factor (3-5), the use of warfarin reduces the incidence of stroke by over 60% (6). Although warfarin is effective in clinical practice (7), there are several barriers to its use, and the rate of stroke remains high at 3.2/100 patient-years (7). Additional strategies to prevent stroke in patients with AF are needed.

In North America, hypertension is the most common risk factor for developing AF (8-10) and is present in more than 50% of patients with AF (10,11). Among patients with AF, the presence of hypertension is associated with a further two- to threefold increase in the risk of stroke (4,12). However, practice guidelines do not recognize the treatment of hypertension as an important component of the management of patients with AF (13) and the rate of optimal blood pressure control in these patients is only 50% (14). It has been shown that a decrease of 10 mmHg in systolic blood pressure is associated with approximately a 35% lower risk of stroke (15-17). Thus, the aggressive treatment of hypertension to existing targets (18) is a practical strategy to further reduce stroke in patients with AF.

Specialists play an important role in the treatment of cardiovascular disease (19). Their involvement in patient care may lead to improved use of evidence-based therapy, better adherence to guidelines and improved patient outcomes (19-21). We sought to evaluate the role of specialists in blood pressure management among patients with AF.

METHODS

The investigators reviewed the outpatient charts of three cardiologists, four electrophysiologists and six internists to identify ambulatory care patients with AF who had been seen within the previous two years. All patients with at least two office visits and either a history of hypertension or a blood pressure greater than 140/90 mmHg at the initial office visit had their charts examined in greater detail. The number of screened but ineligible patients was recorded. A detailed analysis of the consultants' notes was made to determine their role in the management of hypertension.

Data were analyzed using SPSS version 13.0 (SPSS Inc, USA). The serial change in blood pressure was analyzed using the paired Student's *t* test. For the purposes of this analysis, the primary outcome was the change in both systolic and diastolic blood pressure between the time of the first specialist visit and the blood pressure taken at one year of follow-up. This time period was estimated to be sufficient for specialist intervention to have an impact on patients' blood pressure. Medication usage between visits was compared using the χ^2 test. The effect of physician type on the change in blood pressure at one year was evaluated using ANOVA. The local research ethics board approved the present chart review.

RESULTS

The outpatient charts of 209 patients with a diagnosis of AF were screened at a single, tertiary care teaching hospital (McMaster University, Hamilton, Ontario). A total of 118 patients had a history of hypertension and at least one follow-up visit. Their baseline characteristics are displayed in Table 1. At their first specialist visit, the majority of patients were taking at least one antihypertensive medication (Table 2); however, only 62% met the currently recommended target for blood pressure treatment (Table 1) (18).

TABLE 1
Baseline characteristics of patients

Female sex, %	45.8
Age, years (mean $\pm$ SD)	73.3 $\pm$ 9.5
Prior history of hypertension, %	81.4
Systolic blood pressure at first visit, mmHg (mean $\pm$ SD)	149 $\pm$ 24
Diastolic blood pressure at first visit, mmHg (mean $\pm$ SD)	82 $\pm$ 15
Atrial fibrillation duration <1 year, %	47.5
Paroxysmal atrial fibrillation, %	75.7
Persistent/permanent atrial fibrillation, %	24.3
Prior stroke, %	10.2

TABLE 2
Antihypertensive medication

Medication class	Baseline use	Use at most recent follow-up visit	P
ACE inhibitor/ARB, %	47	69	0.0001
Diuretic, %	40	52	0.0001
Beta-blocker, %	35	44	0.0001
Calcium channel blocker, %	28	41	0.0001
Other antihypertensive, %	4	8	0.0001
Antihypertensive medications, mean $\pm$ SD	1.65 $\pm$ 1.11	2.26 $\pm$ 1.11	0.0001
Digoxin, %	27	24	NS
Antiarrhythmic, %	27	28	NS
Warfarin prescribed, %	46	78	0.0001

ACE Angiotensin-converting enzyme; ARB Angiotensin II receptor blocker; NS Nonsignificant

Blood pressure was measured in 93% of patients at their initial visit, and was measured at 64% of subsequent visits. When patients were re-examined by the specialist one year later, systolic blood pressure was lower, but there was no significant change in diastolic blood pressure (Table 3). With a longer follow-up, up to five years, both systolic and diastolic blood pressures were reduced (Table 3). In patients with a blood pressure greater than 140/90 mmHg at the initial specialist visit, a more pronounced reduction in systolic (143 $\pm$ 20 mmHg versus 160 $\pm$ 16 mmHg; $P<0.0001$) but not diastolic (82 $\pm$ 11 mmHg versus 84 $\pm$ 18 mmHg; $P=0.31$) blood pressure was seen at one year. The use of all classes of antihypertensive agents increased over time (Table 2). Warfarin usage after the first specialist visit was nearly twice as high as at baseline (Table 2).

Secondary analyses were performed to identify predictors of blood pressure lowering at one year. Hypertension was identified as a significant problem by the specialist in 57% of cases and changes in antihypertensive therapy were either suggested or initiated in 77%. However, neither the identification of hypertension as a significant issue nor the suggestion or initiation of antihypertensive therapy was associated with a greater reduction in blood pressure at 12 months: the change in systolic blood pressure ($\pm$ SD) was -5.0 ± 29 mmHg if blood pressure was identified as an important problem and -12.5 ± 20 mmHg if it was not ($P=0.237$); the change in systolic blood pressure ($\pm$ SD) was -7.5 ± 27 mmHg if antihypertensive therapy was initiated or recommended and -10.8 ± 23 mmHg if it was not ($P=0.68$). Blood pressure was re-evaluated by the

specialist at least once between the initial and one-year follow-up in 73% of patients; however, these patients did not have a greater reduction in blood pressure than those who did not have their blood pressure re-evaluated (change in systolic blood pressure $\pm$ SD) of -8.3 ± 26 mmHg versus -6.9 ± 24 mmHg, respectively; $P=0.196$). There was no significant difference in the change in systolic blood pressure at one year among internists (-8.9 mmHg), cardiologists ($+4.9$ mmHg) and electrophysiologists (-11.2 mmHg) ($P=0.339$). However, cardiologists (89%) and internists (77%) were more likely than electrophysiologists (26%) to identify hypertension as an important issue ($P<0.0001$). Cardiologists (81%) and internists (74%) were also more likely to suggest or initiate antihypertensive therapy than were electrophysiologists (13%; $P<0.0001$).

The presence of a blood pressure of greater than 140/90 mmHg at the time of the initial specialist visit did not significantly increase the frequency of specialists explicitly identifying hypertension as an important issue (53% versus 38%; $P=0.25$); however, it was associated with a greater number of specialists either suggesting or initiating antihypertensive therapy (73% versus 46%; $P<0.0001$).

DISCUSSION

Among patients with AF receiving outpatient specialist care at a Canadian university hospital, systolic blood pressure was lowered by an average of 8 mmHg within the first year after initial specialist contact. This degree of blood pressure lowering can have an important impact on the risk of stroke among AF patients. In elderly patients with systolic hypertension, a 12 mmHg reduction in systolic blood pressure over five years is associated with a 36% reduction in the hazard ratio for stroke (16). Furthermore, blood pressure lowering may help prevent several subtypes of stroke, including intracerebral hemorrhage (22). Among patients with AF, one-quarter of all strokes are noncardioembolic in nature (23,24), and this percentage increases to 56% among warfarin-treated AF patients (23). Thus, the treatment of hypertension is a complementary stroke-prevention strategy to oral anticoagulation (6) in AF patients.

Although blood pressure was significantly reduced, specialist involvement in the management of hypertension was not optimal. Hypertension was only identified as a relevant problem in 57% of patients and blood pressure was only measured at 73% of specialist visits. Identification of hypertension, in the present cohort, was no better than in the Third National Health and Nutrition Examination Survey (NHANES III) of the general hypertensive population, where only 69% of hypertensive individuals were diagnosed (25). In our survey, 50% of patients were treated to suggested blood pressure targets, which was better than the 24% seen in the NHANES III survey (25), but is still low and is similar to recent clinical trial experience in AF patients. Fifty per cent of patients in the Stroke Prevention in Atrial Fibrillation III (SPAF-III) trial had a systolic blood pressure of greater than 140 mmHg at baseline (14). In the more recent Stroke Prophylaxis Using an Oral Thrombin Inhibitor in Atrial Fibrillation V (SPORTIF V) trial, 35% of patients had a systolic blood pressure greater than 140 mmHg at study entry (5).

In contrast with the treatment of blood pressure, specialists were very effective at implementing the guidelines for antithrombotic therapy (13). Despite a baseline use of only 46%, warfarin was prescribed to 78% of patients after the initial

TABLE 3
Change in blood pressure (BP) over time

Time	Patients (n)	Baseline BP, mmHg (mean $\pm$ SD)	Follow-up BP, mmHg (mean $\pm$ SD)	P
Baseline to 12 months				
Systolic	60	148 $\pm$ 23	140 $\pm$ 20	0.015
Diastolic	60	81 $\pm$ 16	80 $\pm$ 12	0.602
Baseline to most recent follow-up $\geq$ 12 months				
Systolic	81	150 $\pm$ 23	136 $\pm$ 16	0.0001
Diastolic	81	82 $\pm$ 13	76 $\pm$ 11	0.0001

specialist visit. Because all patients in this review had hypertension, the use of warfarin would be recommended in most (13). Thus, for anticoagulation, specialists were quite valuable in the application of evidence-based medicine.

The differences in hypertension management among internists, cardiologists and electrophysiologists must be interpreted cautiously. Although electrophysiologists appeared less interested in the management of hypertension, they were frequently the second or even third specialist involved in the care of individual patients. As such, it may have been understood, if not explicitly stated, that other specialists (internists or cardiologists) would be responsible for the management of the patients' blood pressure. This hypothesis is supported by the observation that although electrophysiologists were less likely to identify or initiate treatment for hypertension, their patients had similar reductions in blood pressure one year later.

Limitations

The present retrospective study was conducted at a single centre. This limits the external validity of the study, but permits a more detailed analysis of the specialist's role in the treatment of hypertension. A broad sample of 13 physicians in three specialties was used to maximize internal validity. The results of the present study are concordant with observations from large, multicentre, clinical trials (5,14) and epidemiological studies (25), suggesting that this single-centre sample reasonably represented the larger population.

CONCLUSIONS

In specialist-treated ambulatory patients with AF, blood pressure was significantly reduced during follow-up. However, in many patients, hypertension is not identified as an important comorbid illness and antihypertensive therapy is neither recommended nor initiated by the specialist. Greater specialist involvement in the identification and treatment of hypertension in patients with AF could lead to an important, additional reduction in stroke.

ACKNOWLEDGEMENTS: Dr Healey was funded by a research fellowship from the Heart and Stroke Foundation of Canada and AstraZeneca Canada Inc.

REFERENCES

1. Albers GW, Dalen JE, Laupacis A, Manning WJ, Petersen P, Singer DE. Antithrombotic therapy in atrial fibrillation. *Chest* 2001;119(1 Suppl):194S-206S.
2. Wolf PA, Abbott RD, Kannel WB. Atrial fibrillation as an independent risk factor for stroke: The Framingham Study. *Stroke* 1991;22:983-8.

3. Risk factors for stroke and efficacy of antithrombotic therapy in atrial fibrillation. Analysis of pooled data from five randomized controlled trials. *Arch Intern Med* 1994;154:1449-57. (Erratum in 1994;154:2254).
4. The Stroke Prevention in Atrial Fibrillation Investigators. Predictors of thromboembolism in atrial fibrillation: I. Clinical features of patients at risk. *Ann Intern Med* 1992;116:5.
5. Albers GW, Diener HC, Frison L, et al. Ximelagatran vs warfarin for stroke prevention in patients with nonvalvular atrial fibrillation: A randomized trial. *JAMA* 2005;293:690-8.
6. Hart RG, Benavente O, McBride R, Pearce LA. Antithrombotic therapy to prevent stroke in patients with atrial fibrillation: A meta-analysis. *Ann Intern Med* 1999;131:492-501.
7. Go AS, Hylek EM, Chang Y, et al. Anticoagulation therapy for stroke prevention in atrial fibrillation: How well do randomized trials translate into clinical practice? *JAMA* 2003;290:2685-92.
8. Kannel WB, Wolf PA, Benjamin EJ, Levy D. Prevalence, incidence, prognosis, and predisposing conditions for atrial fibrillation: Population-based estimates. *Am J Cardiol* 1998;82:2N-9N.
9. Psaty BM, Manolio TA, Kuller LH, et al. Incidence and risk factors for atrial fibrillation in older adults. *Circulation* 1997;96:2455-61.
10. Krahn AD, Manfreda J, Tate RB, Mathewson FA, Cuddy TE. The natural history of atrial fibrillation: Incidence, risk factors, and prognosis in the Manitoba Follow-up Study. *Am J Med* 1995;98:476-84.
11. Kannel WB, Abbott RD, Savage DD, McNamara PM. Epidemiologic features of chronic atrial fibrillation: The Framingham study. *N Engl J Med* 1982;306:1018-22.
12. Tohgi H, Tajima T, Konno T, Towada S, Kamata A, Yamazaki M. The risk of cerebral infarction in non-valvular atrial fibrillation: Effects of age, hypertension and antihypertensive treatment. *Eur Neurol* 1991;31:126-30.
13. Fuster V, Ryden LE, Asinger RW, et al. ACC/AHA/ESC guidelines for the management of patients with atrial fibrillation: Executive summary. 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 and Policy Conferences (Committee to Develop Guidelines for the Management of Patients with Atrial Fibrillation): Developed in collaboration with the North American Society of Pacing and Electrophysiology. *J Am Coll Cardiol* 2001;38:1231-66.
14. Adjusted-dose warfarin versus low-intensity, fixed-dose warfarin plus aspirin for high-risk patients with atrial fibrillation: Stroke Prevention in Atrial Fibrillation III randomised clinical trial. *Lancet* 1996;348:633-8.
15. Lawes CM, Rodgers A, Bennett DA. Blood pressure and cardiovascular disease in the Asia Pacific region. *J Hypertens* 2003;21:707-16.
16. SHEP Cooperative Research Group. Prevention of stroke by antihypertensive drug treatment in older persons with isolated systolic hypertension. Final results of the Systolic Hypertension in the Elderly Program (SHEP). *JAMA* 1991;265:3255-64.
17. Lewington S, Clarke R, Qizilbash N, Peto R, Collins R. Age-specific relevance of usual blood pressure to vascular mortality: A meta-analysis of individual data for one million adults in 61 prospective studies. *Lancet* 2002;360:1903-13. (Erratum in 2003;361:1060).
18. Chobanian AV, Bakris GL, Black HR, et al. The seventh report of the Joint National Committee on prevention, detection, evaluation, and treatment of high blood pressure: The JNC 7 report. *JAMA* 2003;289:2560-72. (Erratum in 2003;290:197).
19. Ezekowitz JA, van Walraven C, McAlister FA, Armstrong PW, Kaul P. Impact of specialist follow-up in outpatients with congestive heart failure. *CMAJ* 2005;172:189-94.
20. Jong P, Gong Y, Liu PP, Austin PC, Lee DS, Tu JV. Care and outcomes of patients newly hospitalized for heart failure in the community treated by cardiologists compared with other specialists. *Circulation* 2003;108:184-91.
21. Bellotti P, Badano LP, Acquarone N, et al. Specialty-related differences in the epidemiology, clinical profile, management and outcome of patients hospitalized for heart failure; the OSCUR study. *Eur Heart J* 2001;22:596-604.
22. Chapman N, Huxley R, Anderson C, et al. Effects of a perindopril-based blood pressure-lowering regimen on the risk of recurrent stroke according to stroke subtype and medical history: The PROGRESS Trial. *Stroke* 2004;35:116-21.
23. Hart RG, Pearce LA, Miller VT, et al. Cardioembolic vs noncardioembolic strokes in atrial fibrillation: Frequency and effects of antithrombotic agents in the stroke prevention in atrial fibrillation studies. *Cerebrovasc Dis* 2000;10:39-43.
24. Bogousslavsky J, Van Melle G, Regli F, Kappenberger L. Pathogenesis of anterior circulation stroke in patients with nonvalvular atrial fibrillation: The Lausanne Stroke Registry. *Neurology* 1990;40:1046-50.
25. Burt VL, Cutler JA, Higgins M, et al. Trends in the prevalence, awareness, treatment, and control of hypertension in the adult US population. Data from the health examination surveys, 1960 to 1991. *Hypertension* 1995;26:60-9. (Erratum in 1996;27:1192).