Occurrence and quality of anticoagulant treatment of chronic atrial fibrillation in primary health care in Sweden: a retrospective study on electronic patient records

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Abstract

Background: Chronic atrial fibrillation is a prevalent cardiac disorder. The literature indicates varying proportions of those treated with anticoagulants, and varying intensity of anticoagulation. Electronic patient records are providing us with clinical data concerning management of anticoagulant treatment in real-life practice that is useful for audits. We aimed to assess warfarin treatment for chronic atrial fibrillation in primary health care with regard to prevalence, incidence, the proportion treated and the quality of anticoagulation control.

Methods: Five primary health care centres in Stockholm with a registered population of 75146 participated in a one-year retrospective study of electronic patient records up until May 2000. All patients over 18 years of age with an encounter labelled 'Atrial fibrillation' were identified, and all records of patients on warfarin treatment were manually reviewed. Main outcome measures were number of patients with chronic atrial fibrillation, number of patients on warfarin treatment, and time within the therapeutic prothrombin range.

Results: In total, 419 patients had chronic atrial fibrillation, giving a prevalence of 0.60% (age-adjusted 0.62%), the age group 65 years or older accounted for 91.6%, and 50.1% were women. Out of these, 50.4% (211 patients) were established on warfarin treatment for chronic atrial fibrillation (0.28% of the population), and there was a predominance of men (p = 0.02). Fifty-four patients started treatment with warfarin for chronic atrial fibrillation (0.07% of the population). Among 25 randomly selected patients on established treatment, the proportion of time within the therapeutic range was 70.2%. Among 24 randomly selected patients starting treatment, the proportion of time with therapeutic values was 54.2% and 66.9% the first and second months of treatment, respectively.

Conclusions: Chronic atrial fibrillation is common among the elderly in primary health care, and about half of these patients are treated with warfarin. It appears to be under-diagnosed, and may also be under-treated. About two thirds of treatment time is spent within the therapeutic range, and further improvement of the quality of anticoagulation control with warfarin may therefore be hard to achieve.
Background

Chronic atrial fibrillation (CAF) is an increasingly common cardiac disorder, with a prevalence of 0.9–1.2% in the population [1,2], and it increases with age to 4.7% in persons aged 65 years or older [3]. It is associated with an annual incidence of thromboembolic stroke of 2–6% [4]. Oral anticoagulant drugs, i.e. vitamin K antagonists, have been shown in well-designed clinical trials to have antithrombotic efficacy in the prevention of embolic stroke in patients with CAF, and they are medically and economically justified [4,5].

Warfarin is the standard anticoagulant drug used in Sweden. It is an efficacious anticoagulant, but it has a narrow therapeutic range. A prothrombin time corresponding to the International Normalized Ratio (INR) target of 2.5 (range 2–3) is recommended for most indications. The anticoagulant response to warfarin is influenced by many drug interactions and it is also affected by genetic and significant environmental variability. A large number of studies have demonstrated that the risk of bleeding complications during treatment with warfarin increases drastically with an INR above the target value, and that the antithrombotic effectiveness disappears with low INR values [6-8]. There is a relationship between the effectiveness of warfarin and the proportion of time within the therapeutic range, and such estimates have therefore been used as a measure of the quality of anticoagulation treatment [9]. Several studies indicate that CAF is the most common treatment diagnosis for warfarin [10,11]. The treatment is considered fairly safe [12], although bleeding complications do occur [13]. The number of fatal or major bleeding complications in clinical practice is about 1.7% per patient-year [14]. Monitoring is frequently managed by general practitioners (GP) [15]. There is ongoing discussion concerning whether efficiency and safety can be kept as low in primary health care (PHC) as at special clinics for anticoagulation services.

The proportion of patients with CAF that are treated with warfarin in primary health care settings is increasing [2], but was shown in recent studies to vary widely, from 29–97% [2,16-18]. A significant underuse of warfarin has been reported [3,16,19]. The proportion of CAF patients eligible for warfarin treatment varies from 41–61% depending on the criteria used [13,20]. Contraindications for warfarin treatment have been reported in 11–18% of these patients [21,22].

The literature indicates a variable level of anticoagulation intensity in real-life settings, with 43–81% of tests within the therapeutic range [23-26], and the proportion of time spent within the therapeutic range varying from 47–51% [22,27]. Few studies have focused on monitoring in rou-
established treatment, and those who 2) started treatment during the study period. For the first group, all patients with established warfarin treatment for CAF as the only treatment diagnosis, or one of several treatment diagnoses, were identified. The follow-up period for each of these patients was 12 months for two centres and three months for three centres, due to variable resources at the centres. The follow-up continued until the last day of the period or the date of discontinuation. For the second group, all patients were identified who started warfarin treatment for CAF as the only indication, or one of several indications, during the study period. The follow-up period was 90 days, starting with the first day of treatment. For both these groups we randomly selected (using a table of random numbers) five patients from each health care centre (a total of 25 patients per group), and they were subjected to a more detailed follow-up of INR monitoring. For the selected patients (as described above), information was collected concerning start date for treatment, and data from each monitoring episode (i.e. where PT was monitored and dosages given) including date and INR value. The monitoring of anticoagulant treatment was performed using INR, and the standard range was from 2.0 to 3.0 INR.

Results

Occurrence and proportion treated

The total registered population was 75,146. In total, 419 patients had CAF, giving a prevalence of 0.60% (age-adjusted 0.62%), and 50.1% were women (Table 1). The age group 65 years or older accounted for 91.6% of patients with CAF, and 3.3% in the population. The prevalence of CAF increased with increasing age, from 0.19% in the age group 45–64 years, to 5.59% in the age group 85 years or older. Out of these, 211 patients were on warfarin treatment for CAF, from 20 to 76 patients at each PHC centre, 122 men and 89 women, and the mean age was 73.7 (CI 95% 72.4; 75.1) (Table 1). Men were significantly predominant (P = 0.02), accounting for 57.8% (CI 95% 51.1; 64.4). The proportion treated with warfarin was 50.4%, declining from 85.7% in the age group 45–64 years, to 18.8% in the age group 85 years or older. The number of patients who started warfarin treatment for CAF at the participating PHC centres was 54, accounting for 25.6% of patients with CAF who were not on warfarin treatment, and for 0.07% of the population.

Anticoagulation control

Among the 25 randomly selected patients established on warfarin treatment, the median start year for the treatment was 1997. Indications for warfarin treatment besides CAF were found for five patients: prosthetic valve (three patients), deep venous thrombosis (one), and cardiac infarction (one). A total of 216 INR monitoring episodes were identified. INR monitoring was done on average 1.3 times per month. The individual range for INR values was 2.0 to 3.0 INR for 24 of the patients, while one patient had a lower range (1.7 to 2.5). The proportion of time within the therapeutic range was 70.2% (Table 2), and the proportion of values within the therapeutic range was 71.5%. Values with a high bleeding risk (INR > 6.0) were not found.

In the 25 randomly selected patients for whom warfarin treatment was initiated during the study period, no treatment diagnosis other than CAF was found. Data concern-

| Age group | <45 | 45–64 | 65–74 | 75–84 | 85+ | Total | Women |
|-----------|-----|-------|-------|-------|-----|-------|-------|
| Registered population | N | 45294 | 18539 | 5125 | 4470 | 1718 | 75146 | 38851 |
| Diagnosed CAF (n = 419) | % | <0.01 | 0.19 | 2.19 | 3.94 | 5.59 | 0.60 | 0.54 |
| Age adjusted | % | <0.01 | 0.16 | 1.35 | 2.04 | 1.05 | 0.28 | 0.23 |
| Established treatment (n = 211) | % | - | 85.7 | 61.6 | 51.7 | 18.8 | 50.4 | 42.2* |

* Significantly more men (p = 0.02)
The proportion treated with warfarin (50.4%) in our study can be considered intermediate as compared with studies mentioned above (29–97%) [2,16-18]. However, considering the proportion of CAF patients who are found eligible for warfarin treatment (41–61%) [3,20] and, on the other hand, the proportion of patients with contraindications for warfarin (11–18%) [21,22], our figures suggest a minor underuse. The declining use of warfarin with older age was somewhat more marked in our study compared to findings in similar studies [2,16]. Numerous barriers to warfarin treatment still exist in clinical practice, even for eligible patients. These include practical, patient-physician- and healthcare system-related barriers [30], among which a major factor seems to be patients’ unwillingness to take warfarin [31]. Our figures may therefore approach what can be achieved in everyday clinical practice. However, the extent to which these figures can be improved is uncertain, since the number of eligible patients is not known in our study. Further improvements should probably include new approaches to CAF treatment such as screening, disease-management teams in PHC, and new strategies for patient education. These need to be supported by the implementation of guidelines, and by new incentives and a health care policy that solve the problem of an increased clinical workload. The number of patients on warfarin treatment and their frequent health care contacts in PHC, a mean of more than once a month in our study, point out a considerable workload related to warfarin treatment, and this has received little attention.

Regarding the INR values, the quality of anticoagulation control can be considered fairly high. The figures were somewhat lower when initiating treatment, as expected. Our figures on monitoring episodes within the therapeutic range (71.5%) are in line with or are higher than figures reported in recent studies [23-26]. The proportion of time spent in the therapeutic range (70.2%) is higher than the figures mentioned above (47–51%) [27,22]. These figures may be improved further, as shown by the special anticoagulation clinics [7], but probably only to a very limited degree. This would require a more organised approach to anticoagulant management including com-
puter dosing systems and improved systems for follow-up [32].

The major limitations of this study are that it is rather small, the lack of clinical features regarding potential contraindications to anticoagulation, and the lack of information about the presence or absence of risk factors for stroke. An evaluation including the safety of warfarin treatment in PHC would require a longer observation time and a larger sample of patients than in this study. Further, the study was conducted locally, and although we tried to compensate for local variations, conclusions about PHC in general must be made with caution. There is no reason to believe that patients on warfarin treatment were missed, as all patients receiving treatment (as defined above) at the PHC centres are registered under INR values in the laboratory module of the record systems. The actual therapeutic range for the patient is an important factor, as it is sometimes individualised in clinical practice, and this was taken into consideration in our study. Most earlier studies are not based on PHC with a registered population, a representative sample of patients, and records from everyday clinical practice, which are the advantages of our study.

Conclusions
CAF is common among the elderly in primary health care, and about half of these patients are treated with warfarin. It appears to be under-diagnosed, and may also be under-treated. About two thirds of the treatment time is spent within the therapeutic range, and a further improvement of the quality of anticoagulation control with warfarin treatment may therefore be hard to achieve. Given the frequent monitoring episodes, there is a considerable workload related to warfarin treatment for CAF, both for patients and for care providers.

Competing interests
The study was supported by grants from the Stockholm County Council and AstraZeneca Sverige AB. IB was a health economist at AstraZeneca Sverige AB at the time the study was performed.

Authors’ contributions
GHN participated in the design and coordination of the study, performed the statistical analysis and drafted the manuscript. IB participated in the design and coordination of the study and drafted the manuscript. All authors read and approved the final manuscript.

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References
1. Feinberg WM, Blackshear JL, Laupacis A, Kronmal R, Hart RG: Prevalence, age distribution, and gender of patients with atrial fibrillation. Analysis and implications. Arch Intern Med 1995, 155:469-473.
2. Majeed A, Moser K, Carroll K: Trends in the prevalence and management of atrial fibrillation in general practice in England and Wales, 1994–1998: analysis of data from the general practice research database. Heart 2001, 86:284-288.
3. Sudlow M, Thomson R, Thrift G, Rodgers H, Kenny RA: Prevalence of atrial fibrillation and eligibility for anticoagulants in the community. Lancet 1998, 352:1167-1171.
4. Hart RG, Benavente O, McBride R, Pearce LA: Antithrombotic therapy to prevent stroke in patients with atrial fibrillation: a meta-analysis. Arch Intern Med 2000, 160:2692-501.
5. Lightowlers S, McGuire A: Cost-effectiveness of anticoagulation in nonrheumatic atrial fibrillation in the primary prevention of ischemic stroke. Stroke 1998, 29:1827-1832.
6. Samra GP, Matchar DB: Relationship between test frequency and outcomes of anticoagulation: a literature review and commentary with implications for the design of randomized trials of patient self-management. J Thromb Thrombolyis 2001, 9:283-292.
7. Asselij J, Hirsh J, Dalen J, Bushey H, Anderson D, Poller L, Jacobson A, Deykin D, Matchar D: Managing oral anticoagulant therapy. Chest 2001, 119:225-385.
8. Hylek EM, Go AS, Chang Y, Jansvold NG, Henault LE, Selby JV, Singer DE: Effect of intensity of oral anticoagulation on stroke severity and mortality in atrial fibrillation. N Engl J Med 2003, 349:1019-1026.
9. Hutton BA, Prins MH, Redekop WK, Tijssen JG, Heisterkamp SH, Buller HR: Comparison of three methods to assess therapeutic quality control of treatment with vitamin K antagonists. Thromb Haemost 1999, 82:1260-1263.
10. Wandell PE: A survey of subjects with present or previous atrial fibrillation in a Swedish community. Scand J Prim Health Care 2001, 19:20-24.
11. Eskola K, Aittoniemi P, Kurunmaki H, Latva-Nevala A, Palonen M, Wallin AM, Vitaniemi M, Verjo I, Ylinen S, Ohman S, Isokoski M: Anticoagulant treatment in primary health care in Finland. Scand J Prim Health Care 1996, 14:165-170.
12. Palareti G, Lelii N, Coccheri S, Poggi M, Manotti C, D’Angelo A, Pengo V, Erba N, Moia M, Cavarella N, Devoto G, Berrettini M, Musolesi S: Bleeding complications of oral anticoagulant treatment: an inception-cohort, prospective collaborative study (ISCOAT) Italian Study on Complications of Oral Anticoagulant Therapy. Lancet 1996, 348:423-428.
13. Poller L, Shlach CR, MacAllum PK, Johansen AM, Munster AM, Magalhaes A, Jespersen J: Multicentre randomised study of computerised anticoagulant dosage. European Concerted Action on Anticoagulation. Lancet 1998, 352:1505-1509.
14. Kalra L, Yu G, Perez I, Lakhani A, Donaldson N: Prospective cohort study to determine if trial efficacy of anticoagulation for stroke prevention in atrial fibrillation translates into clinical effectiveness. BMJ 2000, 320:1236-1239.
15. Wandell PE: Anticoagulant patients in Swedish primary health care. A comparison 5 years apart. Scand J Prim Health Care 1998, 16:183-187.
16. Go AS, Hylek EM, Borowsky LH, Phillips KA, Selby JV, Singer DE: Warfarin use among ambulatory patients with nonvalvular atrial fibrillation: the anticoagulation and risk factors in atrial fibrillation (ATRIA) study. Ann Intern Med 1999, 131:927-934.
17. Wallentin L, Uppholt RE: Atrial fibrillation in a primary care practice: prevalence and management. BMC Fam Pract 2002, 3:11.
18. Hover AR, Rogers JT, Hunt C: A comparison of rural and urban anticoagulation management of atrial fibrillation in a southwest Missouri health system. Mo Med 2003, 100:94-97.
19. Frykman V, Beerman B, Rydén L, Rosenqvist M: Management of atrial fibrillation: discrepancy between guideline recommendations and actual practice exposes patients to risk for complications. Eur Heart J 2001, 22:1954-1959.
20. Wheeldon NM, Tayler DI, Anagnostou E, Cook D, Wales C, Oakley GD: Screening for atrial fibrillation in primary care. Heart 1998, 79:50-55.
21. Filippi A, Betoncelli G, Zaninelli A: Detected atrial fibrillation in northern Italy: rates, calculated stroke risk and proportion of
patients receiving thrombo-prophylaxis. Fam Pract 2000, 17:337-339.
22. Samsa GP, Matchar DB, Goldstein LB, Bonito AJ, Lux LJ, Witter DM, Bian J: Quality of anticoagulation management among patients with atrial fibrillation: results of a review of medical records from 2 communities. Arch Intern Med 2000, 160:967-973.
23. Viitanen M, Eskola K, Kurunmaki H, Latva-Nevala A, Wallin AM, Palonen M, Virio I, Ylinen S, Ohman S, Isokoski M: Anticoagulant treatment of patients with atrial fibrillation in primary health care. Scand J Prim Health Care 1999, 17:59-63.
24. Fitzmaurice DA, Hobbs FD, Murray ET: Primary care anticoagulant clinic management using computerized decision support and near patient International Normalized Ratio (INR) testing: routine data from a practice nurse-led clinic. Fam Pract 1998, 15:144-146.
25. Wändell PE: Anticoagulant treatment of patients in Swedish primary health care. Eur J Clin Pharmacol 2001, 57:61-64.
26. Yermiahu T, Arbelle JE, Shwartz D, Levy Y, Tractinsky N, Porath A: Quality assessment of oral anticoagulant treatment in the Beer-Sheba district. Int J Qual Health Care 2001, 13:209-213.
27. McCormick D, Gurwitz JH, Goldberg RJ, Becker R, Tate JP, Elwell A, Radford MJ: Prevalence and quality of warfarin use for patients with atrial fibrillation in the long-term care setting. Arch Intern Med 2001, 161:2458-2463.
28. Cobbe SM: Using the right drug. A treatment algorithm for atrial fibrillation. Eur Heart J 1997, 18:C33-C39.
29. Huten BA, Prins MH, Redekop WK, Tijssen JG, Heisterkamp SH, Buller HR: Comparison of three methods to assess therapeutic quality control of treatment with vitamin K antagonists. Thromb Haemost 1999, 82:1260-1263.
30. Buckingham TA, Hatasa R: Anticoagulants for atrial fibrillation: why is the treatment rate so low? Clin Cardiol 2002, 25:447-454.
31. Howitt A, Armstrong D, Renton A, Cohen H: Methods for managing the increased workload in anticoagulant clinics. BMJ 1999, 318:1324-1327.
32. Taylor FC, Ramsay ME, Renton A, Cohen H: Methods for managing the increased workload in anticoagulant clinics. BMJ 1999, 312:286.

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