Antithrombotic prescribing in atrial fibrillation: application of a prescribing indicator and multidisciplinary feedback to improve prescribing

Rohar A. Elliott, Michael C. Woodward, C. Alice Oborne

Centre for Applied Gerontology, Bundoora Extended Care Centre, Bundoora VIC 3083, Australia
1Aged Care Services, Austin & Repatriation Medical Centre, Heidelberg West VIC 3081, Australia
2Clinical Age Research Unit, Department of Health Care of the Elderly, Guys, Kings and St Thomas’ School of Medicine, London, UK

Address correspondence to: R. A. Elliott, Pharmacy Department, Austin & Repatriation Medical Centre, Studley Road, Heidelberg VIC 3084, Australia. Fax (+61) 3 9459 4546. Email: rohan.elliott@armc.org.au

Abstract

Background: atrial fibrillation is common in older people, and is associated with an increased risk of ischaemic stroke. Antithrombotic therapy reduces stroke-risk, but is known to be under-prescribed.

Objectives: to use an evidence-based indicator to audit antithrombotic prescribing for older hospital inpatients with atrial fibrillation, and to assess whether feedback of audit results to hospital staff increases antithrombotic use.

Design: cross-sectional notes-based audits, before and after feedback.

Setting: six Aged Care and three General Medicine units at nine Australian public teaching hospitals between September 1998 and May 1999.

Subjects: 1416 hospital inpatients aged 65 years and over (median age 81).

Methods: medication charts were reviewed to identify patients prescribed digoxin or amiodarone. Presence of atrial fibrillation was confirmed by review of the patients’ medical notes. To be considered appropriate, patients with atrial fibrillation had to be receiving either warfarin or aspirin (or both), or have documented contraindications to both agents. Feedback of audit results was provided to medical, pharmacy and nursing staff at multidisciplinary meetings. Changes in antithrombotic prescribing 4–8 weeks and 6 months after feedback were assessed. Prescribing 8 weeks prior to feedback was assessed retrospectively.

Results: appropriateness of the decision to prescribe (or not prescribe) antithrombotic therapy increased from 81/112 (72%) immediately prior to feedback to 97/105 (92%) 4–8 weeks later (P<0.0001). Six months after feedback, appropriateness of prescribing declined slightly, to 85% (p=0.36). Over the 8 weeks prior to feedback, appropriateness of prescribing did not change (74% versus 77%, p=0.80). Increased aspirin prescribing accounted for most of the improvement in antithrombotic use after feedback, while warfarin continued to be under-used.

Conclusions: antithrombotics were under-prescribed for older patients with atrial fibrillation. Audit and multidisciplinary feedback resulted in increased antithrombotic prescribing. The intervention had a greater impact on aspirin prescribing compared with warfarin.

Keywords: atrial fibrillation, prescriptions, drug, warfarin, aspirin, quality assurance, health care

Background

Atrial fibrillation (AF) is a strong independent risk factor for ischaemic stroke, and its prevalence increases with advancing age making it an important health concern for older people. AF affects 6% of people aged over 65 years and 10% of those over 80 years [1]. It is associated with an annual stroke rate of 3–7% in people aged 65–75 years with no additional risk factors, increasing to 5–14% in people over 75 years with one or more additional risk factors [2].
Warfarin and aspirin have been shown to reduce stroke risk in patients with AF. Compared with placebo, warfarin reduces the relative risk of stroke by 62% [3]. Aspirin is less effective, reducing stroke risk by 22% [3]. Despite the strong evidence in their favour, under-use of antithrombotics in community and hospital settings has been widely reported [4–8].

Many strategies to influence medication prescribing have been studied. Audit and feedback is one strategy that has been utilized with mixed success [9–11]. The variable effectiveness of audit and feedback may be explained by variations in the method of delivering feedback, the target group, the inclusion or exclusion of peer comparison data, and the presence or absence of concurrent interventions such as printed materials and educational meetings. Multifaceted interventions appear to be more effective than audit and feedback alone [12, 13].

Evidence-based indicators of prescribing quality for older hospital inpatients have been developed in the UK [14] where they are currently being used by more than 100 hospitals. One of the indicators identifies under-use of antithrombotics for patients with AF. The objectives of this study were to use a modified version of the indicator [15] to audit antithrombotic prescribing for older patients with AF at 9 Australian hospitals, and to assess whether a multifaceted intervention centred around feedback of audit results at multidisciplinary staff meetings could increase antithrombotic use.

**Method**

A convenience sample of six Aged Care (geriatric assessment and rehabilitation) and three General Medicine units at nine public teaching hospitals were recruited. Approval for the study was obtained from the Ethics Committees of all participating hospitals.

Data were collected by two clinical pharmacists between September 1998 and May 1999. Prescribing was assessed cross-sectionally by reviewing prescriptions for all patients aged 65 years and over who were inpatients of the participating units on the day of audit. Patients admitted less than 24 hours prior to audit were excluded as medical assessment of the patient may not have been completed within that time. Appropriateness of antithrombotic prescribing was assessed using an evidence-based prescribing indicator (Figure 1) [15] which utilized prescriptions for digoxin and amiodarone to identify a sample of patients likely to have AF. Presence of AF was confirmed by review of the medical notes. For prescribing to be considered appropriate, patients with AF had to be receiving warfarin or aspirin (or both), or have a contraindication to both agents documented in their medical record.

Initial audits (audit 1) were followed by feedback to hospital staff. The main component of the feedback was presentation at a multidisciplinary staff meeting at each hospital. Meetings were of 1 hour duration, made up of a 20 minute presentation and interactive discussion regarding the antithrombotic prescribing audit, in addition to 20 minutes on two other unrelated areas of prescribing. The presentation consisted of a brief review of the literature supporting antithrombotic use in AF, followed by local audit results and comparative results from other (de-identified) hospitals. The presentations were made by a clinical pharmacist (RAE or CAO) and geriatrician (MCW), and were attended by medical, nursing and pharmacy staff. The multidisciplinary meetings were supplemented with an additional presentation (RAE) for nursing staff unable to attend the multidisciplinary meeting. A brief written summary of the material was distributed at the meetings, and a small (A4) colour poster was placed on the wall of the nurses’ station on participating wards to reinforce the educational message.

A second audit (audit 2) was completed 4–8 weeks after feedback at each hospital to assess changes in prescribing. A third audit (audit 3) at three hospitals was completed after 6 months to assess whether changes were sustained (there was no additional feedback between audit 2 and audit 3). To assess changes in prescribing prior to audit and feedback, an audit of prescribing for inpatients on a designated day 8 weeks prior to audit 1 was completed retrospectively at two hospitals (audit 1).

**Statistical analysis**

Non-parametric statistics (Mann–Whitney U, Kruskal–Wallis) were used to compare the age and number of medications prescribed for the groups of patients involved in the four audits. Chi-square statistics were used to compare the groups’ gender, and to assess changes in prescribing. Multivariate logistic regression was used to identify potential confounding factors which may impact on prescribing, including hospital, age, gender and number of days since admission. Observed differences were considered significant if P-value was less than 0.05.
Results

Prescriptions for 1416 patients, median age 81 years (range 65–105), were reviewed. The median number of days between admission and audit was 16. The age and gender of the groups of patients involved in each audit did not vary significantly (age: \( x^2 = 7.27, p = 0.064 \); gender: \( x^2 = 5.87, p = 0.118 \)).

At audit 1, 112 patients with AF were identified and, excluding patients with contraindications to antithrombotic therapy, 65% were receiving warfarin or aspirin. After feedback of audit results (audit 2; \( n = 105 \)), 90% of eligible patients were receiving antithrombotic therapy (\( x^2 = 13.72, P < 0.0001 \)) (Table 1). Based on the prescribing indicator (i.e. considering patients prescribed an antithrombotic plus those for whom antithrombotic therapy was contraindicated and therefore appropriately withheld), appropriateness of the decision to prescribe (or not) antithrombotic therapy increased from 72% at audit 1 to 92% at audit 2 (\( x^2 = 14.79, P < 0.0001 \)) (Table 1). Improved antithrombotic prescribing was observed at all nine hospitals (Figure 2).

Increased aspirin prescribing accounted for most of the increase in antithrombotic prescriptions. Excluding patients for whom warfarin was contraindicated, 22/65 (34%) were prescribed warfarin at audit 1 compared with 23/57 (40%) at audit 2 (\( x^2 = 0.55, p = 0.46 \)). Excluding patients receiving warfarin or for whom aspirin was otherwise contraindicated, the proportion prescribed aspirin increased from 46/77 (60%) to 55/63 (87%) (\( x^2 = 11.43, p = 0.001 \)).

At the three hospitals which participated in the third audit (audit 3), 6 months after feedback, appropriateness of the decision to prescribe (or not to prescribe) antithrombotic therapy declined slightly but not significantly between audit 2 and audit 3 (93% versus 85%, \( p = 0.36 \)) (Table 2).

Using multivariate logistic regression to identify potential confounders, audit remained the only significant variable (\( p = 0.0027 \)). Patient age showed a trend toward significance (\( p = 0.053 \)), but no other variables were significant: hospital: \( p = 0.76 \); gender: \( p = 0.083 \); days since admission: \( p = 0.44 \). The confounding nature of patient age was that antithrombotic prescribing for older patients was more likely to be inappropriate compared with younger patients—the mean age of patients for whom prescribing was inappropriate was 84 years, compared with 81 years for those for whom prescribing was appropriate (\( t = 2.37; p = 0.019 \)).

### Table 1. Antithrombotic (AT) prescribing for patients with atrial fibrillation (AF) before and after multidisciplinary feedback

<table>
<thead>
<tr>
<th></th>
<th>Audit 1</th>
<th>Audit 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of patients</td>
<td>594</td>
<td>563</td>
</tr>
<tr>
<td>Age (median years)</td>
<td>80</td>
<td>81</td>
</tr>
<tr>
<td>Gender (% female)</td>
<td>55</td>
<td>60</td>
</tr>
<tr>
<td>Number of medications prescribed (median)</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Patients prescribed digoxin or amiodarone</td>
<td>129</td>
<td>119</td>
</tr>
<tr>
<td>Patients on digoxin/amiodarone with documented AF</td>
<td>112</td>
<td>105</td>
</tr>
<tr>
<td>Patients prescribed AT (warfarin, aspirin or both) (of all patients with AF)</td>
<td>68 (61%)</td>
<td>78 (74%)*</td>
</tr>
<tr>
<td>Patients in whom AT indicated (i.e. without a contraindication to both warfarin and aspirin)</td>
<td>89 (80%)</td>
<td>77 (73%)</td>
</tr>
<tr>
<td>Patients prescribed AT (of those in whom AT indicated)*</td>
<td>58 (65%)</td>
<td>69 (90%)*</td>
</tr>
<tr>
<td>Appropriate decision to prescribe AT, of all patients with AF (i.e. patients prescribed an AT plus those for whom AT therapy was contraindicated and therefore appropriately withheld)</td>
<td>81 (72%)</td>
<td>97 (92%)*</td>
</tr>
</tbody>
</table>

* \( p < 0.05 \), Chi-square.

*Patients prescribed AT (of those in whom AT indicated)* is less than ‘patients prescribed AT (of all patients with AF)’ because some patients received AT despite the presence of contraindications.
Antithrombotics were underutilized for older patients with AF in nine Australian hospitals. Prior to feedback of audit results, only two thirds of eligible patients were receiving either warfarin or aspirin. This is consistent with published literature from Australia, the UK and North America, which reports that only 40–63% of eligible patients are prescribed antithrombotic therapy [4–8].

Only one in three patients without a contraindication received warfarin, consistent with other studies that have found warfarin is prescribed for 15–44% of eligible patients [16]. Based on risk-stratification data, warfarin is considered the drug of first choice for patients with AF who are at highest risk of stroke (those over the age of 75 years, or less than 75 years with additional risk factors). Either aspirin or warfarin may be appropriate for patients under 75 years without additional stroke risk factors [17, 18]. The indicator used in this study did not stratify patients according to level of risk, however, based on data from similar populations [19–22] it is likely that most patients (83–100%) in our study would have been in a high risk category and therefore should have been prescribed warfarin.

After feedback of audit data to hospital staff, antithrombotic prescribing improved significantly, with 90% of eligible patients receiving an antithrombotic. However there was a much greater increase in aspirin prescribing compared with warfarin. This could relate to the fact that prescribers are sometimes reluctant to use warfarin in very old patients [16, 23]. We identified a trend suggesting antithrombotic prescribing for older patients was less likely to be appropriate compared with younger patients.

The study did not have a concurrent control group, however, three factors suggest that the increase in antithrombotic prescribing resulted from the intervention. Firstly, in the absence of feedback (between audit –1 and audit 1) there was no significant change in antithrombotic prescribing over time. Secondly, appropriateness of antithrombotic prescribing improved at all nine hospitals after feedback. Thirdly, whilst antithrombotic prescribing in AF improved after feedback, there was no statistically significant improvement in other areas of prescribing (e.g. aspirin in ischaemic heart disease) which were assessed at the same time using similar methodology but without provision of feedback to the prescribing team.

Although audit and feedback as a method to improve prescribing has previously been reported to have variable effectiveness, [12] our intervention had a positive impact. This may have been due to the multifaceted nature of the intervention which included: presentation of feedback at multidisciplinary educational meetings, inclusion of comparative data from other hospitals, presentation and discussion of evidence supporting antithrombotic use in older patients with AF, provision of a written summary of the information, and use of educational posters placed in ward areas. High medical staff attendance rates at feedback sessions were considered to be important, and this was achieved by scheduling sessions to coincide with regular unit meetings. Also important was involvement of a respected senior geriatrician in the feedback sessions. The multidisciplinary nature of the intervention may also have been beneficial since pharmacists and nurses can influence prescribing decisions [24].

At audit 3 (6 months after feedback), appropriateness of antithrombotic prescribing appeared to decline

---

**Table 2. Antithrombotic (AT) prescribing for patients with atrial fibrillation (AF): a) 8 weeks and immediately before feedback; b) immediately before, 8 weeks after and 6 months after feedback**

<table>
<thead>
<tr>
<th>Patient Category</th>
<th>Audit –1</th>
<th>Audit 1</th>
<th>Audit 1</th>
<th>Audit 2</th>
<th>Audit 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients prescribed digoxin or amiodarone</td>
<td>20</td>
<td>27</td>
<td>39</td>
<td>31</td>
<td>31</td>
</tr>
<tr>
<td>Patients on digoxin/amiodarone with documented AF</td>
<td>19</td>
<td>26</td>
<td>36</td>
<td>28</td>
<td>27</td>
</tr>
<tr>
<td>Patients prescribed AT (of all patients with AF)</td>
<td>12 (63%)</td>
<td>13 (50%)</td>
<td>20 (56%)</td>
<td>18 (64%)</td>
<td>22 (82%)*</td>
</tr>
<tr>
<td>Patients in whom AT indicated (i.e. without a contraindication to both warfarin and aspirin)</td>
<td>15 (79%)</td>
<td>15 (58%)</td>
<td>24 (67%)</td>
<td>17 (61%)</td>
<td>21 (78%)</td>
</tr>
<tr>
<td>Patients prescribed AT (of those in whom AT indicated)*</td>
<td>10 (67%)</td>
<td>9 (60%)</td>
<td>15 (63%)</td>
<td>15 (88%)</td>
<td>17 (81%)</td>
</tr>
<tr>
<td>Appropriate decision to prescribe AT, of all patients with AF (i.e. including those patients prescribed an AT plus those patients in whom AT therapy was appropriately withheld because of contraindications to such therapy)</td>
<td>14 (74%)</td>
<td>20 (77%)</td>
<td>27 (75%)</td>
<td>26 (93%)*</td>
<td>23 (85%)</td>
</tr>
</tbody>
</table>

*P<0.05 (Audit 1 versus Audit 3).

*Patients prescribed AT (of those in whom AT indicated)* is less than *patients prescribed AT (of all patients with AF)* because some patients received AT despite the presence of contraindications.

*P=0.06 (Audit 1 versus Audit 2).
Audit and feedback to improve antithrombotic prescribing in atrial fibrillation

slightly towards baseline, although this was not statistically significant (Table 2). It is possible that with a larger sample size the decline might have been significant. A gradual decline over time, after an initial improvement, might be expected given the regular turnover of junior medical personnel in teaching hospitals. We attempted to minimize the impact of this by ensuring that senior medical staff and pharmacists and nurses, who turn over less frequently, were involved in the intervention. Even so, ongoing regular audit and feedback is likely to be required to maintain the improvements achieved.

Absence of risk stratification could be a criticism of the indicator used in this study, however the simplicity of the indicator may also be an advantage because it allows audits of large numbers of patients to be undertaken quickly and easily. Compared with more complex audit tools it is therefore more likely to be utilized on an ongoing basis to monitor antithrombotic prescribing. This is evidenced by the uptake of the original indicator by more than 100 hospitals in the UK. In addition, the indicator can reliably be used by multiple people concurrently because it has been shown to have very good inter-rater agreement (κ=0.7–0.8) [14, 15]. In a recent study at an acute UK hospital trust, a more complex algorithm which stratified patients into high, moderate and low risk groups was used as part of an audit and feedback intervention [20]. Although the audit criteria were more sophisticated, the results of this study were similar to our study. There was a significant increase in overall appropriateness of antithrombotic prescribing which consisted of a greater increase in the use of aspirin compared with warfarin [20]. Inter-rater agreement with application of the algorithm was not assessed. The similar findings of these two studies suggests that it may not be necessary to use complex algorithms to monitor antithrombotic prescribing for elderly hospital inpatients. Regular application of a simplified indicator with known inter-rater agreement may be suitable to assess and monitor changes in antithrombotic prescribing over time.

It is unfortunate that warfarin prescribing did not improve significantly given its greater efficacy compared with aspirin. Warfarin prescribing is more complex than aspirin, and its adverse effects potentially more serious, so it is perhaps not surprising that it is harder to increase prescribers’ use of warfarin in older patients. A recent review of studies examining physicians’ use of warfarin in AF identified a range of potential barriers to warfarin prescription [16]. These included:

i. Lack of awareness of the current literature or clinical practice guidelines (or unwillingness to accept that these are applicable to their patients).

ii. Tendency to under-estimate the benefit-risk ratio of warfarin in older patients.

iii. Previous bad experiences with the use of warfarin.

iv. Tendency to assume, without consultation, and often incorrectly, that a patient would not be prepared to use warfarin.

v. Inconvenience of monitoring warfarin therapy.

vi. Difficulty in maintaining therapy within the therapeutic range.

vii. Lack of access to expert advice.

viii. Lack of patient reliability.

ix. Lack of physician awareness of how infrequently they prescribe warfarin (self-reported rates are often greater than observed in clinical practice).

Feedback of prescribing data and simple educational interventions may help to overcome some, but not all, of these barriers. To increase warfarin use in older patients, prescriber feedback may need to be combined with more intensive education and guidelines focussing on the benefits and risks of warfarin therapy and identification of patients most likely to benefit. Another strategy could be immediate concurrent feedback or prompts provided to prescribers when a patient with AF who is not on warfarin is identified (this could be done manually, for example by clinical pharmacists, or via decision support functions in electronic prescribing software). Multi-disciplinary anticoagulant clinics [25] and improved access to expert advice may also be beneficial.

Conclusion

Antithrombotics were under-prescribed for older patients with AF at nine Australian hospitals. Application of an evidence-based prescribing indicator, combined with multidisciplinary feedback, increased antithrombotic use. Improved prescribing was still evident after 6 months, although there appeared to be a partial decline towards baseline, suggesting that ongoing feedback at regular intervals may be required to maintain improvements. The intervention had a greater impact on aspirin prescribing compared with warfarin, indicating that further research is required to find ways to increase warfarin use.

Key points

- Antithrombotics were under-prescribed for older people with AF in Australian hospitals.
- Audit and multidisciplinary feedback significantly improved antithrombotic prescribing.
- Warfarin continued to be under-used even after audit and feedback.

Acknowledgements

Funding was provided by the Victorian Department of Human Services (Aged, Community and Mental Health). We would like to thank the participating hospitals for their support and cooperation, and Ms Sarah Agius for assistance with statistical analysis. We would also like to acknowledge the contributions of the project Reference Group: Professor Joanne Brien, Chair in Clinical Pharmacy, St Vincent’s Hospital, Sydney; Mr Jonathan
References


