Atrial fibrillation: a comparison of methods to identify cases in general practice

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SUMMARY
The importance of atrial fibrillation as a treatable risk factor for stroke is well established. Less is known about how to
find previously unidentified cases within the community so
that antithrombotic treatment can be offered to a wider
group of at-risk patients. The aim of our study was to exam-
line ways to improve the efficiency of practice-based screen-
ing for atrial fibrillation, including issues of time and financial
cost. We used different combinations of pulse palpation and
interpretation of 12-lead and bipolar electrocardiographs as
carried out by practice nurses. The best strategy for the
detection of atrial fibrillation in a practice population would
appear to be to screen all eligible subjects by nurse pulse
palpation, followed by 12-lead electrocardiograph readings
in those who have a pulse suggestive of atrial fibrillation.
The electrocardiograph interpretation can be undertaken
effectively by a trained nurse.

Keywords: atrial fibrillation; general practice; pulse palpa-
tion; practice nurses.

Introduction
The prevalence of atrial fibrillation has been estimated at 5%
in those aged over 65 years.¹ The use of warfarin in hospital-
based trials has shown significant reduction in stroke risk in
patients with atrial fibrillation.² This has led to efforts to find the
best method for identifying patients in the community who have
atrial fibrillation so that antithrombotic treatment can be consid-
ered. Hill et al invited patients aged 65 years and over in a prac-
tice population to attend for a 12-lead electrocardiograph. This
method had a small yield at the cost of a high workload.³ Other
work has demonstrated that about three-quarters of cases of atrial
fibrillation already have a record of the problem in their general
practice notes.⁴ A large population study compared prescription
searches for digoxin with pulse palpation by a nurse as a means
of identifying atrial fibrillation. Digoxin-based searches picked
up only half of the cases. Pulse palpation had a much better sen-
sitivity but at the cost of a higher number of false positives.⁵

In our study, we examined the validity of identifying atrial fib-
rillation through combinations of pulse palpation and interpreta-
tion of electrocardiographs as carried out by practice nurses and
a general practitioner (GP).

Methods
The study patients were all recruited from a single practice.
Patients aged 65 years or over with a diagnosis of atrial fibrilla-
tion were identified by searching computerised records using the
Read codes for atrial fibrillation and digoxin prescription. An
equal number of patients aged 65 years or over, without either
code in their computer records, was sampled. All patients were
invited to attend the surgery by appointment. The patients were
instructed not to divulge any information about their medical his-
tory or medication to the recording nurse.

One nurse (Nurse A: JS) saw all the patients and had no prior
knowledge of their medical history. Her background was in both
community and accident and emergency (A&E) nursing, and she
had experience of taking and interpreting electrocardiograms.
She palpated the pulse and recorded the result as ‘regular’ or
‘irregular’. She then recorded bipolar and 12-lead electrocardio-
grams, labelling them with an identifying number only. Bipolar
ECGs depend on limb leads only, do not require removal of
clothing, and therefore are a simpler, quicker procedure. At a
later date both types of ECG were interpreted independently by
the nurse and one of the GP partners in the practice (SS) and, for
the 12-lead only, a cardiologist. They were unaware of the results
of the pulse palpation. All procedures were timed.

Other nurses with different previous experience of pulse pal-
pation and ECG interpretation reviewed a random sample of the
patients. Nurse B was a practice nurse with no additional ECG
training. Nurse C was also a practice nurse but formerly worked
on a coronary care unit and had been trained there to interpret
ECGs. The 12-lead electrocardiogram interpreted by the consultant
cardiologist was used as the ‘gold standard’ for comparison.
Different combinations of pulse palpation and ECG interpreta-
tion by nurses and the GP were analysed to determine the most
efficient method of screening for the gold standard. A simple
analysis of time and financial costs was also undertaken. Costs
were estimated using British Medical Association and Whitley
Council rates for GPs and nurses respectively.

Results
A total of 86 patients attended out of 154 invited, a response rate
of 56%. Of these, 26 (30%) had atrial fibrillation and 60 (70%)
were in sinus rhythm according to the 12-lead ECG as interpret-
ed by the consultant cardiologist.

Against this gold standard high sensitivities were recorded
generally for each of the methods (one-step strategies in Table
1). There was more variation in specificity, although all methods
were above 75%. Nurse interpretation of the ECGs, with the
exception of Nurse C, was inferior to those of the GP. The more
experienced the nurse, the better the test performance. Indeed,
bipolar testing and reading by Nurse C (the trained cardiology
nurse) had a 100% sensitivity and specificity as a one-step stra-
tegy. The specificity of nurse palpation alone (Nurse A) was sig-
nificantly lower than that achieved by GP interpretation of either
a bipolar or a 12-lead ECG alone.
To investigate combinations of methods, patients with a positive test according to Nurse A’s interpretation of the pulse palpation were considered as being re-tested by one of the ECG methods (one-step strategies). Compared with the nurse palpation alone, there were improvements in specificity recorded by such two-step methods resulting in nearly all non-cases being correctly identified. These improvements were all statistically significant (P<0.05) by McNemar’s test.

There was a significant increase overall in the time taken by Nurse A to obtain readings of pulse palpation (mean = 73 seconds), bipolar ECG (mean = 163 seconds), and 12-lead ECG (mean = 636 seconds). Average times taken for ECG interpretation were 38, 26, 44, and 26 seconds for nurse bipolar, GP bipolar, nurse 12-lead, and GP 12-lead respectively. The two-step strategies that combine pulse and bipolar would reduce recording time compared with bipolar testing of all individuals.

Addition of 12-lead ECG interpretation by a GP in only those patients identified by the nurse as positive on pulse palpation gave an overall sensitivity of 100% and specificity of 98%, with lower total time and financial cost than if the GP ECG was used as the sole screening method. It is estimated that there would be an average 62% reduction in time per patient assessment between 12-lead ECG as a one-step method applied to all subjects aged 65 years or over and 12-lead ECG as a second step restricted to those with an irregular pulse on nurse palpation.

Finally, to investigate the performance of the practice nurse who had no specialised cardiology, A&E or electrocardiography experience, we examined two-step strategies in the subgroup of patients seen by Nurse B for pulse palpation plus GP interpretation of electrocardiographs (Table 1). Although the numbers were small, sensitivity was lower than for Nurse A; however, there was 100% specificity.

Discussion

The aim of our patient selection process was to ensure a study group that contained a mixture of patients with gold standard atrial fibrillation and patients without atrial fibrillation. Non-response to invitation was unlikely to represent a bias in this study for two reasons. First, all attending patients had a 12-lead ECG interpreted by a consultant cardiologist and this was used as a gold standard to separate the patients into ‘cases’ of atrial fibrillation.
rillation and ‘controls’. Secondly, the nurse had no prior knowledge of the patients or the proportion of atrial fibrillation cases within the study population. However, when considering the broader applicability of the results of this study to actual screening programmes in primary care, the issue of participation rates among the elderly population would need to be taken into account in judging its overall usefulness.

The high sensitivity of pulse palpation by nurse screening of older patients for atrial fibrillation confirms the picture from an earlier study. In that study the disadvantage was high false positive rates. In our study, carrying out 12-lead electrocardiography in all pulse-positive patients with interpretation by the GP would improve specificity but increase the average time and cost per patient tested. However, this is still clearly more efficient than screening all patients with 12-lead electrocardiography in the first place. Furthermore, the 12-lead electrocardiograph is also then available for use in the clinical management of the confirmed case.

Other two-step strategies also appear to be efficient in terms of low costs and high detection rates. In particular, although the two-step strategy with bipolar GP readings had lower sensitivity than the two-step strategy with 12-lead readings, the difference was based on only one misclassified case. It is important not to rule out this option on the basis of one result, especially since bipolar readings are clearly quicker to obtain than 12-leads. However, any patient with atrial fibrillation will need a 12-lead ECG for assessment anyway. We can thus compare two strategies: the two-step strategy with 12-lead GP readings of all pulse positives versus a three-step approach, in which nurse palpation is followed by bipolar readings in the pulse positives and 12-lead ECG assessment of the bipolar positives. The sensitivity would be 96% (25/26) and specificity would be 98% (59/60). This approach would take on average 239 seconds to complete and cost 61 pence per person based on a population screening programme. The time and cost is similar to the two-step strategy involving GP 12-lead electrocardiographs. Furthermore, there is inconvenience in adding an additional step to the screening process. Thus, potential loss of sensitivity and inconvenience suggests that the two-step strategy, involving GP 12-lead electrocardiographs, would still be the preferred approach to use.

The full results refer to a practice nurse with A&E training and experience in electrocardiography. A nurse with cardiology experience, using and interpreting bipolar ECGs, is an effective alternative. However, in most practices, nursing expertise may be closer to that of Nurse B. In this regard, it is promising that the performance of the two-step strategy involving palpation by Nurse B and 12-lead ECG readings by the GP was close to that of the more experienced nurse.

Our conclusion is that practice nurse pulse palpation plus 12-lead ECG reading by a GP is an efficient means of screening older patients for atrial fibrillation. The potential of screening using pulse palpation and bipolar readings taken and read by a trained nurse should, however, be more extensively explored.

References

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