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Screening for atrial fibrillation in general practice: A national, cross-sectional study of an innovative technology☆

Gerard Bury [a,*], Davina Swan [a], Walter Cullen [b], David Keane [a], Helen Tobin [a], Mairead Egan [a], David Fitzmaurice [c], Crea Carberry [a], Cecily Kelleher [a]

[a] University College Dublin, Ireland
[b] University of Limerick, Ireland
[c] University of Birmingham, UK

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ABSTRACT

Background: To test the use of three lead monitoring as a screening tool for atrial fibrillation (AF) in general practice. AF is responsible for up to a quarter of all strokes and is often asymptomatic until a stroke occurs.
Methods: 26 randomly selected general practices identified 80 randomly selected patients aged 70 or older from their database and excluded those known to have AF, those with clinical issues or who had not attended for three years. Up to 40 eligible patients/practice were invited to attend for screening. A 2 min three-lead ECG was recorded and collected centrally for expert cardiology assessment. Risk factor data was gathered.
Outcomes: (i) point prevalence of AF, (ii) proportion of ECG tracings which were adequate for interpretation, (iii) uptake rate by patients and (iv) acceptability of the screening process to patients and staff (reported separately).
Results: Of 1447 current patients, 1003 were eligible for inclusion, 639 (64%) agreed to take part in screening and 566 (56%) completed screening. The point prevalence rate for AF was 10.3%–2.1% new cases (12 of 566 who were screened) and 9.5% existing cases (137 of 1447 eligible patients). Only four of 570 (0.7%) screening visits did not record a usable ECG and 11 (2.6%) three lead ECGs required a clarifying 12 lead ECG.
Conclusions: Three lead screening for AF is feasible, effective and offers an alternative to pulse taking or 12 lead ECGs. The availability of this technology may facilitate more effective screening, leading to reduced stroke incidence.

1. Introduction

Atrial fibrillation (AF) is a common arrhythmia in elderly patients. Its prevalence doubles every decade after 50 years of age, from 0.5% at age 50–59 years to almost 9% of people aged 80–89 years [1]. AF creates a five-fold risk of ischaemic stroke [2]. The stroke risk associated with AF also increases steeply with advancing age and with the presence of common co-morbidities such as hypertension and diabetes. AF is responsible for 25% of ischaemic strokes and AF-associated strokes are more likely to be recurrent, severe and fatal than strokes due to other causes [3,4].

Anticoagulation of AF patients can reduce stroke risk by approximately 60% [5]. However, AF is often asymptomatic and may be paroxysmal, making its detection challenging. AF is usually detected opportunistically; one recent study has reported a rate of newly detected AF of 30% among 1368 patients with risk factors for stroke, not known to have AF, who had continuous cardiac monitoring for extended periods [6]. A further continuous monitoring study of patients who had suffered a stroke or transient ischaemic attack (TIA) showed that 95% of AF detected was paroxysmal and 86% of episodes lasted for less than 1 h [7]. Given the significant stroke related burden of 'silent AF', the need for introduction of new methods of monitoring has been highlighted [8]. As undiagnosed and perhaps asymptomatic, elderly patients often visit their GP for common co-morbidities; GPs have a unique opportunity to actively seek patients with AF [9].

Strategies to detect such cases include a range of opportunistic and systematic screening models and various clinical techniques ranging from simple pulse checks to 12 lead ECG with expert interpretation. The most effective method of identifying unsuspected AF remains unclear [10].

The 2007 SAFE study showed that structured AF screening of elderly patients in general practice improved detection compared to routine care [11]. SAFE further compared opportunistic pulse taking with systematic 12-lead ECG screening and found both screening strategies equally effective at detecting AF. SAFE concluded that opportunistic pulse taking remains the best available screening technique, mainly because of the practical difficulties in carrying out 12 lead ECGs in general practice. However, a pulse check used to screen for AF has a low specificity (70–81%), and for every five 12-lead ECGs subsequently

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* Corresponding author.

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conducted to confirm diagnosis, only one case will have AF [12,13]. By contrast, ECGs using less than 12 leads, e.g. bipolar ECGs, have been found to have a high sensitivity and high specificity for AF screening, when interpreted by someone with appropriate expertise [13]. GPs' expertise in interpreting ECGs can vary greatly, however [14].

Novel technologies are under examination to address the challenges of screening for AF in the community, including the use of iPhone ECG devices by pharmacists and general practice nurses and receptionists in studies which demonstrate potential benefits to these approaches [15–17]. In this study we explore the use of a novel technology in a screening initiative in a general practice setting, using three-lead monitoring.

Three-lead ECG monitoring is available as an adjunct to many Advisory External Defibrillators (AEDs) including the model introduced to Irish general practices through the MERIT project (Medical Emergency Responders: Integration and Training) [18]. Since 2005 MERIT has been equipping and training Irish GPs to manage cardiac arrest in the community. Ireland has a well developed general practice system, with approximately 2600 GPs working at around 2000 sites around the country. Approximately a quarter of Irish general practices are members of the MERIT scheme, which provides a standard Laerdal/Phillips FR2 + AED to each of the 497 participating practices. The FR2 + AED has a 3-lead ECG monitor as an integral component. The monitor generates a lead II rhythm strip, visible on the FR2 + screen during ECG recording; interpretative software is not included. The ECG tracing may subsequently be electronically downloaded from a data card in the FR2 + for more detailed review. This technology has never been systematically used for the purpose of AF screening. While 12-lead ECGs are time-consuming (10–15 min) and require some privacy to conduct, the 3-lead ECG is quick and easy to use and does not require the patient to undress. It may thus be more acceptable to GPs and patients than 12-lead ECG screening. Our study aims to test the feasibility and acceptability of this technology to screen older patients for AF in general practice.

2. Methods

This was a multi-centred study, among computerised general practices in Ireland, of the feasibility and acceptability of FR2 + units to screen for atrial fibrillation among approximately 1000 patients aged 70 years or older, who were not known to have had atrial fibrillation at any time.

Patients aged 70 years and over were selected because of higher risk and because all in this age group became entitled to free primary care services in Ireland in 2004. Although eligibility changed slightly in 2010, the vast majority of people aged 70 or older are registered with general practices for free primary care. Excellent and easily accessible databases therefore exist on this population in computerised general practices.

Each of the 467 MERIT practices was sent an information leaflet in Jan 2011 and an invitation to participate, if computerised. An expression of interest form was returned by 166 eligible practices. We randomly selected 25 practices for participation and an additional 15 reserve practices to replace any practice which declined to participate or withdrew from the study.

Within each practice, we obtained a list of all patients aged 70 years and over. From this we identified a random sample of 80 patients for the practice to review for study eligibility until they attained a quota of 40 eligible patients. Several practices had large numbers of deceased and past patients on their register and needed longer lists of randomly selected patients to identify 40 eligible patients. Two practices had less than 80 patients within this age group and so had all of these patients selected. Random selection of patients for each practice was achieved with computer generated random numbers (www.randomizer.org) to access entries in lists of patients.

Each practice reviewed their list of randomly selected patients and the patients' medical charts, sequentially until they identified 40 eligible patients. Patients were eligible if they had attended at least once in the past three years. Patients were not eligible if they ever had atrial fibrillation or atrial flutter or if they had a terminal illness or cognitive impairment which might impact on informed consent. Practices could also exclude patients where they considered participation inadvisable because of other significant clinical problems. Once practices had completed the selection process, they reported to the research team the number of patients excluded and the reason for each exclusion. Three practices identified less than 40 eligible patients for the study.

2.1. Intervention

Training of practice staff covered recording an ECG using the FR2 + ECG monitoring leads and uploading ECG recordings to a PC using a card reader with Review Express Connect (REC) software and Cutepdf writer.

A pack of materials was provided to practices, including: Ambu electrodes (R-00-S/25), a Lindy card-reader (Lindy USB 2.0 Multi-Card Reader Pro/Lindy USB Card Reader 6-in-1/Lindy USB 2.0 Card Reader 23-in-1), REC software, a study manual, stationery and Irish Heart Foundation patient information booklets on AF. The researchers kept in contact with practices for the duration of the study to provide technical and other support.

Practices wrote to selected patients inviting them to participate in 3-lead ECG screening for atrial fibrillation. A study information leaflet was included with a consent form to be completed and returned in a pre-paid envelope to the practice; patients were asked to consent to anonymised use of medical record data and to take part in a three-lead screening exercise by their general practitioner. Non-respondents received a written or a telephone reminder from the practice.

Practices could screen patients when they attended the surgery for other purposes and/or could arrange appointments with patients specifically for screening. Each practice organised the various aspects of the screening process (i.e., recording, uploading and analysing ECGs) among their staff.

Patients had their ECG recorded for 2 min. For convenience the monitoring leads could be placed in standard positions on the patient's trunk or limbs. If placed on the trunk, an electrode was positioned below the left and the right clavicles, and on the left hip. If placed on the limbs, an electrode was positioned on the left and the right wrists, or backs of each hand, and on the left ankle.

The ECG tracing on the data card in the FR2 + was uploaded to a PC. ECGs were emailed, or occasionally printed and posted, to the research team and analysed by the study cardiologist for the presence of AF and other arrhythmias. Results were posted to GPs. We rang practices to confirm receipt of all abnormal results.

Practices returned ECG results to patients. Participating GPs were responsible for patients' subsequent clinical care.

2.2. Main outcome measures

Our main outcome measures were: (i) the point prevalence rate of atrial fibrillation, (ii) the proportion of ECG tracings which were adequate for interpretation, (iii) the uptake rate by patients, and (iv) the acceptability of the screening process to patients and staff.

We recorded the following baseline data for each patient from their medical record: demography, lifestyle, known risk factors for and complications of AF, other health conditions, prescribed medicines and therapeutic interventions. A GP or practice nurse within each practice assisted researchers with data extraction.

At patients' screening visit, the GP or practice nurse recorded the patient's self-reported current risk factors for AF, health status and current smoking and alcohol use.

GPs took responsibility for immediate analysis of patients' ECGs and completed a form noting if AF and/or other arrhythmias were present. Forms were returned to the research team and were not seen by the study cardiologist.

Acceptability surveys were carried out among staff and patients and are reported separately.

We analysed the point prevalence rate of AF on an intention to treat basis. For continuous variables, the median and interquartile range were reported, and Mann and Whitney U tests were used. Two-tailed tests were applied. For categorical variables, chi square tests were used. A probability value of <0.05 was regarded as significant. SPSS (PASW) version 20 was used to analyse the data.

The study was approved by the Research Ethics Committee of the Irish College of General Practitioners and funded by the Health Research Board, Ireland. The authors have no competing interests.

3. Results

3.1. Participant flow

3.1.1. Practices

Of 25 practices initially invited to take part, seven did not complete the study. One practice immediately declined to participate, two withdrew after the training session, and four proved unresponsive prior to patient recruitment. Eight additional reserve practices were recruited; of 33 randomly selected practices invited to participate, 26 (79%) completed the study.

Almost half (n = 12; 46%) of the 26 practices which completed the study served an urban patient population, one-fifth (n = 5; 19%) served a rural patient population, and one-third (n = 9; 35%) categorised themselves as serving a mixed population. One-fifth (n = 5; 19%) of practices consisted of single-handed GPs. Just one practice did not have a practice nurse.

3.1.2. Patients

Fig. 1 describes the flow of participants in the study. In all, 2200 patients aged 70 years and over were randomly selected from the 26 practice registers and reviewed by practices for study eligibility. Practices excluded 754 patients who were not current patients and an additional