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Quality improvement in action

Screening for atrial fibrillation in patients aged 65 years or over attending annual flu vaccination clinics at a single general practice

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ABSTRACT

Background Atrial fibrillation (AF) is a common, treatable cause of stroke. Screening is recommended at influenza vaccination ('flu') clinics, but not implemented nationally.

Objectives We aimed to determine if screening for AF by pulse assessment of those aged $\geq$ 65 years attending flu vaccination was effective, practical and feasible. The success of screening was determined by discovery of undiagnosed cases, estimating the prevalence of undiagnosed AF, assessing the accuracy of a second-year General Practice Specialty Trainee (GPST2) and interpretative software at diagnosing AF on electrocardiography (ECG), completion without disrupting routine practice, estimating cost-effectiveness and guiding future screening.

Design Patients $\geq$ 65 years old attending flu clinics were screened. Patients with an irregular pulse had an ECG, with interpretation by the GPST2, interpretative automated software and a reporting service.

Results A total of 573 patients were screened, identifying 95 patients with an irregular pulse: 21 had prior AF, 5 were < 65 years old and 1 had a myocardial infarction (MI) during follow up; 68 were invited for ECG, of whom 39 attended; 2 new cases of AF were diagnosed. Pre-screening AF prevalence was 12.2% in those aged $\geq$ 75 years, and 12.4% after screening. A new case was discovered for every 286 patients screened. Sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) were 100% for the GPST2 and interpretative software for ECG diagnosis of AF versus cardiology assessment. Identifying a new case cost approximately £234. Limitations included low uptake of ECG appointments, and delayed and low completion of ECGs, leading to missed AF diagnoses.

Conclusions Screening was ineffective. ECG immediately after pulse assessment is essential. Screening was acceptable to patients but required additional resources. Age groups 65–74 and $\geq$ 85 years were not adequately screened using flu clinics. Novel methods screening older, non-attending patients are required. Practices should introduce annual pulse checks into chronic disease templates and prompts for those aged $\geq$ 65 years attending surgery. Additional screening should target practices with low AF prevalence or poor rates of opportunistic screening.

Keywords: atrial fibrillation, flu vaccination clinics, general practice, primary care, screening

How this fits in with quality in primary care

What do we know?
Atrial fibrillation (AF) is a common treatable cause of stroke with a prevalence of around 2% and rising. Consequences include a fivefold risk of stroke, cognitive dysfunction, left ventricular dysfunction, increased hospitalisations, reduced quality of life and a doubled death rate. Half of those who could benefit from treatment for AF are not receiving it. The National Institute for Health and Clinical Excellence (NICE) does not advocate systematic screening. Opportunistic screening by pulse assessment and electrocardiography (ECG) clarifying irregularities is supported by the Royal College of Physicians Edinburgh, the British Heart Foundation and the European Society for Cardiology.

What does this paper add?
Screening at flu clinics was practical, feasible and acceptable to patients, allowing screening of 33% of the target population. ECG immediately after pulse assessment is essential to ensure patient attendance and so that paroxysmal AF is not missed. Screening was ineffective at this practice because those aged 65–74 and $\geq$ 85 years were not adequately screened using flu clinics, and those attending were regular attendees already well screened opportunistically. Practices should include annual pulse checks in chronic disease templates and prompts to palpate pulses of those aged $\geq$ 65 years attending surgery, and use automated blood pressure devices that highlight pulse abnormalities.

Introduction

Atrial fibrillation (AF) confers a fivefold risk of stroke.[1] Anticoagulation reduces stroke risk by 68%,[2] making diagnosis worthwhile. However, estimates suggest half of those who could benefit from treatment are not receiving it[1] due to failure in diagnosis of asymptomatic patients and initiating treatment. Action is essential given the projected increase in strokes secondary to AF with ageing[3] and increasingly obese populations.[4]

The Royal College of Physicians Edinburgh suggest opportunistic screening of those aged $\geq$ 65 years by pulse check, and 12-lead electrocardiography (ECG) for those with pulse irregularity,[5] whilst the British Heart Foundation[6] and NHS Improvement[7] advocate pulse screening at influenza vaccination (flu) clinics. The SAFE study (a large multicentre randomised controlled trial comparing targeted and total population screening versus routine practice for the detection of AF in patients $\geq$ 65 years old by pulse assessment at 50 primary care centres across the West Midlands) concluded that screening was more effective at detecting new cases of AF than routine care, opportunistic and systematic screening being equivalent, and systematic screening being more expensive.[8]

Moorlands Medical Centre (MMC) used electronic blood pressure (BP) devices that did not identify pulse irregularities,[9] and the practice computer template did not prompt pulse palpation. This raised concerns regarding the effectiveness of opportunistic screening.

Subsequent analysis of MMC's practice records revealed an AF prevalence of 1.7% (Table 1), whilst the Quality Outcomes Framework (QOF) visit from 2009 reported an AF prevalence of 2.1% (A Foster, personal communication, September 2011). The reduced prevalence given an ageing population warranted investigation.

The SAFE study revealed similar AF prevalence in most age and gender categories (Table 1) compared with the MMC data. Noticeable differences existed amongst men and women aged 65–74 years, with prevalence of 6.9 and 4.1%,[8] as opposed to 4.77 and 2.24%, respectively. The SAFE study's assertion supporting opportunistic screening depends on high rates of pulse assessment (70% of eligible patients were screened opportunistically). Was this level of opportunistic pulse palpation missing at MMC?

Systematic screening increases AF detection by 60%.[6] More systematic 'opportunistic' screening of patients attending flu clinics has been conducted as pilots and local enhanced services (LES).[10] Reports concluded that this was an efficient method to screen opportunistically, with minimal disruption to surgery practice and effective use of resources and time.[11,12] The largest scheme allowed ECG evaluation of irregular pulses immediately or later at the practice's discretion.[11]

This study assessed whether screening for atrial fibrillation without additional funding amongst those aged $\geq$ 65 years attending flu clinics was effective, practical and feasible. Satisfied by discovering undiagnosed cases, estimating the undiagnosed AF burden, assessing the accuracy of a second-year General Practice Specialty Trainee (GPST2) and interpretative software at diagnosing AF on ECG, completion without disrupting routine practice, estimating cost-effectiveness and guiding future practice screening activities for AF.

Table 1 Practice database search for known cases of AF (September 2011)

	Age group (years)							
	0–34	35–44	45–54	55–64	65–74	75–84	85–89	$\geq$ 90
Males with known AF	0	3	2	8	21	34	10	3
Total, males	1578	646	614	618	440	233	56	25
Females with known AF	0	0	1	0	10	29	16	9
Total, females	1583	611	629	584	446	317	120	77
AF prevalence, males	0	0.46	0.32	1.29	4.77	14.59	17.86	12
AF prevalence, females	0	0	0.16	0	2.24	9.15	13.33	11.69
AF prevalence, males + females	0	0.29	0.24	0.67	3.5	11.45	14.78	11.76
Overall AF prevalence, males	1.92							
Overall AF prevalence, females	1.49							
Total AF prevalence	1.7							
AF prevalence $\geq$ 65 years	7.7							
AF prevalence $\geq$ 75 years	12.2							

Methods

MMC has 8500 patients, and provide primary medical care in Leek, UK. Screening was approved by the partners and patients' participation group. Ethical approval was deemed unnecessary. Pulses were assessed by a GPST2 and a medical student. Administrative staff recalled patients for ECGs conducted by a nurse.

Patient selection

Patients aged $\geq$ 65 years attending flu clinics during 2011 were offered pulse assessment post flu vaccination. Patients' screening suitability (sole inclusion criterion age $\geq$ 65 years, exclusion criterion age $\leq$ 64 years) was assessed by the GPST2 and medical student before they left the surgery post vaccination. The purpose of screening was explained, verbal consent obtained and refusals noted. Past medical history was not known or sought. Patients with pulse abnormalities were informed that they required an ECG and would receive an appointment by post. An information leaflet was offered outlining pulse assessment, AF and the need for subsequent ECG. Patients failing to attend ECG appointments were phoned and/or sent another letter.

Pulse screening

Radial pulse was assessed for $\geq$ 30 seconds, and regularity rather than rate was determined. Patients were categorised according to pulse as normal or abnormal. Simple irregular and regular categorisation offers better sensitivity, but correspondingly lower specificity than looking for irregularly irregular pulses (sensitivity 91% and specificity 74%, as opposed to 54 and 98%, respectively).[13]

ECG

ECGs were conducted over four months by a practice nurse. A Biolog 3000 was used for all ECGs, except five when the machine broke; the second machine was a CardiofaxQ. The interpretative software used was CardioView® (software version 5.0.0.110, QRS Diagnostics, 2009).

Interpretation of ECGs

ECGs were interpreted by the GPST2, who was blind to the interpretative software report, but aware that the indication was pulse irregularity. Subsequently, all ECGs were faxed to Broomwell HealthWatch TeleMedical Monitoring Services where they were interpreted by a cardiac physiologist or nurse specialist with peer review by a cardiologist (taken as reference standard). They were not blinded to the software report, but were aware of the indication and blinded to the GPST2's interpretation.

Patients identified with new AF after ECG (primary end point) were reviewed by practice doctors.

Results

Practice records analysis

Analysis of MMC practice records revealed 1714 registered patients aged $\geq$ 65 years (Table 1). A total of 797 patients attended flu clinics during 2011. Of these, 573 were assessed as eligible for screening, being aged $\geq$ 65 years and consenting (none refused; the remaining 224 patients excluded were aged $\leq$ 64 years). Subsequently, 573 patients had a pulse assessment, correspondingly screening 33% of the practice list aged $\geq$ 65 years.

Pulse assessment, yield and prevalence estimates

A total of 573 patients were assessed, of whom 95 had an irregular pulse, and from these 2 new cases of AF were diagnosed. Of the 95 patients with irregular pulses, 21 were excluded after medical records revealed prior diagnosis of AF, 5 were excluded as analysis of records revealed they were aged < 65 years (all had ECGs conducted, none revealed AF); another was excluded after admission to hospital with a myocardial infarction (MI; his ECG in hospital did not show AF). Subsequently, 68 ECG invitations were sent. Thirty-nine patients attended over four months after a second set of reminders with appointments were sent out. In total, 57% of the patients identified as having an irregular pulse attended for an ECG.

Two ECGs were rejected by the cardiologist due to their quality. Five were excluded as the ECGs were done on a different machine, with different interpretative software, and the cardiologists found the printouts illegible when faxed. Therefore 32 ECGs were interpreted fully, revealing 2 new cases of AF (Figure 1).

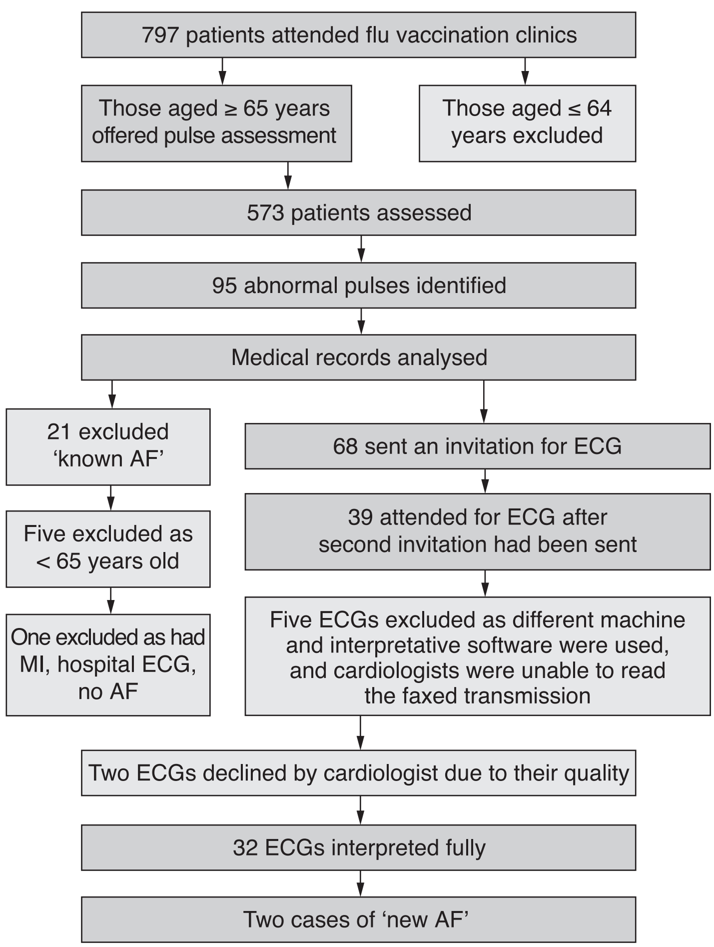

Figure 1 Flowchart of screening process.

The seven rejected ECGs were reviewed by the GPST2 and a partner. Neither saw evidence of AF.

Of the MMC screened population of patients with irregular pulses, 25.5% had AF (by subsequent records analysis or ECG). Both 'new AF' cases were aged ≥ 75 years. CHA_2DS_2-VASc[14] scores were 3 and 7, conferring an annual stroke risk of 3.2 and 9.6%, respectively. Both patients were counselled by practice clinicians regarding stroke risk and advising oral anticoagulation, but both chose aspirin.

The yield of patients with AF was 4%. The yield with 'new AF' was 0.35% (Box 1).

ECG interpretation

The GPST2 identified all cases of AF on ECG as did the interpretative software. No cases were mistakenly diagnosed as AF, correspondingly sensitivity, specificity, PPV and NPV was 100% for both GPST2 and interpretative software for ECG interpretation regarding diagnosing of AF compared with cardiology opinion.

Age stratification of patients having ECGs

Time constraints prevented the collection of age data for all patients screened, and only those having ECGs were categorised (Table 2).

Cardiologist rhythm analysis

In total, 36% (14/39) of ECGs confirmed potentially irregularly irregular rhythms. Two showed AF; the others showed ectopic beats.

Discussion

Discovery of undiagnosed cases

Two 'new AF' cases were identified, a new case being discovered for every 286 patients screened. We assessed 573 patients, and 95 had abnormal pulses (16.6%). Thirty-nine of the 95 patients had an ECG (57%), 23 had AF (24.2%), and two were new cases (8.7%). In comparison, the SAFE study assessed 3278

Box 1 Atrial fibrillation yield: proportion and false positive rate calculations

- Yield of patients with AF was 4% (21 + 2/568 × 100).
- Yield of patients found to have 'new AF' was 0.35% (2/568 × 100).
- Proportion of patients with irregular pulses proven to have AF was 25.5% (23/{95 – 5 'the patients aged < 65 years inappropriately screened' = 90} × 100).
- False-positive rate in MMC screening was 74% (90 – 23/95 × 100).

Table 2 AF status and numbers in age cohorts who had ECGs

	Age groups (years)			
	65–74	75–84	85–89	≥ 90
Males with known AF	21	34	10	3
Total males	440	233	56	25
Females with known AF	10	29	16	9
Total females	446	317	120	77
AF prevalence males + females (%)	3.5	11.45	14.78	11.76
Had ECG males + females	18	18	3	0
Had ECG, females	8	8	1	0
Had ECG, males	10	10	2	0
% of total (females + males) who had ECG	2	3.3	1.7	0

patients in their opportunistic arm, 361 patients had abnormal pulses (11%), 238 had an ECG (65.9%), 84 had AF (35.3%), and 31 were 'new' AF diagnoses (36.9%). One new case was discovered for every 106 patients screened.[8] Clearly, opportunistic screening seems more efficient. Did this reflect the fact that MMC patients were already well screened opportunistically, that we conducted the screening badly, or both?

In the SAFE study, 61.8% of pulses were taken by GPs and 27.8% by practice nurses. In our screening, 58.8% of pulses were taken by the medical student and 41.2% by the GPST2. The MMC assessors' inexperience may account for more abnormal pulses being identified (16.6 vs. 11%) and less AF discovered (24.2 vs. 35.3%). The former is more likely; sensitivity is less likely to be lost than specificity (supported by the number of MMC ECGs showing ectopics).

The SAFE study reported a false-negative rate of 2% and a false-positive rate of 70% for pulse assessment.[8] The false-positive rate in MMC screening was 74% (Box 1), comparing favourably. Accepting satisfactory screening quality, this suggests that the MMC provided a good opportunistic service in comparison with other practices, supported by the baseline prevalence of AF in those $\geq$ 65 years being 7.7% as opposed to 6.9% in the SAFE study.[8] Consequently, the majority presenting with AF on palpation of a radial pulse had been diagnosed previously (21 of 23). However, this reinforces the fear that patients who do not attend the practice are not being screened effectively for AF and we were re-sampling a previously screened population (only 2 of 23 pulses confirmed to have AF were new cases of AF).

Estimated practice prevalence

Assuming a representative sample and robust screening process, the MMC potentially has another four undiagnosed cases of AF (Box 2). However, the sample appeared skewed, with the largest proportion coming from the 75–84 years group (3.3%), with those aged 65–74, 85–89 and $\geq$ 90 years poorly represented (Table 2). When considering the increasing prevalence of AF with age (Table 1), coupled with the previously noted lower recorded prevalence in the 65–74-year-old category at the MMC, and the missed diagnoses due to delay in conducting an ECG (for paroxysmal AF) or non-attendance for ECG, four additional patients seems a conservative estimate.

The SAFE study's AF prevalence amongst those aged 65–75 years was 4.6%, and amongst those aged $\geq$ 75 years was 10.3%.[8] Pre-screening data at the MMC revealed a prevalence of 3.5% in those aged 65–75 years, and 12.2% in those aged $\geq$ 75 years, rising to 12.4% after screening. Screening would be more fruitful amongst those $\geq$ 75 years old.

Concerns regarding patient selection

Those patients aged $\geq$ 85 years may be poorly represented because frailty or transport difficulties made attending surgery difficult. A similar pattern was observed in the SAFE study, with 61% and 60% of men and women aged < 75 years attending screening; for those aged $\geq$ 75 years attendance fell to 50% and 39%, respectively.[8] MMC practice nurses visit older patients to give flu vaccines; subsequently, these patients do not attend flu clinics. The 65–74-year-old group's poor attendance may represent poor uptake of the vaccine, or that flu vaccines are given opportunistically to patients attending routine appointments, or at work, local chemists or supermarkets. Given that the sample had only 39 patients, the reliability of these assertions is uncertain. Interestingly, concern regarding the applicability of screening to actual primary care populations due to poor participation rates among the elderly has been raised previously.[15] The MMC experience suggests that those most at risk of AF-related stroke (older patients who do not attend regularly, therefore missing opportunistic pulse screening) are least likely to undergo screening at flu clinics.

Box 2 Estimates of undiagnosed AF cases in the MMC population

1714 'registered patients' aged $\geq$ 65 years/100 $\times$ 0.35 (yield of new AF) = 6.
Uptake of ECG appointments (57%). Two new cases of AF were identified, therefore another two could be expected in the sample; additionally up to a third of AF diagnoses may have been missed as they were paroxysmal. Subsequently, if ECGs were conducted immediately after pulse palpation we may have identified six new cases of AF.
Taking a yield of 1.05% (6/568 $\times$ 100).
1714 'registered patients' aged $\geq$65 years'/100 x 1.05 = 17
Therefore there could be as many as 15 (17 – 2 already identified) potentially undiagnosed cases of AF in the MMC population.
This corresponds to a number needed to screen to identify a new case of AF of 95 (573/6) rather than 286 (573/2).

Accuracy of ECG interpretation

Interpretation of ECGs at MMC was accurate compared with interpretation by cardiologists (taken as reference standard). However, with only two cases of AF and a small sample (32 fully interpreted ECGs) it is difficult to be confident in the validity of the accuracy of the GPST2 and interpretative software. In addition, the cardiologist was not blinded to the interpretative software report, and this introduces possible bias.

Learning points for future screening

As noted by prior studies, the low specificity of pulse assessment made ECG confirmation of diagnosis an essential, but time- and resource-consuming, aspect of screening.[8,13] No patient refused pulse assessment, evidencing the acceptability and convenience of screening at flu clinics. However, uptake of the ECG appointment was poor (57%), even after additional appointments were offered. Because of non-attendance, the last ECG was not conducted until four months after the pulse check. The poor uptake of ECGs and delay in conducting ECGs are the main limitations of this study. This offers clear learning points. First, reinforcing to patients the value of interventions to prevent stroke more clearly might have increased ECG uptake. Second, the MMC compares poorly with previous trials which had higher ECG uptake rates of 73.3[13] and 74%.[16] However, in these, ECGs were done on the same day as the pulse assessment. This could not be provided without additional finances at the MMC, or without disrupting the flu clinic and routine clinical appointments. A similar exercise involving invitation for ECGs achieved a comparable response rate (56%).[15]

Fitzmaurice *et al* noted that a third of AF in populations aged > 65 years is either self-limiting or paroxysmal.[17] Clearly, ECGs must be conducted immediately after pulse assessment to increase ECG uptake and identify paroxysmal AF (which carries the same stroke risk as permanent AF).[18] Additional funding is required to provide the capacity to conduct large numbers of ECGs in a short period, which is a necessity for screening at flu clinics.

Completing ECGs immediately after pulse palpation during screening at MMC could have identified four further new cases of AF, giving a number needed to screen to identify a new case of AF of 95 rather than 286, and providing a yield of new AF cases identified by screening of 1% rather than 0.35% (see Box 2).

Resource use and cost-effectiveness

The exercise required four afternoons assessing pulses (incurring no direct costs), 13 hours of nursing time conducting ECGs, costs incurred (and potential revenue lost from alternative remunerated work) due to wasted appointments subsequent to non-attendance, ECG interpretation and cardiology review (no additional cost, cardiology reporting was a pilot service), and disposables (letters, postage, ECG) provided by the practice and clinic costs (not charged).

Identifying a new case of AF cost approximately £234 (see Box 3); in comparison an LES reported a cost of £372.[11] However, as neither patient was anticoagulated, the investment was futile. The patients were counselled appropriately and made their decisions. The cost to prevent a stroke in year one assuming anticoagulation was approximately £9911 (see Box 4), again comparing favourably with published LES values of £11 594 to £17 534.[11]

The SAFE study estimated that the minimum worthwhile change in detection rate for screening versus routine practice was 1%.[8] Routine practice at MMC identified an AF prevalence of 3.7% in the screened sample $\geq$ 65 years. Post screening, the prevalence rose to 4%. Clearly screening for AF at MMC flu clinics should not be repeated.

Should other practices screen at flu clinics?

Yields of new AF depend on the disparity between the true and known prevalence of AF in the population sampled. Practices with a low prevalence should review screening practices and improve opportunistic provision (aiming for 70% annual screening) before screening at flu clinics. Screening populations at flu clinics that have already been well screened opportunistically wastes resources and reduces the cost-effectiveness of screening.

Indiscriminately screening large populations (including various practice subpopulations with a variable undiagnosed burden of AF) may identify significant numbers of new patients with AF, making the exercise appear cost-effective. However, patients may be screened

Box 3 Screening costs

ECG in primary care costs $\sim$ £34 per ECG; this includes nurses' time to conduct ECG (£12)[23].
MMC screening costs 39 (number of ECGs conducted) $\times$ 12 (nurses' time to conduct ECG) = £468. The cost to identify a new case of AF was £234. Interpretation took approximately 1 minute and was done as part of routine care; the practice already has ECG machines which are maintained for routine use, and consumable costs are minimal.

Box 4 Cost-effectiveness of screening

Two new patients diagnosed with AF had annual stroke risks of 3.2 and 9.6%.
Overall annual average stroke risk $(3.2 + 9.6)/2 = 6.4\%$.
Cost to identify 100 such patients = cost to identify new AF × 100 patients:
£234 × 100 = £23 400.
Cost to treat 100 such patients with warfarin = 100 × £383[24] = £38 300.
Cost to find and treat 100 such patients:
£23 400 + £38 300 = £61 700.
Costs of complications of anticoagulation not accounted for.
Assumes all patients are anticoagulated (unlikely).
Direct health cost per stroke in first year = £11 900[24].
Increasing annual risk reduction not accounted for (patient's stroke risk with AF increases with age); other costs associated with AF not included.
Therefore costs of stroke in this population = 6.4 × £11 900 = £76,160.
Money saved by potential 68% reduction in strokes = 76 160 × 0.68 = £51 788.80
Therefore in the first year preventing one stroke costs £61 700 – £51 788.80 = £9911.20.

Box 5 High-risk groups for AF-related stroke

Annual AF-related stroke risk increases from 1.5% for those aged < 65 years with no risk factors, to 4% if aged < 75 with risk factors, and 6.5% for those aged > 75 with risk factors.[25] The impact of AF on stroke risk increases dramatically with age, those aged 80 to 89 years with AF have an annual stroke risk of 23.5%.[3]
Risk factors: ageing, hypertension, symptomatic heart failure, tachycardiomyopathy, valvular heart disease, cardiomyopathy, atrial septal defects, congenital defects, coronary artery disease, thyroid dysfunction, obesity, diabetes, COPD, sleep apnoea and chronic renal disease.[18]

unnecessarily (if already screened opportunistically), and screening low-risk subpopulations (given lower prevalence) will identify fewer cases, with lower individual stroke risks, leading to poorer cost-effectiveness. Targeting screening to practices with lower diagnosed prevalence or lower rates of opportunistic screening, whilst investigating the value of targeted screening of patients with medical conditions commonly coexistent with AF, causing or perpetuating AF, or representing global cardiovascular risk factors, seems prudent. This may increase screening yield, and improve cost-effectiveness of screening and treatment by greater risk reduction with treatment for high-risk patients (Box 5).

The prevalence and incidence of AF increase dramatically with age. Annual opportunistic assessment for AF as endorsed by the SAFE study[8] may be appropriate for younger patients, but more frequent assessment may be prudent as patients age and develop comorbidities increasing stroke risk.[3,14,19]

Conclusion

The MMC experience highlights the challenge of identifying people with asymptomatic AF and initiating treatment, thereby preventing strokes. Two new cases of AF eligible for anticoagulation were identified, but neither patient consented to anticoagulation. Ongoing education for professionals and patients is warranted, highlighting the clear benefits of identifying and treating AF with oral anticoagulation rather than aspirin.[18]

Patients aged 65–74 and ≥ 85 years were not effectively screened by routine practice or screening at flu clinics, posing ongoing challenges regarding screening these groups. Screening at flu clinics was acceptable to patients and feasible, but conducting ECGs immediately after pulse palpation is essential.

Screening targeted according to practice demographics and lower than expected AF prevalence may offer better cost-effectiveness than indiscriminately screening at all flu clinics. Practices should insert pulse checks into chronic disease templates and prompts for patients aged ≥ 65 years who attend the surgery.

Our experience and the literature suggest that clinical commissioning groups should encourage practices to reach 70% annual opportunistic screening rates amongst those aged ≥ 65 years,[8] before employing alternative, resource-demanding screening strategies such as flu clinics for practices with lower than expected diagnosed AF prevalence.

Novel fingertip devices[20] and newer blood pressure devices[21,22] offer encouraging alternative screening strategies that generate significantly fewer false positives when identifying people with potential AF compared with palpation of the pulse (thereby requiring fewer confirmatory ECGs).

The impact of hypertension, coronary heart disease and cardiac failure on the risk of stroke weakens with age. AF is the exception, where risk increases from 1.5% for those aged 50–59 years to 23.5% for those aged 80–89 years.[3] The elderly are most vulnerable, and screening reliant on attendance at surgeries is likely to be ineffective, regardless of whether this is part of routine care or an enhanced service. Screening must target those most vulnerable to developing AF, and the most vulnerable are less likely to attend the surgery; therefore screening should take place wherever they are. Further research assessing the validity of concentrating efforts on those aged $\geq$ 75 years is warranted, as well as consideration of how to access high-risk but poorly attending age cohorts.

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REFERENCES

1 Department of Health. *Progress in Improving Stroke Care*. National Audit Office, 29 January 2010. www.nao.org.uk/publications/0910/stroke.aspx
2 Sacco RL, Benjamin EJ, Broderick JP *et al*. Public health burden of stroke. *Stroke* 1997;28:1507–17. stroke.ahajournals.org/content/28/7/1507.full
3 Wolf PA, Abbott RD, Kannel WB. Atrial fibrillation as an independent risk factor for stroke: the Framingham Study. *Stroke* 1991;22:983–8.
4 Miyasaka Y, Barnes ME, Gersh BJ *et al*. Secular trends in incidence of atrial fibrillation in Olmsted County, Minnesota, 1980 to 2000, and implications on the projections of future prevalence. *Circulation* 2006;114:119–25.
5 Christie B. People over 65 should be screened for atrial fibrillation throughout the UK, say stroke specialists. *BMJ* 2012;344:e1644.
6 British Heart Foundation. Policy statement, Atrial fibrillation, 9 November 2010. Original source now unavailable: Atrial fibrillation update. www.heart.nhs.uk
7 NHS Improvement, Heart and Stroke Improvement. *Atrial Fibrillation in Primary Care: making an impact on stroke prevention. National Priority Project Fnal Summaries*. Leicester: NHS Improvement, October 2009, p. 10.
8 Hobbs FDR, Fitzmaurice DA, Jowett S *et al*. A randomised controlled trial and cost-effectiveness study of systematic screening (targeted and total population screening) versus routine practice for the detection of atrial fibrillation in people aged 65 and over. The SAFE study. *Health Technology Assessment* 2005;9(40).
9 McManus RJ, Mant J, Hull MR, Hobbs FD. Does changing from mercury to electronic blood pressure measurement influence recorder blood pressure? An observational study. *British Journal of General Practice* 2003;53(497):953–6.
10 NHS Stroke Improvement Programme. AF QIPP business case. Atrial fibrillation – detection and optimal therapy in primary care. www.improvement.nhs.uk/heart/HeartImprovementHome/AtrialFibrillation/AtrialFibrillationResources/tabid/136/Default.aspx
11 Gordon S, Hickman M, Pentney V. Screening for asymptomatic atrial fibrillation at seasonal influenza vaccination. *Primary Care Cardiovascular Journal* 2012; 5:161–4.
12 NHS Improvement, Heart and Stroke Improvement. *Atrial Fibrillation in Primary Care: making an impact on stroke prevention. National Priority Project Final Summaries.* Leicester: NHS Improvement, October 2009.
13 Morgan S, Mant D. Randomised trial of two approaches to screening for atrial fibrillation in UK general practice. *British Journal of General Practice* 2002;52(478):373–4, 377–80.
14 Lip GY, Nieuwlaat R, Pisters R *et al*. Refining clinical risk stratification for predicting stroke and thromboembolism in atrial fibrillation using a novel risk factor-based approach: the Euro heart survey on atrial fibrillation. *Chest* 2010;137:263–72.
15 Somerville S, Somerville J, Croft P, Lewis M. Atrial fibrillation: a comparison of methods to identify cases in general practice. *British Journal of General Practice* 2000;50(458):727–9.
16 Sudlow M, Rodgers H, Kenny RA, Thompson R. Identification of patients with atrial fibrillation in general practice: a study of screening methods. *BMJ* 1998; 317:327–8.
17 Fitzmaurice DA, Hobbs FDR, Jowett SM *et al*. Screening versus routine practice in the detection of atrial fibrillation in patients aged 65 or over: cluster randomised control trial. *BMJ online*, 29 June 2007. www.bmj.com/content/335/7616/383
18 Camm AJ, Kirchhoff P, Lip GYH *et al*. Guidelines for the management of atrial fibrillation. The Task Force for the Management of Atrial Fibrillation of the European Society of Cardiology (ESC). *European Heart Journal* 2010;31:2369–429.
19 Heeringa J, Van der Kuip DAM, Hofman A *et al*. Prevalence, incidence and lifetime risk of atrial fibrillation: the Rotterdam Study. *European Heart Journal* 2006;27:949–53.
20 Lewis M, Parker D, Weston C, Bowes M. Screening for atrial fibrillation: sensitivity and specificity of a new methodology. *British Journal of General Practice* 2011; 61:38–9.
21 Marazzi G, Iellamo F, Volterrani M *et al*. Comparison of Microlife BP A200 Plus and Omron M6 blood pressure monitors to detect atrial fibrillation in hypertensive patients. *Advances in Therapy* 2012;29(1):64–70.
22 National Institute for Health and Clinical Excellence. *MTG13. WatchBP Home A for opportunistically detecting*

atrial fibrillation during diagnosis and monitoring of hypertension. January 2013. www.nice.org.uk/MTG13

23 York Health Economics Consortium. *A Cost Calculating Tool for Different Methods of Carrying Out ECGs in the UK*. October 2011. www.ntac.nhs.uk/web/FILES/ECG-Telemedicine/ECG_Telemedicine_In_Primary_Care_Final_v2_-_20122011.pdf

24 NHS Improvement, Heart and Stroke Improvement. *Atrial Fibrillation in Primary Care: making an impact on stroke prevention. National Priority Project Final Summaries 2009*. Leicester: NHS Improvement.

25 National Institute for Health and Clinical Excellence. Atrial fibrillation: the management of atrial fibrillation. Costing report. Implementing NICE guidance in England. *NICE Clinical Guideline* 2006;36:23.

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ETHICAL APPROVAL

The MMC approved the initial audit and screening exercise. No formal ethical approval was deemed necessary.

PEER REVIEW

Not commissioned; externally peer reviewed.

CONFLICTS OF INTEREST

None.

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