**Should we screen for atrial fibrillation?**

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**Yes—Mark Lown**

Atrial fibrillation (AF) is detected in around a third of all patients with ischaemic stroke, Data from stroke registries show that in these patients unknown, untreated, or undertreated AF is responsible for most of the strokes, which are often fatal or debilitating.1 AF screening has been the subject of much recent debate by international collaborations of experts and in the UK parliament because of the increasing prevalence of AF (the number of patients in the UK is predicted to rise from 700 000 in 2010 to between 1.3 and 1.8 million by 20602) and the potential to prevent AF related strokes with appropriate anticoagulation.

Although data from randomised controlled trials are lacking, cohort studies indicate that screen detected AF is not a benign condition and, in the presence of additional risk factors, warrants consideration of anticoagulation. In a cohort study of 5555 asymptomatic patients with incidentally detected AF, anticoagulation therapy (n=2492) compared with no antithrombotic therapy (n=1460) was associated with significantly reduced adjusted risk of stroke from 4% to 1%, and risk of death from 7% to 4% in just 1.5 years.3 This suggests that screen detected AF responds to treatment similarly to that detected during routine care.

An effective and economical screening programme could minimise the potential for harm in terms of inappropriate treatment (anticoagulation leading to an increased risk of major bleeding) and unnecessary investigations; maximising the diagnostic yield of AF that carries significant risk; and maximising the uptake of appropriate anticoagulation treatment in people with newly detected cases.

**Accurate detection**

Single lead electrocardiographic (ECG) devices are inexpensive, non-invasive, reusable, and convenient, and they have been shown to be cost effective for AF screening.4 Automated AF detection algorithms have been shown to have high sensitivity and specificity (>95%) for detecting AF, which can greatly reduce workload.5 Trained clinicians can confirm AF diagnoses from single lead ECGs with high accuracy and further reduce the risk of treatment of people with false positive results, which is the main risk associated with screening. Since single lead ECGs are not routinely used to detect previous infarctions or hypertrophy, their use would reduce the detection rate of “incidentalomas” compared with 12 lead ECGs.

As a substantial proportion of AF is paroxysmal early in the disease course, intermittent screening together with repeated screening every few years could reduce the risk of false negative cases. There is likely to be an optimal screening duration and frequency for detecting paroxysmal AF, which is clinically important in at risk populations—for example, people older than 65. In the KP-rhythm cohort study, patients in the highest tertile of AF burden were three times as likely to have a thromboembolism than those in the two lower tertiles while not taking anticoagulants, after adjustment for CHA2DS2-VASc score.6

Advances in wearable technology and algorithms, including machine learning techniques, are likely to yield inexpensive and practical options to determine AF burden and help stratify stroke risk.7 Indeed, “screening” for AF will become part of many people’s daily lives because of technology such as the latest Apple watch.

**Acceptability**

Crucially, the Strokestop screening study (7173 participants) showed that screening for AF twice daily, over 14 days, is well accepted (only 1% of participants recorded fewer than 15 single lead ECGs over two weeks); it detected new AF in 3% of the screened population, and more than 90% of those accepted anticoagulation treatment.7 In the UK, national database data showed that the use of oral anticoagulants in people with AF with a CHA2DS2-VASc score ≥2 increased from 48% in 2006 to 78.6% in 2016. (Suboptimal treatment was one of the key points raised by the UK National Screening Committee when it recommended against screening in 2014.) The increase in anticoagulation treatment from 2009 is estimated to have prevented over 75 AF related strokes resulting in hospital admission a week in England.8

Comprehensive patient centred informed consent can ensure patients are made aware of benefits and harms of screening, including false reassurance. There is also the potential to manage reversible bleeding risk factors at scheduled reviews.

The prevalence of AF is rising steeply and is associated with increased risk of heart failure, myocardial infarction, and death, and treatment with anticoagulation is associated with reduction in all these outcomes relative to placebo. Evidence is also growing that AF is associated with cognitive decline and dementia,9 and if the mechanism is vascular anticoagulation could mitigate the risk.

Current evidence provides a strong case for introducing AF screening now. The outcomes of large randomised trials of screening, such as that proposed by Mant and colleagues,10 would strengthen the evidence base. The UK screening committee is due to review its recommendations in the near future.

**No—Patrick Moran**

The case for making screening a central pillar of efforts to tackle the looming epidemic of atrial fibrillation is promising, but important gaps in the evidence base for this intervention remain. These include questions about the effect of screening on stroke outcomes; the optimal combination of screening test, screening strategy, and target population; and the opportunity cost of implementing population based programmes. The growing international momentum behind AF screening should be harnessed to ensure that these important gaps in knowledge are filled, rather than being overlooked as a result of an understandable eagerness to take action on a major challenge facing health systems globally.11

AF seems to meet many of the criteria for disease screening developed by Wilson and Junger.12 It is an important health problem that can be diagnosed using a readily available test, and proved treatments exist to reduce the risk of AF related stroke. However, although experimental and observational evidence indicates that screening increases AF detection, we have no evidence from randomised controlled trials that screening reduces the incidence or severity of stroke in screened versus unscreened populations.13-15

**Risk profile assumptions**

In an era when the scale of overdiagnosis and overtreatment in modern medicine is becoming increasingly clear, any assumption that greater AF detection equates to improved health outcomes requires serious critical scrutiny.16 Such an assumption implies that the risk profile of screen detected patients—and by extension their propensity to use, benefit from, and be harmed by, anticoagulant treatment—is the same as those presenting clinically.

Potential harms of AF screening include the negative consequences of being labelled with a serious health problem, the risk of bleeding from anticoagulation treatment, and the opportunity cost of the health benefits that would be forgone by choosing to allocate scarce resources to implementing this intervention. Central to estimating the scale of these harms is knowing the risk of stroke in untreated AF, and as recent research shows, there is considerable uncertainty surrounding this, even in clinically diagnosed patients.17 Given how little we currently know about the clinical risk profile of the cohort that would be identified through screening, we cannot be sure that improvements in stroke outcomes would sufficiently outweigh any harms to justify prioritising screening at the expense of other interventions. Although the balance of benefits and harms has been explored using simulation models that combine the best available evidence from multiple sources, the external validity of these types of studies is low.18 19

Fortunately, clinical trials that seek to definitively answer these important questions are already under way, and we must wait for their results rather than push ahead with implementing a costly public health intervention that may prove difficult to withdraw if these studies do not show significant benefits of screening.20 21

**Screening strategy unclear**

From a policy perspective, there is considerable ambiguity about how screening would be scaled up and implemented in practice, given the high level of heterogeneity in the target population, screening test, and screening strategy used in previous studies. For example, the three trials that showed increased AF detection rates included different populations, different tests, and different ECG readers.22-24 The available evidence does not, therefore, present decision makers with a uniformly defined solution that can be transposed into policy.

Furthermore, the rapid pace of development in ECG diagnostics—including the use of smartphone apps, wearable devices, and automated ECG interpretation—has the potential to diminish the applicability of previous research carried out using older technology.

All screening studies to date have used one-off testing within a given population, so the effect of successive screening rounds on the detection of incident or paroxysmal disease is also unknown. The only available data on the comparative effectiveness and cost effectiveness of different start ages and screening frequencies, which is of crucial importance for the design of a screening programme, come from simulation modelling studies.18 19 25

Coordinated, concerted efforts are required to combat the steep rise in AF associated with worldwide population ageing.11 However, in the absence of research that reliably confirms the health benefits of screening and provides sufficient information to guide successful implementation there remains considerable uncertainty about the potential for screening to reduce the burden of AF related morbidity and mortality in society.

Competing interests: Both authors have read and understood BMJ policy on declaration of interests and ML declares that he is a collaborator on the upcoming trial to investigate screening for atrial fibrillation led by Professor Mant and colleagues.

**References**

1 Freedman B, Potpara TS, Lip GY. Stroke prevention in atrial fibrillation. Lancet 2016;388:806-17. 10.1016/S0140-6736(16)31257-0 27560276

2 Lane DA, Skjøth F, Lip GYH, Larsen TB, Kotecha D. Temporal trends in incidence, prevalence, and mortality of atrial fibrillation in primary care. J Am Heart Assoc 2017;6:e005155. 10.1161/JAHA.116.005155 28455344

3 Freedman B, Camm J, Calkins H, etal . AF-Screen Collaborators. Screening for atrial fibrillation: a report of the AF-SCREEN International Collaboration. Circulation 2017;135:1851-67. 10.1161/CIRCULATIONAHA.116.026693 28483832

4 Health Information and Quality Authority. Health technology assessment (HTA) of a national screening programme for atrial fibrillation in primary care, 2015. 2015. https:// [www.hiqa.ie/sites/default/files/2017-02/HTA-of-Screening-for-Atrial-Fibrillation.pdf](http://www.hiqa.ie/sites/default/files/2017-02/HTA-of-Screening-for-Atrial-Fibrillation.pdf)

5 Lown M, Yue AM, Shah BN, etal . Screening for atrial fibrillation using economical and accurate technology (from the SAFETY Study). Am J Cardiol 2018;122:1339-44. 10.1016/j.amjcard.2018.07.003 30131106

6 Go AS, Reynolds K, Yang J, etal . Association of burden of atrial fibrillation with risk of ischemic stroke in adults with paroxysmal atrial fibrillation: the KP-RHYTHM Study. JAMA Cardiol 2018;3:601-8. 10.1001/jamacardio.2018.1176 29799942

7 Svennberg E, Engdah lJ, Al-Khalili F, Friberg L, Frykman V, Rosenqvist M. Mass screening for untreated atrial fibrillation: the STROKESTOP Study. Circulation 2015;131:2176-84. 10.1161/CIRCULATIONAHA.114.014343 25910800

8 Cowan JC, Wu J, Hall M, Orlowski A, West RM, Gale CP. 10 year study of hospitalized atrial fibrillation-related stroke in England and its association with uptake of oral anticoagulation. Eur Heart J 2018;39:2975-83. 10.1093/eurheartj/ehy411 29982405

9 Singh-Manoux A, Fayosse A, Sabia S, etal . Atrial fibrillation as a risk factor for cognitive decline and dementia. Eur Heart J 2017;38:2612-8. 10.1093/eurheartj/ehx208 28460139

10 Nuffield Department of Primary Care Health Sciences. Upcoming trial involving 120 000 patients to investigate screening for atrial fibrillation. 16 May 2018. https://www.phc.ox. ac.uk/news/new-research-to-investigate-whether-screening-can-prevent-one-in-ten-strokes.

11 Morillo CA, Banerjee A, Perel P, Wood D, Jouven X. Atrial fibrillation: the current epidemic. J Geriatr Cardiol 2017;14:195-203.28592963

12 Wilson JMG, Jungner G. Principles and practice of screening for disease. World Health Organization Public Health Papers, No 34. 1968.

13 Jonas DE, Kahwati LC, YunJ DY, Middleton JC, Coker-Schwimmer M, Asher GN. Screening for atrial fibrillation with electrocardiography: evidence report and systematic review for the US Preventive Services Task Force. JAMA 2018;320:485-98. 10.1001/jama.2018.4190 30088015

14 Mairesse GH, Moran P, Van Gelder IC, etal. ESC Scientific Document Group. Screening for atrial fibrillation: a European Heart Rhythm Association (EHRA) consensus document endorsed by the Heart Rhythm Society (HRS), Asia Pacific Heart Rhythm Society (APHRS), and Sociedad Latinoamericana de Estimulación Cardíaca y Electrofisiología (SOLAECE). Europace 2017;19:1589-623. 10.1093/europace/eux177 29048522

15 Moran PS, Teljeur C, Ryan M, Smith SM. Systematic screening for the detection of atrial fibrillation. Cochrane Database Syst Rev 2016;6:CD009586.27258214

16 Treadwell J, McCartney M. Overdiagnosis and overtreatment: generalists—it’s time for a grassroots revolution. Br J Gen Pract 2016;66:116-7. 10.3399/bjgp16X683881 26917633

17 Quinn GR, Severdija ON, Chang Y, Singer DE. Wide variation in reported rates of stroke across cohorts of patients with atrial fibrillation. Circulation 2017;135:208-19. 10.1161/CIRCULATIONAHA.116.024057 27799272

18 Moran PS, Teljeur C, Harrington P, etal . Cost-effectiveness of a national opportunistic screening program for atrial fibrillation in Ireland. Value Health 2016;19:985-95. 10.1016/j.jval.2016.07.007 27987649

19 Welton NJ, McAleenan A, Thom HH, etal . Screening strategies for atrial fibrillation: a systematic review and cost-effectiveness analysis. Health Technol Assess 2017;21:1-236. 10.3310/hta21290 28629510

20 Friberg L, Engdahl J, Frykman V, Svennberg E, LevinL-Å, Rosenqvist M. Population screening of 75- and 76-year-old men and women for silent atrial fibrillation (STROKESTOP). Europace 2013;15:135-40. 10.1093/europace/eus217 22791299

21 National Institute for Health Research. NIHR awards £3m for new research to investigate screening to prevent one in ten strokes. Press release, 16 May 2018. www.nihr.ac.uk/ news/nihr-awards-3m-for-new-research-to-investigate-screening-to-prevent-one-in-tenstrokes/8491

22 Hobbs FD, Fitzmaurice DA, Mant J, 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 Technol Assess 2005;9:iii-iv, ix-x, 1-74. 10.3310/hta9400 16202350

23 Svennberg E, Engdahl J, Al-Khalili F, Friberg L, Frykman V, Rosenqvist M. Mass screening for untreated atrial fibrillation: the STROKESTOP Study. Circulation 2015;131:2176-84. 10.1161/CIRCULATIONAHA.114.014343 25910800

24 Steinhubl SR, Waalen J, Edwards AM, etal . Effect of a home-based wearable continuous ECG monitoring patch on detection of undiagnosed atrial fibrillation: the mstops randomized clinical trial. JAMA 2018;320:146-55. 10.1001/jama.2018.8102 29998336

25 Aronsson M, Svennberg E, Rosenqvist M, etal . Designing an optimal screening program for unknown atrial fibrillation: a cost-effectiveness analysis. Europace 2017;19:1650-6. 10.1093/europace/eux002 28340009