Screening for Atrial Fibrillation
A Report of the AF-SCREEN International Collaboration

ABSTRACT: Approximately 10% of ischemic strokes are associated with atrial fibrillation (AF) first diagnosed at the time of stroke. Detecting asymptomatic AF would provide an opportunity to prevent these strokes by instituting appropriate anticoagulation. The AF-SCREEN international collaboration was formed in September 2015 to promote discussion and research about AF screening as a strategy to reduce stroke and death and to provide advocacy for implementation of country-specific AF screening programs. During 2016, 60 expert members of AF-SCREEN, including physicians, nurses, allied health professionals, health economists, and patient advocates, were invited to prepare sections of a draft document. In August 2016, 51 members met in Rome to discuss the draft document and consider the key points arising from it using a Delphi process. These key points emphasize that screen-detected AF found at a single timepoint or by intermittent ECG recordings over 2 weeks is not a benign condition and, with additional stroke factors, carries sufficient risk of stroke to justify consideration of anticoagulation. With regard to the methods of mass screening, handheld ECG devices have the advantage of providing a verifiable ECG trace that guidelines require for AF diagnosis and would therefore be preferred as screening tools. Certain patient groups, such as those with recent embolic stroke of uncertain source (ESUS), require more intensive monitoring for AF. Settings for screening include various venues in both the community and the clinic, but they must be linked to a pathway for appropriate diagnosis and management for screening to be effective. It is recognized that health resources vary widely between countries and health systems, so the setting for AF screening should be both country- and health system-specific. Based on current knowledge, this white paper provides a strong case for AF screening now while recognizing that large randomized outcomes studies would be helpful to strengthen the evidence base.
**AF-SCREEN: ESTABLISHMENT AND GOALS**

AF-SCREEN international collaboration was founded in September 2015 and includes >100 physicians (cardiologists, electrophysiologists, primary care physicians, stroke neurologists, and geriatricians), nurses, allied health professionals, epidemiologists, health economists, and patient group representatives from 31 countries. The collaboration seeks to promote discussion and research about screening for unknown or undertreated AF to reduce stroke and death and to provide advocacy for implementation of country-specific AF screening programs (www.afscreen.org).

Although many patients with AF develop symptoms leading to appropriate diagnosis and management, the first manifestation may be a debilitating stroke or death. Finding AF before symptoms are manifested could lead to initiation of appropriate effective therapy, including oral anticoagulants (OACs) to reduce stroke and death1 and potentially initiation of risk-factor modifications to reduce complications from AF progression.

The past decade has witnessed a surge in the number and sophistication of diagnostic tools, ranging from inexpensive devices that detect persistent or paroxysmal AF to devices capable of long-term continuous characterization of brief, asymptomatic AF. Those participating in the AF-SCREEN collaboration recognize a unique and timely opportunity to reexamine the approaches and rationale for AF diagnosis at an early asymptomatic stage. This prompted the development of a white paper on screening for AF, developed from a consensus meeting of AF-SCREEN members held in Rome in August 2016. Full details of the genesis of the white paper and the Delphi process used are provided in the appendix in the online-only Data Supplement.

Incidence of Screen-Detected AF and Cardiac Implanted Electronic Device (CIED)-Detected Atrial High-Rate Episodes

Many terms have been used to describe screen-detected AF, including unrecognized, undiagnosed, silent, subclinical AF, and cardiac implanted electronic device (CIED)-detected atrial high-rate episodes. In this article, we will refer to AF detected on single-timepoint screening or patient-activated ECG recorders as screen-detected AF, whereas brief transient AF detected by CIEDs with atrial monitoring capability are referred to as CIED-detected atrial high-rate episodes. CIED-detected atrial high-rate episodes could be caused by oversensing or other atrial tachyarrhythmias and need close inspection of the stored electrograms before labeling them AF. CIEDs are not implanted to screen for AF, and CIED-detected atrial high-rate episodes are not included in our definition of screen-detected AF and should not be grouped with screen-detected AF. A full discussion of CIED-detected atrial high-rate episodes has been included in this white paper principally to enhance our understanding of the significance of screen-detected AF and its relationship with stroke.

The incidence of screen-detected AF strongly depends on the population screened and duration/intensity of screening.2 Single-timepoint screening of a general population ≥65 years of age detects undiagnosed AF in 1.4%,2 and the AF detected is largely persistent. In a large population-based study of individuals 75 to 76 years of age, a more intense 2-week screening program using twice-daily intermittent handheld ECG recordings identified AF in 3.0% (0.5% on the initial ECG3). The identical protocol restricted to those with ≥1 additional stroke risk factor identified 7.4% with AF.5

The incidence of atrial high-rate episodes in patients with CIEDs ranges from 30% to 60% depending on the population and the detection algorithm used.6-15 In 2580 patients with a history of hypertension and no prior AF history, CIED-detected atrial high-rate episodes ≥6 minutes were found in 35% of patients with implanted devices over a mean follow-up of 2.5 years and doubled the risk of stroke.11 Silent AF is more frequent than symptomatic AF in patients with a pacemaker or during external continuous rhythm monitoring.16 Because patients with CIEDs have a medical condition that may affect the occurrence of atrial high-rate episodes, other studies (ASSERT-II [Subclinical AF in older asymptomatic patients] NCT01694394, REVEAL-AF [Incidence of AF in high risk patients] NCT01727297, GRAF [Graz study on the Risk of Atrial Fibrillation] NCT01461434, Danish Loop study NCT02036450) using subcutaneous long-term continuous monitoring in people at risk of AF may provide a more reliable estimate of AF in non-CIED populations and elucidate its clinical significance. The initial report of the ASSERT-II study showed that brief episodes of subclinical AF are common among individuals ≥65 years of age who have stroke risk factors and evidence of left atrial enlargement. Among 256 patients with an average left atrial volume of 76.5 mL receiving an implantable cardiac loop recorder, the rate of subclinical AF detection for episodes lasting ≥5 minutes was 34% per year.17 The studies reporting incidence of CIED-detected atrial high-rate episodes8,10-15,18,19 have been summarized in Table 1.

Risk of Stroke and Death in Untreated Screen-Detected AF

No data specifically address the risk of stroke and death in untreated screen-detected AF in the general population. The closest approximation includes cohort studies of individuals with AF detected incidentally in the absence of symptoms. One study20 showed that individuals who were asymptomatic at presentation were 3 times as likely to have had an ischemic stroke before AF diagnosis, and in follow-up they had similar risk of stroke and death as those with symptomatic AF. In a later study from this group, 161 out of 476 individuals with new AF were asymptomatic at presentation, and these people...
Table 1. Incidence of Cardiac Implanted Electronic Device–Detected Atrial High-Rate Episodes in the Population With Cardiac-Implanted Devices

<table>
<thead>
<tr>
<th>Year</th>
<th>Trial</th>
<th>Device Indication</th>
<th>Clinical Profile of Patients</th>
<th>Mean Age</th>
<th>% Male</th>
<th>% LVEF</th>
<th>Mean CHADS₂ Follow-Up</th>
<th>AF Burden Threshold</th>
<th>Incidence of AF</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002</td>
<td>Gillis et al.⁸</td>
<td>PPMs for sinus node disease</td>
<td>All</td>
<td>70±12</td>
<td>52%</td>
<td>NA</td>
<td>718±383 days</td>
<td>&gt;1 min</td>
<td>157/231 (68%)</td>
</tr>
<tr>
<td>2003</td>
<td>Ancillary MOST¹⁰</td>
<td>PPMs for sinus node disease</td>
<td>All</td>
<td>Median 73 (68,81) for no AHRE</td>
<td>45%</td>
<td>NA</td>
<td>Median 27 mo</td>
<td>&gt;5 min</td>
<td>156/312 (50%)</td>
</tr>
<tr>
<td>2010</td>
<td>TRENDS¹²</td>
<td>PPMs and ICDs</td>
<td>History of prior stroke</td>
<td>72.8±9.9 for no AHRE</td>
<td>63% for no AHRE</td>
<td>NA</td>
<td>4.1±0.8 for no AHRE</td>
<td>Mean 1.4 y</td>
<td>45/163 (28%)</td>
</tr>
<tr>
<td>2010</td>
<td>TRENDS¹²</td>
<td>PPMs and ICDs</td>
<td>All indications</td>
<td>70.2±11.8</td>
<td>66%</td>
<td>NA</td>
<td>≥2 in 70%</td>
<td>&gt;5 min</td>
<td>416/1368 (30%)</td>
</tr>
<tr>
<td>2012</td>
<td>ASSERT¹¹</td>
<td>PPMs and ICDs</td>
<td>History of hypertension</td>
<td>76±7 for no AHRE</td>
<td>59% for no AHRE</td>
<td>NA</td>
<td>2.3±1.0 for no AHRE</td>
<td>&gt;6 min</td>
<td>895/2580 (34.7%)</td>
</tr>
<tr>
<td>2012</td>
<td>Home monitor CRT²⁴</td>
<td>CRTDs and CRTPs</td>
<td>Congestive heart failure</td>
<td>66±10</td>
<td>77%</td>
<td>25 (20–30)</td>
<td>≥2 in 64%</td>
<td>370 days (253–290)</td>
<td>≥14 min</td>
</tr>
<tr>
<td>2013</td>
<td>Healey et al.¹²</td>
<td>PPMs</td>
<td>All indications</td>
<td>71.7±14.4 for no AHRE</td>
<td>59% for no AHRE</td>
<td>NA</td>
<td>2.0±1.30 for no AHRE</td>
<td>Single center Retrospective</td>
<td>&gt;5 min</td>
</tr>
<tr>
<td>2015</td>
<td>IMPACT¹⁵</td>
<td>ICDs and CRTDs</td>
<td>No permanent AF</td>
<td>64.2±11.5 for control</td>
<td>73% for control</td>
<td>29.4±11.3 for control</td>
<td>&gt;4–12 sec</td>
<td>945/2718 (34.8%)</td>
<td></td>
</tr>
<tr>
<td>2016</td>
<td>RATE Registry¹⁶</td>
<td>PPMs and ICDs</td>
<td>All</td>
<td>73.6±11.8 for PPMs, 64.5±12.6 for ICDs</td>
<td>54% in PPM 72% in ICDs</td>
<td>57.8±10.5 for PPM 29.2±11.3 for ICDs</td>
<td>22.9 mo (median)</td>
<td>&gt;3 atrial premature complexes</td>
<td>145/300 (48%) of PPM patients 155/300 (52%) of ICD patients of the representative samples studied</td>
</tr>
</tbody>
</table>

AF indicates atrial fibrillation; AHRE, atrial high-rate episode; ASSERT, Asymptomatic Atrial Fibrillation and Stroke Evaluation in Pacemaker Patients and the Atrial Fibrillation Reduction Atrial Pacing Trial; CRT, cardiac resynchronization therapy; CRTD, cardiac resynchronization therapy defibrillator; CRTP, cardiac resynchronization therapy pacemaker; ICD, implanted cardioverter defibrillator; IMPACT, the IMPACT of BIOTRONIK Home Monitoring Guided Anticoagulation on Stroke Risk in Patients With ICD and CRT-D Devices; MOST, Mode Selection Trial; NA, not applicable; PPM, permanent pacemaker; RATE, Registry of Atrial Tachycardia and atrial fibrillation Episodes; and TRENDS, A Prospective Study of the Clinical Significance of Atrial Arrhythmias Detected by Implanted Device Diagnostics.
had an increased risk for cardiovascular (hazard ratio [HR], 3.12; 95% confidence interval [CI], 1.50–6.45) and all-cause mortality (HR, 2.96; 95% CI, 1.89–4.64) compared to those with typical symptoms after adjustment for CHA2DS2-VASc score and age (Figure 1).21

In 5555 patients with asymptomatic clinical AF detected incidentally in general practice, the adjusted stroke rate in the 1460 untreated patients was 4% and all-cause mortality 7% over 1.5 years of follow-up compared with 1% and 2.5%, respectively, in matched controls without AF.22,23 In the EORP AF registry (Euroobservational Research Programme), mortality at 1 year was >2-fold higher in asymptomatic versus symptomatic AF (9.4% versus 4.2%, \( P <0.0001 \)).24 In the Belgrade AF study, survival free of AF progression or ischemic stroke was worse in those with an asymptomatic presentation.25

The major studies regarding thromboembolic risk of CIED-detected atrial high-rate episodes in patients with implanted pacemakers, defibrillators, and cardiac resynchronization devices all show increased stroke rate with CIED-detected atrial high-rate episodes, but the absolute risk of stroke was much lower than might be expected for patients with clinical AF and similar CHA2DS2-VASc score.6,7,9,11,13,18 A minimum 5-minute duration of atrial high-rate episodes was found to have clinical relevance in the MOST study (Mode Selection Trial).10 Alternative arbitrary or data-derived atrial high-rate episodes burden cut points have been explored over the subsequent 10 years, ranging from 5 minutes to 24 hours.11 Uncertainty remains about the minimum burden that increases thromboembolic risk. A recent reevaluation of the ASSERT study indicated that stroke risk was increased only in patients with atrial high-rate episodes duration ≥24 hours.26 These studies are summarized in Table 2.

Key Point 1
Screen-detected AF as found on single-timepoint screening or intermittent 30-second recordings over 2 weeks is not a benign condition and, with additional stroke risk factors, carries sufficient risk of stroke to justify consideration of screening and therapy to prevent stroke.

Response to Treatment of Screen-Detected AF
Screening for a particular disease implies that an effective therapy improves outcomes. For AF, OACs have a major impact on reducing stroke, systemic embolism, and all-cause mortality.28 The nonvitamin-K antagonist OACs further improve outcomes with less intracranial bleeding.29 It has been questioned whether screen-detected AF should prompt OAC treatment and whether the response to treatment is the same as for symptomatic AF. An undetermined proportion of asymptomatic patients with incidentally detected AF were included in the pivotal anticoagulant studies, but these studies have not been analyzed separately.28 No randomized controlled trials exist, and it may be unethical to randomize patients with screen-detected AF to no therapy or an ineffective drug such as aspirin. The treatment decision for a given individual with screen-detected AF is determined by stroke risk factors (CHA2DS2-VASc score) according to guidelines1,30 and by the duration of the AF episode in the case of CIED-detected atrial high-rate episodes.

In the cohort study of 5555 asymptomatic patients with AF detected incidentally in general practice, OAC therapy (n=2492) compared with no antithrombotic therapy (n=1460) was associated with significantly reduced adjusted risk of stroke from 4% to 1% and death from 7% to 4% in only 1.5 years, suggesting that screen-detected AF may respond similarly.22,23 Ongoing studies, including ARTESIA (Apixaban for the Reduction of Thrombo-Embolism in Patients With Device-Detected Sub-Clinical Atrial Fibrillation; NCT01938248) and NOAH (Non-vitamin K Antagonist Oral Anticoagulants in Patients With Atrial High Rate Episodes; NCT02618577), will help refine the benefit of nonvitamin-K antagonist OACs in CIED-detected atrial high-rate episodes and provide more information on the burden or duration of atrial high-rate episodes that will benefit.

Screen-detected AF (single-timepoint screening or patient-initiated recording) is likely to have the same response to OAC therapy as incidentally detected AF and symptomatic AF, with significant reduction in stroke and death. The absolute level of stroke risk for CIED-detected atrial high-rate episodes may be lower than screen-detected AF and may modify the risk–benefit of OAC therapy. The burden threshold of CIED-detected atrial
Table 2. Summary of Studies Regarding Cardiac Implanted Electronic Device–Detected Atrial High-Rate Episodes and Thromboembolic Risk

<table>
<thead>
<tr>
<th>Trial (Year)</th>
<th>Number of Patients</th>
<th>Duration of Follow-Up</th>
<th>Atrial Rate Cutoff (bpm)</th>
<th>AF Burden Threshold</th>
<th>Hazard Ratio for TE Event</th>
<th>TE Event Rate (Below vs. Above AF Burden Threshold)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ancillary MOST4 (2003)</td>
<td>312</td>
<td>27 mo (median)</td>
<td>&gt;220</td>
<td>5 min</td>
<td>6.7 (P=0.020)</td>
<td>3.2% overall (1.3% vs. 5%)</td>
</tr>
<tr>
<td>Italian AT500 Registry5 (2005)</td>
<td>725</td>
<td>22 mo (median)</td>
<td>&gt;174</td>
<td>24 h</td>
<td>3.1 (P=0.044) (95% CI, 1.1–10.5)</td>
<td>1.2% annual rate</td>
</tr>
<tr>
<td>Botto et al6 (2009)</td>
<td>568</td>
<td>1 y (mean)</td>
<td>&gt;174</td>
<td>CHADS₂+AF burden</td>
<td>n/a</td>
<td>2.5% overall (0.8% vs. 5%)</td>
</tr>
<tr>
<td>TRENDS7 (2009)</td>
<td>2486</td>
<td>1.4 y (mean)</td>
<td>&gt;175</td>
<td>5.5 h</td>
<td>2.2 (95% CI, 0.96–5.05, P=0.06)</td>
<td>1.2% overall (1.1% vs. 2.4%)</td>
</tr>
<tr>
<td>Home Monitor CRT8 (2012)</td>
<td>560</td>
<td>370 days (median)</td>
<td>&gt;180</td>
<td>3.8 h</td>
<td>9.4 (95% CI, 1.8–47, P=0.006)</td>
<td>2.0% overall</td>
</tr>
<tr>
<td>ASSERT9 (2012)</td>
<td>2580</td>
<td>2.5 y (mean)</td>
<td>&gt;190</td>
<td>6 min</td>
<td>2.5 (P=0.007) (95% CI, 1.28–4.85)</td>
<td>(0.69% vs. 1.69%)</td>
</tr>
<tr>
<td>SOS10 (2014)</td>
<td>10016</td>
<td>2 y (median)</td>
<td>&gt;175</td>
<td>1 h</td>
<td>2.11 (P=0.008) (95% CI, 1.22–3.64)</td>
<td>0.39% per year overall</td>
</tr>
<tr>
<td>RATE Registry11 (2016)</td>
<td>5379 (3141 with pacemakers and 2238 with ICDs)</td>
<td>22.9 mo (median)</td>
<td>NA</td>
<td>Nonsustained atrial high-rate episodes with a duration from 3 atrial premature complexes to 15–20 s</td>
<td>0.87 (95% CI, 0.58–1.31, P=0.51)</td>
<td>For nonsustained atrial high-rate episodes: 0.55% (0.34%–0.76%) per year for pacemakers and 0.81% (0.50%–1.12%) per year for ICDs</td>
</tr>
</tbody>
</table>

AF indicates atrial fibrillation; AHRE, atrial high-rate episode; ASSERT, Asymptomatic Atrial Fibrillation and Stroke Evaluation in Pacemaker Patients and the Atrial Fibrillation Reduction Atrial Pacing Trial; bpm, beats per minute; CI, confidence interval; CRT, cardiac resynchronization therapy; ICD, implanted cardioverter defibrillator; MOST, Mode Selection Trial; NA, not applicable; RATE, Registry of Atrial Tachycardia and Atrial Fibrillation Episodes; SOS, stroke prevention strategies; TE, thromboembolic; and TRENDS, A Prospective Study of the Clinical Significance of Atrial Arrhythmias Detected by Implanted Device Diagnostics.

Role of AF in Ischemic Stroke

In stroke registries, at least a third of patients with ischemic stroke have either previously known or newly detected AF at the time of stroke.33 Stroke was the first manifestation of AF in >25% of AF-related strokes.31 The association with AF is even higher if prolonged poststroke external or implanted monitoring is performed.34,35 In the Swedish Riks-Stroke register of 94,000 ischemic strokes, ≈9% were associated with previously unknown AF and 20% with known but undertreated AF,31,32 whereas in a global registry 10% were caused by previously unknown AF.36

Recent evidence from CIEDs raises questions about the temporal and mechanistic relationship between AF and stroke, and whether AF is necessary for left atrial thromboembolism to occur.3,37–39 In several studies, there does not appear to be a proximate temporal relationship between device-detected atrial high-rate episodes and strokes although patients with atrial high-rate episodes are at increased risk for stroke.19,37,38 Only a small minority of patients with CIED-detected atrial high-rate episodes who have a stroke experience arrhythmia in the month before a stroke.9,37 One third had no atrial high-rate episodes during 1 year of rhythm monitoring before their stroke and only manifested atrial high-rate episodes after their stroke.19,37 Furthermore, multiple markers of abnormal atrial substrate have been associated with stroke independently of AF.40 In a small proportion of patients, however, a close proximate relationship exists between a daily atrial high-rate episode burden ≥5.5 hours and stroke, with risk highest in the 5 days before stroke, falling to a nonsignificant increase in risk by 30 days before stroke (Figure 2), pointing to AF being a risk factor in these patients.41 The temporal relationship between CIED-detected atrial high-rate episodes and stroke is summarized in Table 3. A limitation of these studies is the small numbers of strokes and usually lack of adjudication as cardioembolic.

Even short AF episodes can create a prothrombotic state that persists for some time after the episode. Furthermore, atrial cardiomyopathy related to aging or systemic risk factors can lead to AF or atrial thromboembolism. Once AF develops, it impairs atrial function and secondarily leads to atrial remodeling, which in addition...
to flow abnormalities further increases thromboembolic risk.43 Atrial cardiomyopathy as a cause of thromboembolism before AF could explain why a brief period of AF is associated with stroke months later, why many patients manifest AF for the first time after a stroke, and why one third of strokes are currently of unknown cause. Advanced neurocardiac imaging and continuous monitoring may provide further insights into the pathophysiology in future.

Nevertheless, AF remains an important risk marker as well as risk factor for stroke, with well-documented efficacy of OAC for stroke prevention. Anticoagulated patients with AF have residual stroke rates similar to matched individuals without AF, which underlines the efficacy of OACs in prevention of AF-related stroke.23 OACs remain underused in AF patients at risk of stroke: 30% to 50% of eligible patients with AF are not being given OAC, many are mistreated with aspirin monotherapy, and the remainder are not receiving any antithrombotic therapy.31,34,44 It is likely that both unknown and undertreated AF contribute to a substantial proportion of all strokes, which could be prevented by screening strategies. Regarding the role of AF in stroke, it is likely that AF is both a risk factor and a strong risk marker for stroke.

**Which Patients or Individuals to Screen?**

For a screening program to be efficient, the screening technique must have a high positive predictive value using a low-risk tool at low cost. Screening yield depends on disease prevalence and diagnostic test performance. AF increases disproportionally in older adults, rendering age 1 of the best predictors of AF.45 The prevalence of AF ≤50 years of age is negligible in most populations and may not justify screening in this group.45 The prevalence of AF differs by ethnicity; for example, indigenous Australians have a higher burden of AF and higher risk at much younger ages than Europeans.46

If the screening procedure is inexpensive and easy to use (eg, pulse palpation or single-timepoint handheld devices),47,48 screening can be nonselective and just age-based. A threshold ≥65 years of age (a CHA2DS2-VASc score of at least 1 in a male and 2 in a female) will detect undiagnosed AF in 1.4% in clinic or population settings,3 in which case European Society of Cardiology (ESC) guidelines recommend that OAC be considered (Class IIa); OACs are recommended (Class I) for a score of 2 in a male or 3 in a female.30 Opportunistic screening in all patients contacting the health system ≥65 years of age has been adopted in the ESC AF guidelines but might

**Figure 2. Time trend of risk of stroke for AF in 60 days before stroke.**

Odds ratio for nonoverlapping 5-day epochs of AF burden in implanted devices ≥5.5 hours in 1 day during the 5-day epoch, from 1 to 5 days before stroke (left-hand point), through 56 to 60 days before stroke (right-hand point). Each stroke case epoch is matched to six 5-day control epochs between 91 and 120 days before stroke. There is a progressive fall in odds ratio of stroke from 17.4 for AF occurring 1 to 5 days before stroke to nonsignificant increases for AF >21 days before stroke. AF indicates atrial fibrillation. Reprinted from Turakhia et al41 with permission of the American Heart Association, Inc. Copyright © 2015, American Heart Association, Inc.

**Table 3. Temporal Relationship Between Cardiac Implanted Electronic Device–Detected Atrial High-Rate Episodes and Stroke**

<table>
<thead>
<tr>
<th>Year</th>
<th>Trial</th>
<th>Number of Patients With TE Event</th>
<th>Definition of AF Episode</th>
<th>Any AF Detected Before TE Event</th>
<th>AF Detected Only After TE Event</th>
<th>No AF in 30 Days Before TE Event</th>
<th>Any AF in 30 Days Before TE Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>Boriani et al42</td>
<td>33/3438</td>
<td>5 min</td>
<td>21/33 (64%)</td>
<td>NA</td>
<td>12/33 (67%)</td>
<td>11/33 (33%)</td>
</tr>
<tr>
<td>2011</td>
<td>TRENDS9</td>
<td>40/2486</td>
<td>5 min</td>
<td>20/40 (50%)</td>
<td>6/40 (15%)</td>
<td>29/40 (73%)</td>
<td>11/40 (27%)</td>
</tr>
<tr>
<td>2014</td>
<td>ASSERT11,37</td>
<td>51/2580</td>
<td>6 min</td>
<td>18/51 (35%)</td>
<td>8/51 (16%)</td>
<td>47/51 (92%)</td>
<td>4/51 (8%)</td>
</tr>
<tr>
<td>2014</td>
<td>IMPACT19</td>
<td>69/2718</td>
<td>36/48 atrial beats ≥200 beats per minute</td>
<td>20/69 (29%)</td>
<td>9/69 (13%)</td>
<td>65/69 (94%)</td>
<td>4/69 (6%)</td>
</tr>
<tr>
<td>2015</td>
<td>Turakhia et al41</td>
<td>187/9850</td>
<td>≥5.5 h or ≥6 min on any day 120 days previously</td>
<td>36/187 (19%)</td>
<td>≥5.5 h 50/187 (26%)</td>
<td>≥6 min</td>
<td>NA</td>
</tr>
</tbody>
</table>

AF indicates atrial fibrillation; ASSERT, Asymptomatic Atrial Fibrillation and Stroke Evaluation in Pacemaker Patients and the Atrial Fibrillation Reduction Atrial Pacing Trial; IMPACT, the IMPACT of BIOTRONIK Home Monitoring Guided Anticoagulation on Stroke Risk in Patients With ICD and CRT-D Devices; NA, not applicable; TE, thromboembolic; and TRENDS, A Prospective Study of the Clinical Significance of Atrial Arrhythmias Detected by Implanted Device Diagnostics.
be more efficient if an older age threshold is chosen or an additional stroke risk factor is required. Superiority over a simple age-based criterion, however, needs to be proven.

Among individuals 75 years of age in Sweden, a single ECG detected 0.5% to 1% with undiagnosed AF. Adding 2 weeks of twice-daily patient-activated handheld ECG detected an additional 2.5% with undiagnosed AF and 7.4% after enrichment with ≥1 additional stroke risk factors. Even more AF is detected with continuous recording by external or implanted devices (Table 1), but that technology is costly and may only be justified in populations at high risk and with sufficient yield from screening (eg, older age plus additional risk factors or embolic stroke of undetermined source [ESUS]). Adding biomarkers (eg, natriuretic peptides, high-sensitivity troponin) to existing clinical predictors may improve the prediction of AF incidence.50,51 However, there is marginal improvement in model discrimination and reclassification.

**Key Point 2**

Single-timepoint screening of people ≥65 years of age in the clinic or community appears justified based on yield of screening and likely cost-effectiveness. For those >75 years of age or in younger age groups at high risk of AF or stroke, 2 weeks of twice-daily intermittent AF screening may be warranted.

**Ischemic Stroke and ESUS**

Randomized controlled trials and observational studies have established the effectiveness of ECG monitoring after stroke for improving AF detection (number needed to screen=8–14), with longer monitoring durations increasing AF detection probability. ECG monitoring after stroke is likely cost-effective. However, randomized controlled trials have not been powered to assess the effect of prolonged ECG monitoring on stroke or mortality.

After an acute ischemic stroke/transient ischemic attack in patients not known to have AF and without contraindications to OACs, a tiered AF ECG monitoring approach is advised. ESC guidelines recommend ≥72 hours ECG monitoring in all stroke survivors, but more research is required to identify non-ESUS subgroups benefiting most from more prolonged monitoring. Ongoing randomized controlled trials are exploring an alternative strategy of blanket nonvitamin-K antagonist OAC therapy after limited negative Holter monitoring in ESUS (RE-SPECT [Randomized, Double-Blind, Evaluation in Secondary Stroke Prevention Comparing the Efficacy and Safety of the Oral Thrombin Inhibitor Dabigatran Etxilate Versus Acetylsalicylic Acid] ESUS NCT02239120 and NAVIGATE ESUS [Rivaroxaban Versus Aspirin in Secondary Prevention of Stroke and Prevention of Systemic Embolism in Patients with Recent ESUS] NCT02313909).

**Key Point 3**

Long-term continuous rhythm monitoring using either external or implanted devices or extended intermittent patient-activated recordings may diagnose clinically important AF in individuals with recent ESUS.

**Overview of Screening Methods**

Pulse palpation to assess pulse irregularity is a readily accessible method for screening in primary care, shown to be effective as a screening strategy in the SAFE study (Screening for Atrial Fibrillation in the Elderly). It can also be used in the community, in both high- and low-middle-income countries, but has some limitations. In the clinic, it is usually performed by physicians or nurses, whereas in the community, nonphysician health professionals and lay people can be trained to detect pulse irregularity. In routine primary care, the pulse is infrequently assessed. Cardiac auscultation can also detect AF but is even less frequently performed in primary care.

Innovation in technology has produced new screening devices that improve feasibility and cost-effectiveness of widespread screening (Table 4). These devices are recognized as valid for AF detection by the European Primary Care Cardiovascular Society and could be used to complement traditional screening by pulse palpation.

Oscillometric blood pressure monitors with an AF detection function based on pulse irregularity offer high sensitivity (92% to 100%) and specificity (90% to 97%) and are superior to pulse palpation. Similar algorithms are being built into smart-watches and fitness bands. The technology is attractive given the wide distribution of smartphones but requires a noise-free trace for optimal performance. Ultimately, with all pulse-based detection systems, an ECG is required to confirm either the short- (current gold standard) or single-lead documenting P-waves.

A range of handheld devices produce diagnostic quality lead 1 single-lead ECGs, most with automated algorithms more accurate than pulse palpation (sensitivity 94% to 99% and specificity 92% to 97%). These devices have been widely used for single-timepoint AF screening. Repeated handheld ECG recordings over 14 to 28 days have diagnostic accuracy equivalent to standard event recorders, superior to 12-lead ECG and 24-hour Holter for paroxysmal AF and have been used successfully in large-scale AF screening studies. Although single-lead ECGs may not always show P-waves, the advantages outweigh this limitation. The accepted arbitrary episode duration for defining AF is 30 seconds.

Continuous monitoring coupled with a diagnostic algorithm will detect paroxysmal AF more effectively than repeated patient-activated devices, although the prognos-
tic significance of brief episodes is uncertain. Continuous monitoring can be accomplished by noninvasive devices (eg, prolonged Holter monitoring, a wearable nonadhesive dry-electrode belt, or a wearable-patch: feasible for 2 to 4 weeks and superior to 24-hour Holter).

The main disadvantages of prolonged external monitoring are skin irritation from electrodes and patches, leading to reduced patient compliance, and the large amounts of data generated.

All devices with automated AF diagnostic algorithms require low-noise high-quality signals for optimal performance. This may be difficult when devices are given to patients or used in the community. High sensitivity is desirable, but there is a trade-off with lower specificity, which can create much extra work and cost in verifying diagnoses with an ECG (if not recorded by the device). Device performance, therefore, must be tested in the setting where it will be used for screening to optimize performance.

**Key Point 4**

Mass or opportunistic screening for AF can be accomplished by pulse palpation; oscillometric (blood pressure) or photoplethysmographic (smartphone camera) devices; and handheld ECG devices providing a rhythm strip. Because ECG confirmation is mandated by guidelines for the diagnosis of AF, handheld ECG devices have the advantage of providing a verifiable ECG trace and would therefore be the preferred screening tool. Prolonged continuous ECG monitoring with external or subcutaneous recorders will diagnose more paroxysmal AF but requires further evaluation: cost-effectiveness will be limited by expense and detection of AF with lower absolute stroke risk.

### Settings for Screening

Interest in community screening has increased recently in a number of countries. Prospective studies have used pulse palpation, single- or multilead ECG, and single-timepoint or intermittent recordings using systematic or opportunistic approaches across entire populations or age-specific strata of total populations or defined populations in cohort studies. Screening has also been performed opportunistically in volunteers during annual events (eg, Heart Rhythm Week in Belgium). The STROKESTOP study invited half of the 75- to 76-year-olds in 2 Swedish regions to attend screening, and 53% accepted, similar to the rate in the SAFE study. This approach was stepped, with an initial single-lead ECG, followed by twice-daily intermittent patient-activated ECG recordings over a 2-week period in those individuals without AF.

Pharmacies offer an attractive setting for community screening. People ≥65 years of age with chronic con-
ditions in many countries visit their community pharmacy every 1 to 3 months. AF screening with pulse check and smartphone-based ECG in Australian pharmacies was found to be feasible, cost-effective,48 and well accepted.80 The major issue is ensuring referral and then treatment of detected individuals,79 so an established referral pathway is crucial.

Primary care is an ideal setting: In addition to regular primary care physician visits, nursing support for screening is available, and there is a direct link with the practitioner to prescribe OAC. Two challenges remain: (1) developing a sustainable strategy for detecting undiagnosed AF, and (2) providing adequate treatment for patients with known or newly discovered AF because undertreatment is common.81

The SAFE study showed that opportunistic screening with pulse palpation in primary care was as effective as systematic 12-lead ECG screening in detecting undiagnosed AF in patients ≥65 years of age, and more cost-effective.85 Although some guidelines recommend screening using pulse palpation,30 pulse taking is not common practice.82 The new ESC guidelines have added ECG rhythm strip to the recommendation on pulse palpation for opportunistic screening.35 For scalability and sustainability, screening could be linked to existing workflow (eg, cardiovascular risk management programs or influenza vaccination).47,58,83-85

Computerized medical records linked to electronic decision support tools86 could provide prompts for regular screening, calculate stroke risk, and advise guideline-recommended therapy to assist workflow and treatment decisions (eg, AF SMART ACTRN12616000850471). In some countries, large generalist or specialized out-patient clinics provide an alternative setting to primary care for screening87 but may have similar issues with sustainable delivery of the screening intervention and subsequent treatment.

Key Point 5
The setting for AF screening needs to be individualized according to country- and healthcare system-specific requirements and resources and must be linked to a pathway for appropriate diagnosis and management for screening to be effective. Settings that have been used effectively include some that are community-based and others based in primary care, specialist practices, or general or specialist clinics. Primary care and outpatient clinics have the advantage of offering a direct link with treatment and a potentially sustainable workflow (see online-only Data Supplement for country-specific considerations).

Health-Economic Assessments
Economic assessment of AF screening depends on a range of factors, including: (1) rate of undiagnosed AF in the target population, (2) difference in AF detection between the screening intervention and routine practice without screening (3) stroke and mortality risk of the target population, (4) expected reduction in stroke and mortality and increase in bleeding risk from OAC, (5) cost of the screening methodology, and (6) country-specific “willingness-to-pay” thresholds to avoid 1 stroke.

In the first paper on health economic modeling for AF screening,88 both annual ECG screening and pulse palpation with confirmatory ECG were cost-effective in a Japanese population. Later, the SAFE study evaluated opportunistic versus systematic screening using pulse palpation followed by ECG55,89 and showed, using probabilistic sensitivity analyses, a 60% likelihood that opportunistic screening was cost-effective in both men and women. The Swedish STROKESTOP population screening study4 confirmed that ECG screening was likely to be cost-effective using a lifelong decision-analytic Markov model.90 Two other smaller studies evaluating smartphone ECG screening in community pharmacies48 (relying on estimated stroke and death rates and improvements with OAC treatment in incidentally detected asymptomatic AF)22 and pulse checking in an influenza vaccination clinic91 also described cost-effectiveness. A simulation of direct medical costs in the United States concluded that costs were greater in those patients with undiagnosed AF than for similar people without AF, justifying strategies to identify and treat undiagnosed AF.92

Most recently, a study of lifetime costs and effects of a single handheld ECG screening of patients >65 years of age during the annual influenza vaccination in The Netherlands83 found that screening would decrease overall costs by €764 (USD$939) and increase quality-adjusted life years by 0.27 per patient. That is, AF screening for patients >65 years of age during the influenza vaccination was likely to be cost-saving.

Reviews of systematic and opportunistic screening for AF detection93,94 indicate that both were more cost-effective than routine practice for those ≥65 years of age, although this outcome depends on method chosen, frequency of screening, and age. For example, a formal Health Technology Assessment in Ireland considered a number of models and found costs per quality-adjusted life year varying between €792,619 (USD$936,902) for screening annually from 55 years of age to €8,037 (USD$9,500) for a single screening at 75 years of age,95 but no data are available on the detection rate for annual or other frequencies of repeated screening. More data are required to compare cost-effectiveness of different screening interventions and the effect of different age cutoffs.

Screening for Undetreated Known AF
Undertreatment exposes patients to a significant risk of fatal or disabling strokes. Population surveys96,97 and registries indicate that treatment remains suboptimal with large country differences.31 Population screening using a variety of techniques3,4,76 would identify undertreated patients and may provide an opportunity to refer
to appropriate physicians or clinics to initiate OACs or reinitiate OACs in those who have discontinued.30,31

A prospective, Swedish population-based study found 9.5% of individuals (81/848) were known to have AF on a 12-lead ECG; 43% of these patients were not on OAC.5 Through the screening program, 52% of undertreated individuals had OAC initiated. A similar number of patients had known AF (9.3%) in the STROKESTOP study,4 but only 22% were not on OAC. After cardiologist follow-up, more than half without contraindications commenced OAC therapy. This finding highlights the importance of future implementation research in which AF screening programs incorporate well-defined referral pathways and strategies for initiating OAC therapy, in both newly diagnosed and undertreated known AF.

Patient Preferences and Advocacy

A large patient survey reported that a majority of patients with persistent AF were in favor of AF screening with handheld ECGs (T. Lobban and M. T. Hills, personal communication, September 2016). Patients also believed healthcare professionals needed to be better educated about AF symptoms.

The patient voice is as important as the clinician voice in driving change. Political advocacy from patients, caregivers, and patient-led organizations has demonstrated the need for improved awareness, education, and disease information.98,99 Patient-led organizations can more effectively identify the challenges patients face and engage policymakers to bring about change,98 leading to improved outcomes for patients and healthcare providers (www.stopafib.org, www.heartrhythmalliance.org). Campaigns such as the Arrhythmia Alliance’s Know Your Pulse campaign to screen for AF can be successful in raising awareness and bringing about policy change.

Numerous governing bodies such as the National Institute for Health and Care Excellence (UK) and scientific organizations now seek the input of patients and patient organizations in developing clinical guidelines and scientific publications.1,30

Patients support screening to detect AF earlier. Increased education about AF for healthcare professionals is required, ensuring they respond to any reported patient symptoms. Public awareness campaigns will be helpful to educate people about checking their pulse and the benefits of OAC for preventing AF-related stroke. It will be beneficial for professional health organizations to work in partnership with professional patient-led organizations to drive AF education and detection programs, advocate for screening, and evidence-based treatment for those with diagnosed AF.

Current Guidelines

The ESC recommends opportunistic pulse-taking in all patients ≥65 years of age or in high-risk subgroups, followed by an ECG if irregular, to allow for timely AF detection.30,89 Pulse taking in practice is recommended by the National Institute for Health and Care Excellence (UK) guidelines but only for symptoms. However, the new 2016 ESC guideline30 also includes an ECG rhythm strip as an alternative to pulse palpation, at least 72 hours of ECG monitoring after a transient ischemic attack or stroke with additional longer term monitoring considered, and consideration of systematic screening in patients ≥75 years of age or those at high stroke risk. An additional recommendation is to interrogate CIEDs for atrial high-rate episodes and, if detected, prompt further ECG monitoring to document AF before initiating therapy.

The American College of Cardiology/American Heart Association/Heart Rhythm Society guidelines1 make no recommendation on the topic of screening but do state that early detection and treatment of asymptomatic AF before the first complications occur is a recognized priority for the prevention of stroke.

Guidelines address specific subgroups where screening may be worthwhile, including high-risk patients (eg, poststroke, ≥75 years of age), in whom prolonged monitoring is more likely to detect AF.

Key Point 6

There is a need to perform large randomized controlled studies using hard end points (including stroke, systemic embolism, and death), of strategies for screening, to strengthen the evidence base to inform guidelines and national systematic screening strategies.

CONCLUSIONS

In older individuals with screen-detected AF, the absolute risk of ischemic stroke and death appears sufficient to justify consideration of treatment with OACs. Irregularity of the pulse is a simple way to screen for AF, but pulse palpation is seldom done in routine practice, and inexpensive screening devices are available. Because an ECG is required to confirm AF diagnosis, devices that provide a medical quality ECG trace have an advantage over pulse-based devices and would be preferred as screening tools. Single-timepoint screening for AF appears justified based on yield and cost-effectiveness; as a further step, 2 weeks of twice daily intermittent recordings may be justified in people ≥75 years of age or in other groups at high risk of AF or AF-related stroke. Patient differences will modulate the type and intensity of screening (eg, ESUS requires higher intensity). The setting for screening is highly dependent on the health system in each country and needs to be individualized but must crucially be linked to a pathway for appropriate diagnosis and management. Although the World Health Organization criteria for screening appear to be met100 and the evidence is strong for commencing screening ef-
forts in many countries, 1 or more large and adequately powered randomized outcomes trials of a strategy of screening would strengthen the evidence for the adoption of larger scale systematic screening programs for AF to reduce ischemic stroke/systemic embolism and death (Figure 3).

Figure 3. Diagrammatic representation of key points on screening.
Enrichment is the use of additional risk factors or biomarkers to either increase the proportion with unknown AF in the screened population or increase the risk of stroke in those with AF detected by screening in that population. Patients who are undertreated are patients with known AF who are not receiving oral anticoagulant according to guidelines. (see page 1859 section, Screening for Undertreated Known AF). Although this is not strictly speaking screening, such patients will be detected by population screening for AF, so this has been placed in a different shape with a dotted line connector. BP indicates blood pressure; ESUS, embolic stroke of uncertain source; and PPG, photoplethysmography.
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APPENDIX
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1862 May 9, 2017

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FOOTNOTES

The online-only Data Supplement is available with this article. The online-only Supplement is available with this article.

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**SCREENING FOR ATRIAL FIBRILLATION: A REPORT OF THE AF-SCREEN INTERNATIONAL COLLABORATION**

**a. Delphi Process for AF-SCREEN consensus document**

The document content and structure were agreed by the steering committee (John Camm UK, Hugh Calkins USA, Ben Freedman Australia, Jeff Healey Canada, Mårten Rosenqvist Sweden, and Jiguang Wang China), and AF-SCREEN members, in late 2015. Individual sections were allocated to and written by 18 small groups of members with content expertise (co-authors), many of whom were the lead investigators of the seminal papers in that particular area. Each group was encouraged to produce one or more draft recommendations. A Delphi process involved the steering committee voting on which key questions should be selected for discussion and secret voting by those present at the AF-SCREEN consensus meeting. This meeting was held in August 2016, immediately before the ESC annual scientific meeting in Rome. Following voting at the meeting, those draft recommendations which received a large number of votes were workshopped over 2 days, and 7 selected for on-line secret voting by all members. The panel below shows the final wording of the key questions used in the on-line ballot, and the number of votes, with the percent agreement with the statement/key question. All seven received >85% agreement (Panel 1). These formed the basis of the key points used in the white paper. No formal recommendations are provided in the white paper.

<table>
<thead>
<tr>
<th>Panel 1</th>
<th>AF-SCREEN Key Issues</th>
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<tr>
<td>1.</td>
<td>Screen-detected AF as found on single timepoint screening, or intermittent 30 second recordings over 2 weeks, is not a benign condition, and with additional stroke risk factors, carries sufficient risk of stroke to justify consideration of screening and therapy to prevent stroke. <em>105 votes, 98% agreed</em></td>
</tr>
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<td>2.</td>
<td>Single timepoint screening of people aged 65 or over in the clinic or community is recommended, based on yield of screening and cost-effectiveness. <em>104 votes, 93% agreed</em></td>
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3. As a further step after single timepoint screening, two weeks of twice-daily intermittent handheld ECG recording should be considered for screening for AF in people aged 75 or over, or in younger age groups at high risk of AF or stroke. 104 votes, 86% agreed

4. Long-term continuous rhythm monitoring using either external or implanted devices or extended intermittent patient-activated recordings is recommended for individuals with recent embolic stroke of undetermined source (ESUS). 104 votes, 92% agreed

5. The setting for AF screening needs to be individualized according to country-specific and health care system-specific requirements and resources and must be linked to a pathway for appropriate diagnosis and management. This can be community-based or in primary care or specialist practices or clinics. 105 votes, 99% agreed

6. Mass screening or opportunistic screening for AF can be accomplished by pulse palpation; oscillometric (blood pressure) or photoplethysmographic (smartphone camera) devices; and handheld ECG devices providing a rhythm strip. ECG confirmation is always required for diagnosis of AF. Handheld ECG devices have the advantage of providing a verifiable ECG trace and are preferred. 105 votes, 93% agreed

7. Large randomized controlled studies using hard endpoints (including stroke/systemic embolism and death), of strategies for screening should be performed to strengthen evidence to inform national systematic screening strategies. 105 votes, 97% agreed

NB None of the above relate to CIED-detected AHREs

b. AF incidence and future projections

In the United States, Europe, and China the lifetime risk of AF is 22% to 26% in men and 22% to 23% in women. It has been projected that the number of people with AF in the United States and Europe will double by 2050. For China, it has been estimated that in 2050, there will be 5.2 million men and 3.1 million women with AF. A comprehensive long-term analysis of AF in the United States - Framingham Heart Study cohort further supports these projections. The age-adjusted period prevalence and incidence increased three to four-fold over 5 decades of observation (1958-2007). In China, a 20-fold increase in AF prevalence in an 11-year time period was observed.

Globally, there has been progressive increase in the incidence and prevalence of AF
between 1990 and 2010 as assessed in the Global Burden of Disease (GBD 2010) Study.\textsuperscript{8} However, there was significant regional variation, with high-income countries having higher AF incidence and prevalence. The higher rates of AF may in part be attributable to better detection or even opportunistic screening in high-income countries. Furthermore, between 2005 and 2010, the increase in AF prevalence was minimal, especially in high vs. low- and middle-income countries.\textsuperscript{8} Reasons for the temporal trends in AF are multifactorial and include increased awareness and surveillance leading to earlier and more frequent detection, with decreased mortality and stroke contributing to longer survival after AF diagnosis, especially in high income countries.\textsuperscript{7} Although the prevalence of most risk factors changed over time, the strength of their association with AF remained largely unchanged, in both Framingham and PREVEND cohorts,\textsuperscript{7,9} though the majority of AF epidemiology data comes from North America and Europe. Many AF risk factors such as systolic blood pressure (the most common risk factor worldwide for AF is hypertension\textsuperscript{7,9-11}), and heart failure decreased, due to improved management of hypertension and increased survival after myocardial infarction and heart failure, whereas obesity and diabetes increased. The lower increase in AF prevalence between 2005 and 2010 may be influenced by increased awareness for AF risk factors, and improved management of AF risk factors.\textsuperscript{8}

Population AF-attributable risk of stroke is difficult to estimate, due to unrecognized asymptomatic and/or paroxysmal AF. For example, the Framingham study estimated population AF-attributable risk to be 1.5\% (ages 50-59 years) rising to 23.5\% (80-89 years),\textsuperscript{12} but this is likely to be an underestimate, as it counted only persistent/longstanding AF, estimated at 0.4\% of the population.\textsuperscript{13} Current prevalence estimates, which include paroxysmal and persistent AF, are much higher: in the Swedish registry, almost 4\% of the adult population received a hospital diagnosis of AF.\textsuperscript{14,15} Given there are also individuals with undiagnosed AF, the population AF-attributable stroke risk could be much higher.

**Summary point:** The global burden of AF will continue to grow. Increasing efforts to improve early detection and awareness, by region-specific effective screening and treatment programs, and risk-factor-specific prevention are required to improve stroke-free survival.

**b. Consequences of undiagnosed AF other than stroke**
In addition to stroke, patients with undiagnosed AF may be susceptible to cardiac remodeling, heart failure, silent cerebrovascular events and dementia.

AF is associated with atrial and ventricular structural damage,\textsuperscript{16,17} which serves as the substrate for AF progression and may lead to ventricular dysfunction and arrhythmias that might explain the excess incidence of sudden cardiac death observed in AF patients in RCTs and registries.\textsuperscript{18} When conducted to the ventricle at rapid rates, AF causes ventricular dysfunction and heart failure, by way of a tachycardia-induced cardiomyopathy that can be the first clinical manifestation of the arrhythmia.\textsuperscript{19} Silent brain infarcts commonly occur in patients with AF,\textsuperscript{20} and are of particular concern with catheter ablation procedures.\textsuperscript{21} Likewise, patients with AF have a higher frequency of premature dementia and cognitive decline than matched patients in sinus rhythm.\textsuperscript{22} The large community-based Rotterdam study has shown an increased risk of dementia, independent of clinical stroke, in subjects with both prevalent and incident AF.\textsuperscript{23} Although direct causal relationship has not been proven between silent ischemic events and dementia, increased use of OAC in susceptible populations, or successful elimination of AF for example with catheter ablation, may ultimately reduce dementia. Whether patients with undiagnosed AF have a higher risk of adverse outcomes such as heart failure or dementia compared to symptomatic AF is not known.

**Summary Point:** Trials and registries monitoring asymptomatic people at risk for AF should be supported. These should incorporate comorbidities such as heart failure and dementia in addition to traditional endpoints (stroke, death, bleeding). Since these outcomes are ubiquitous in AF populations by virtue of co-morbidity and age, rigorous endpoint definition and experimental design, with longer follow-up (especially for dementia), will be required for reliable conclusions.

d. **AF in the context of concurrent major illness: Secondary AF**

AF may be triggered by reversible, acute, secondary causes such as cardiac and non-cardiac surgery, hyperthyroidism, myocarditis/pericarditis, myocardial infarction, pulmonary embolism, pneumonia, sepsis, and alcohol intoxication.\textsuperscript{24} In 2,275,588 hospitalized patients, secondary AF occurred in 22,780 (1%). The majority were post-surgery (30% cardiothoracic,
20% non-cardiothoracic), infections (23%), or post-myocardial infarction (18%).\textsuperscript{25} AF recurrence, stroke risk and mortality are similar for primary and secondary AF.\textsuperscript{26} New-onset postoperative AF (POAF) complicates 16-32\% of cardiac surgery,\textsuperscript{27} and is associated with longer hospitalization and more postoperative complications.\textsuperscript{27-34} POAF often recurs post discharge,\textsuperscript{28, 30, 35} with an absolute recurrence rate of \~20\% during 3.5 years of follow-up.\textsuperscript{35} Following cardiac surgery, POAF carries a higher risk of stroke, hazard ratio 1.3 in 2 years after adjusting for confounders,\textsuperscript{36} and higher mortality.\textsuperscript{27, 31, 32, 37} POAF occurs after 1-3\% of non-cardiac procedures,\textsuperscript{29, 36} and doubles stroke risk within 2 years.\textsuperscript{36} Screening for recurrent AF in POAF following cardiac surgery using patient-activated handheld ECGs, revealed recurrent AF in 25\% within 3 weeks, mostly asymptomatic.\textsuperscript{38} The prognostic significance of recurrence is unknown, as is the incidence after return to sinus rhythm with other secondary AF.

Transient AF occurs frequently during intercurrent illnesses. Prognosis is comparable to common AF, therefore, targeted screening appears warranted, although specific data on silent secondary AF are not available. Further research is needed to develop an evidence base to guide management of secondary AF, and whether screening for recurrence is warranted.\textsuperscript{39, 40}
### TABLE A: Arguments against screening and AF-SCREEN response

<table>
<thead>
<tr>
<th>Arguments against screening</th>
<th>Potential AF-SCREEN response</th>
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<tr>
<td>Individuals with screen-detected AF are at lower risk than patients in the pivotal anticoagulant trials, and the epidemiological studies. Uncertainty over whether it is worth treating these people (UK National Screening Committee)⁴¹</td>
<td>Supposition that individuals with predominantly persistent screen-detected AF have outcomes that closely correspond with incidentally-detected asymptomatic or minimally symptomatic AF. Such patients are not low risk, and treatment seems to have same effect as in symptomatic AF. Question remains about whether absolute risk of brief paroxysmal CIED-detected AHREs is high enough to justify treatment.</td>
</tr>
<tr>
<td>Don’t need expensive new technology - doctors should just do a pulse check in every consultation, particularly those at risk⁴¹</td>
<td>Doctors don’t check the pulse, and new technologies are more accurate, readily available, relatively inexpensive, easy to use, and can provide immediate ECG verification.</td>
</tr>
<tr>
<td>Need more information on benefits and cost-effectiveness before screening healthy general population⁴¹</td>
<td>All recent cost effectiveness simulations indicate screening for AF alone or including screening for “actionable AF” (known but untreated with OAC) will be cost-effective. An outcomes based randomized trial of screening will strengthen this evidence.</td>
</tr>
<tr>
<td>Treatment and care for people with AF is not optimal, why find more. Unlike to be cost effective if screen-detected AF not treated (UK National Screening Committee)⁴¹</td>
<td>This is not an argument against screening, rather it is an argument in favor of improving treatment. Indeed, the cost-effectiveness simulation using UK data with only 55% prescription of OAC according to guideline still shows cost-effectiveness (base case in SEARCH-AF)⁴²</td>
</tr>
<tr>
<td>The test needs to be improved and standardized (UK National Screening Committee)</td>
<td>This criticism not valid for the hand-held ECGs, or the oscillometry and PPG pulse methods which have been tested and validated.⁴³⁻⁵²</td>
</tr>
<tr>
<td>Opportunity cost from health care dollars spent on screening instead of treatment of known disease</td>
<td>Common to all screening tests, though health economic assessments indicate this unlikely to be a major factor</td>
</tr>
<tr>
<td>Harm can come from the diagnostic cascade arising from the initial test eg echo, stress test etc is well documented, and the harm from “incidentalomas,” uncovered in the diagnostic work-up again well documented</td>
<td>This is common to all screening tests, and risk to benefit calculations might include this, though hard to estimate the cost of this potential harm.</td>
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</table>
| Need a randomized controlled trial to provide definitive evidence for effectiveness in reducing hard endpoints, as screen-detected AF may not have as high a risk as we think, so benefit less, and unscreened people may present with symptoms or be detected incidentally before an event. Event differential between screened and unscreened populations may be less than anticipated, and harms may outweigh benefits.  

18 | Randomized controlled trial may be required to strengthen the evidence base, but current data suggests not low risk, and simulations suggest screening would be both effective and cost-effective. However, this depends on definition of undiagnosed AF, i.e. screen-detected AF vs brief CIED-detected AHREs, or that found in long-term continuous monitoring. |
Australia

**Ben Freedman, Kylie Gwynne, Jessica Orchard, Nicole Lowres, Lis Neubeck**

Australia has a predominantly Caucasian population with a high prevalence and incidence of atrial fibrillation (AF). The incidence rate is projected to increase. There is no systematic program for screening for AF but a number of pilot studies have been carried out including a study in the community in pharmacies and two in general practice (one during the flu vaccination).

There is currently no reimbursement for screening for AF or for a rhythm strip which might be used in the process, and this would be a barrier to widespread adoption in either community (eg pharmacy) or in general practice, where most of primary care takes place in this country. It is likely that general practitioners are probably best placed to carry out screening because of the high rate of visits from their patients in the population at-risk for developing AF, and their role in being able to prescribe anticoagulant if AF is found. There are no large primary care clinics or outpatient services, so general practice would be the preferred option in this country. Pharmacists already do perform blood pressure checks and are respected health professionals with a wide national reach, and by adding simple hand-held ECG screening as performed in the pilot, could produce an impact on detection of unknown AF, provided there was some remuneration and an adequate pathway was developed with patients’ GPs for treatment.

More widespread adoption would require a fair bit of advocacy from both clinicians and patient groups.

**Aboriginal Australians**

Aboriginal Australians have a high rate of AF at an early age. In hospital discharge studies and in other registries, the age of incidence is about 20 years lower than in non-Aboriginal Australians. Moreover, the CHADSVASc risk scores are much high when AF presents at an early age.

A study is currently underway to use opportunistic screening to detect AF in Aboriginal adults in Australia. This is a mixed methods study which will use the Kardia smartphone ECG to screen 1500 Australian Aboriginal people living in New South Wales, Northern Territory and Western Australia to estimate prevalence and age distribution of Atrial Fibrillation of the Australian Aboriginal population.

There are a number of unique challenges in identifying Aboriginal people with asymptomatic AF:

- the population is small (just under 3% of the Australian population);
- they are not reliably identified within the health care setting (or patient records) and the population is widely dispersed;
- Aboriginal people are less likely to access health care services; likely to have lower health literacy; and less likely to seek health care assessment or treatment at the early signs.
Austria
Helmut Puererfellner, Martin Martinek, Georgios Kollias

Austria has a population of currently 8.7 million inhabitants. As in most Western countries, atrial fibrillation (AF) is projected to increase in prevalence. For the time being, around 150,000 to 200,000 individuals are affected.

The public health system is tax-financed with no access restrictions and free of charge. Outpatients are mainly seen by the general practitioners who have an important role as gatekeepers. Patients with atrial fibrillation will further be referred to internal medicine specialists or cardiologists who work in-office based on contracts with the public health insurance companies. Alternatively, they are sent to hospital in case of emergencies.

The Austrian Cardiac Society has endorsed the ESC guidelines on the management of atrial fibrillation. Accordingly, opportunistic screening for AF is recommended. In 2012, the Austrian Cardiac Society organized a symposium together with the Austrian Ministry of Health to bring together the most important stakeholders in order to increase awareness for AF in the public and to increase the cooperation between the different medical specialties. Consequently, a platform for AF was installed and a patient brochure on AF was published in 2015 authored by both authorities. A nationwide AF registry was discussed. Currently, a nationwide stroke registry as well as an ablation registry have been established.

There is a well-developed system for screening patients after an ESUS (embolic stroke of unknown source) where loop recorders are routinely implanted.

We are currently starting a protocol to look for silent AF in an international study project called the SILENCE study. In this study, high risk patients aged >65 years of age with either concomitant diabetes or heart failure are screened with a hand-held ECG device over a period of 14 days to detect silent AF. Results are expected for 2018-2019.
At present there is no structured national strategy for AF screening in the Balkan Region countries including Serbia, Bosnia & Herzegovina, Croatia, Montenegro, Albania and Bulgaria. Opportunistic screening at the general practice level is left at the discretion of the responsible physicians. Recently, the Serbian AF Association (a non-profit association of the physicians involved in the management of AF) has initiated a regional collaborative AF project with ultimate goal to facilitate the formulation of feasible approach(es) to diagnosis and management of AF in the Region, including the strategies for AF screening. The project will also involve measures of public education such as ‘check your pulse’ and illustrated summary of AF essentials.
Belgium
Georges H. Mairesse and Hein Heidbüchel

Belgium is a mid-size European country with a population of 11,000,000 inhabitants and Brussels as its capital city. Access to high-quality health services is good with universal protection against the risk of illness. However, preventive medicine and health promotion are not the responsibility of the national government, but are handled at regional or community level.

Screening for AF has not yet been recognized as a priority by health authorities. The Belgian Heart Rhythm Association (BeHRA), a working group of the Belgian Society of Cardiology, has started in 2010 national awareness campaigns. These campaigns are run in May or June, during the World Heart Rhythm Week. During that week, AF awareness is promoted through national and regional media, including the audiovisual press, and distribution of informative leaflets via general practitioners and pharmacies. Political or sport figures are solicited to highlight these campaigns in the media. Funding had to be supported through industry grants.

During this week, in almost all Belgian hospitals, a free screening is organized using single-lead, handheld ECG recorders. The population of >40y is targeted with the message that “From 40 years old, one-in-four adults will be confronted at least once with AF”. Nevertheless, all participants are welcome for AF screening if they wish. Since 2016, the use of the MyDiagnostick ECG stick allowed recordings also outside hospitals, like in shopping malls. Demographics and CHA2DS2-VASc scores are collected at the time of screening.

The prevalence of AF found during these campaigns was 1.4%, with a clear increase with age. Women participated more in the screening program, but prevalence of AF was higher in men. AF was found mainly in patients with an intermediate to high stroke risk. Adequate anticoagulation was low in those patients.

In addition to this screening program, a website (http://www.monrythmecardiaque.be) was designed to allow every Belgian citizen to calculate his/her risk for developing AF, based on sex and age probabilities. It also allows calculation of stroke risk based on the CHA2DS2-VASc score. During these campaigns over 7 years, information about AF was delivered to >250,000 people, either during the screening sessions or via the Web site.

In contrast to the BeHRA initiative described above, there is no national or regional effort to organize systematic screening for AF in risk populations (like those over a certain age, or with risk factors like diabetes or hypertension). Although some clinical specialists (like neurologists) have developed clinical pathways including long-term ECG recording (up to implantable loop recorders), there is no standard pathway implemented throughout the Belgian health care system to perform systematic screening. To further develop such screening initiatives, health authorities’ support and financing would be needed.
Brazil

Antonio Luiz Pinho Ribeiro

Cardiovascular diseases have been Brazil’s leading cause of death for half a century and, in 2011, were responsible for 31% of the deaths. Coronary artery disease, stroke and hypertensive cardiopathy are the main specific causes of death, but diseases related to poverty, as Chagas disease and rheumatic heart disease, are still prevalent. Brazilian public national health system (SUS) provides universal access to all levels of care, but problems related to underfunding, difficult access of the more deprived populations and quality of the assistance in the public system are still major problems of SUS.

There is no nationwide survey on the prevalence of atrial fibrillation, but a study conducted using a large state-wide program of ECG database (n=262,685 primary care patients > 5 years-old) showed a prevalence of 2.4% for men and 1.3% for women; age and sex distribution was not very different from the observed in other Western World surveys (table 1). Most of atrial fibrillation patients in Brazil do not receive anticoagulation therapy: in the primary health care centers, only 1.5% reported the use of warfarin, the only anticoagulation drug available in the SUS. In 162 consecutive patients with atrial fibrillation who performed ECG at University hospital, 50.6% knew that they had atrial fibrillation and only 35.5% of those classified as high risk were using oral anticoagulation. In another Brazilian tertiary outpatient clinic, only 55% of patients at high risk were receiving dose-adjusted warfarin.

Although stroke stands as the second cause of death in Brazil, there is no public policy to detect or treat atrial fibrillation in Brazil. Brazilian Society of Cardiology guidelines on the management of atrial fibrillation also does not include a chapter on screening. The main barriers to screening programs for atrial fibrillation in Brazil are the uneven access to ECG exams and the paucity of resources for anticoagulation of the new patients, especially in the public health system. Only warfarin is available in the list of essential medicines and there is a very limited number of active anticoagulation clinics. The access to ECG test are being improved by some largescale, public teleECG systems available in some states of the country. Specific national protocols for recognition, risk stratification and treatment of atrial fibrillation in the primary health care should be established, including conditions for safe anticoagulation using warfarin or the new oral anticoagulants.

Table 1: Prevalence of atrial fibrillation in 262,685 patients from primary health care centers in Minas Gerais, Brazil, 2011

<table>
<thead>
<tr>
<th>Age group (years)</th>
<th>Males (%)</th>
<th>Females (%)</th>
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<tr>
<td>05-19</td>
<td>0,0</td>
<td>0,1</td>
</tr>
<tr>
<td>20-29</td>
<td>0,2</td>
<td>0,1</td>
</tr>
<tr>
<td>30-39</td>
<td>0,3</td>
<td>0,2</td>
</tr>
<tr>
<td>40-49</td>
<td>0,7</td>
<td>0,3</td>
</tr>
<tr>
<td>50-59</td>
<td>1,6</td>
<td>0,7</td>
</tr>
<tr>
<td>60-69</td>
<td>3,2</td>
<td>1,9</td>
</tr>
<tr>
<td>70-79</td>
<td>6,3</td>
<td>4,1</td>
</tr>
<tr>
<td>80-89</td>
<td>9,8</td>
<td>6,7</td>
</tr>
<tr>
<td>≥ 90</td>
<td>14,6</td>
<td>8,7</td>
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As in other countries, the prevalence of AF in Canada is increasing, although the location of AF diagnosis appears to be shifting. In Canada, incident AF cases diagnosed in hospital have declined 21%, whereas the proportion of cases diagnosed in the outpatient setting have risen by 50% between 2000 and 2005. Regardless of the healthcare setting, OAC therapy is under-utilized. The ageing population will greatly impact AF rates and implementation of stroke prevention therapy; in Canada the largest growing segment of the population are those 65 years and older (see: Statistics Canada www.statcan.gc.ca/eng/start). At present the Canadian Cardiovascular Society AF guidelines recommends OAC for individuals ≥ 65 years; however, there are no specific recommendation for AF screening.

The Canadian Stroke Prevention Intervention Network (C-SPIN) is leading several screening studies to better understand the nature of undiagnosed and undertreated AF in Canada. The Program for Identification of ‘Actionable’ AF (PIAAF) will evaluate the optimal setting, screening methods and cost-effectiveness of AF screening. The PIAAF-Pharmacy study completed enrollment of 1145 subjects, and employed a comprehensive approach to screening stroke risk factors including: using a single lead handheld ECG device to detect AF; blood pressure measurement and a diabetes risk assessment questionnaire. The PIAAF-Family Practice study is a multicenter cohort study of patients attending family practice clinics who will undergo single time point AF screening with a 30 second pulse check, single lead handheld ECG device and BP machine with automated AF detection algorithm; enrollment is targeted for completion this fall. There are two randomized AF screening trials in older patients with multiple stroke risk factors. The SCREEN-AF study among family practice patients ≥ 75 years with a history of hypertension and no known AF compares standard care to standard care plus 2-week ECG patch monitor and concurrent AF-BP monitor and ASSERT-3 randomized patients ≥ 80 years without known AF to have a single 24-hr Holter monitor vs. a 24-hr Holter monitor followed by a 30-day external ECG loop recorder with automatic AF-detection. The data from the PIAAF program will help to inform the design of a cluster randomized trial of a community-wide intervention to prevent stroke by detection and treatment of AF and hypertension. This trial will provide a better understanding of how AF screening programs can be implemented in a country with such geographic and demographic diversity. Beyond screening, AF detection must be linked to strategies using existing or novel care pathways to improve OAC use. The PIAAF Rx study will be the first randomized trial of pharmacist’s prescribing OAC compared to usual care for those ≥ 65 years with one additional stroke risk factor and ‘actionable’ AF in the community.
In 2014, under the auspices of the Chinese Commission of Health and Family Planning and the Chinese Preventive Medicine Association (with its Stroke Prevention and Control Council), a group of experts, mainly stroke neurologists, published in a booklet a consensus document on AF screening and subsequent anticoagulant therapy in patients with an acute stroke and transient ischaemic attack. This consensus document recommended that in patients with an acute ischaemic stroke or transient ischaemic attack, AF should be screened routinely by disease history inquisition, physical examination, and 12 leads ECG recording, and if possible by a 24-hour Holter ECG monitoring. In patients with unidentifiable causes of AF or with suspected cardiogenic embolism, a 24-hour Holter ECG monitoring is required. If the Score for the Targeting of Atrial Fibrillation (STAF) is ≥5 points or the Left Atrial Diameter Score (LADS) is ≥4 points, multiple AF screening approaches, including 24-hour or longer Holter ECG monitoring or repeated 12 leads ECG recordings are required. Until recently, there has not been any report on the implementation of these recommendations on the identification of AF in patients with an acute stroke or transient ischaemic attack.

In the past about a decade, several multi-centre and single-centre surveys on the prevalence of AF were conducted. The prevalence of AF varied between these studies. However, the prevalence of AF in consistently increased with age advancing. In addition, the AF patients were on average a few years younger than in North American and European populations. This early onset may be related to poorer blood pressure control and other unidentifiable risk factors. Although health care has been substantially improved in the past years in the rural areas, people in the remote countryside still have very limited access to screening services. Another limiting factor is that apparently more efficient screening devices or techniques than Holter are not yet reimbursed in clinical practice.

Starting AF screening from high risk populations, such as patients hospitalized for acute ischaemic stroke or transient ischaemic attack and elderly patients with hypertension and other cardiovascular risk factors, may be a realistic approach. Hand held ECG recording devices with validated algorithms can be a useful and efficient screening tool, and should be investigated in controlled clinical trials. Self-pulse measurement education and home blood pressure monitoring using blood pressure monitor with an additional function of irregular heart beat detection would also help in improving awareness for AF screening.
Denmark
Axel Brandes, Jesper Svendsen, Ulrik Dixen

Denmark has a tax-financed public health system, which is free of charge for all patients. The general practitioners (GPs) have a gatekeeper function for outpatients. Cardiologists are almost exclusively hospital-based. The Danish Society of Cardiology has endorsed the ESC guidelines on the management of AF and, thus, recommends opportunistic screening for AF, as the Danish Stroke Society (DSS) does for all patients with stroke or TIA.\textsuperscript{86, 87} Moreover, the DSS recommends long-term ECG monitoring in all patients with stroke or TIA, but has no specific recommendations for the monitoring method used.\textsuperscript{87} Some patient organisations like the Stroke Association also recommend opportunistic screening with pulse-taking followed by an ECG.\textsuperscript{88}

To date, there has been no co-ordinated national AF screening campaign for the general population, but almost all stroke and TIA patients receive long-term ECG monitoring either during their stay at the stroke units or by referral to a cardiology outpatient clinic. There are no data on the number of undetected AF cases available. All stakeholders in the Danish health system have largely focussed on AF treatment, which can be followed using the different nation-wide registries. Several years ago a nation-wide stroke registry and an ablation registry have been established. A national AF registry is in development and will be launched by the end of 2016. In particular, GP’s and Danish cardiologists have had much focus on the introduction of NOACs during the last years and, therefore, also on the referral of newly diagnosed AF patients to cardiologists or anticoagulation clinics.

It is expected that the LOOP study, which will include 6,000 high-risk patients and identify unrecognized AF using implantable loop recorders and, thus, is aiming at reducing stroke risk, will put AF screening more into the spotlight. Results of this large randomized study are expected in 2019-2020.
As in many countries, AF in France is often overlooked and diagnosed too late. In 20% of cases, AF is diagnosed when a stroke occurs. PROFIL FA was a French AF awareness campaign in general practice presented by Davy et al in 2014. Participating general practitioners (GPs) were asked, on a given day, to look for several clinical items in all their consecutive patients over 65 years, according to a dedicated and simple questionnaire including the 7 criteria of the thromboembolic risk score CHA2DS2VASc score, the existence of 4 symptoms, transient and suggestive of AF episodes: palpitations, chest pain, dyspnoea (shortness of breath) and asthenia (weakness), and finally palpation of an irregular radial pulse.

When AF was suspected, GPs referred patients to a cardiologist for diagnostic confirmation. The study included 603 physicians and 4,592 patients. AF had already been diagnosed in 840 patients (18% of cases). The remaining 3,752 patients were evaluated on a single day using the questionnaire. Of these, AF was clinically suspected in 585 patients (1 in 6) and they were referred to a cardiologist. Out of the 585 patients in whom AF was suspected by the GP, 129 patients (nearly 1 in 4) had the existence of AF confirmed by the specialist who then prescribed appropriate treatment. An irregular pulse was linked to a diagnosis of AF in only 1 out of 2 cases. For patients without irregular heartbeat, the presence of two symptoms and/or a previous stroke history were also predictors of AF.

Another study demonstrated that identification of AF after ischemic stroke was closely related to the number of risk factors from the CHA2DS2VASc score in French patients. The detection of silent AF to prevent ischaemic stroke may require the use of long term external or internal electrocardiogram (ECG) monitors. However, symptomatic AF or AF with fast ventricular rate was not identified by implantable loop recorders in patients under 75 years with unexplained cerebral ischemia and no cardiovascular risk factors. The use of such device should not be generalized in the systematic evaluation of these patients. By contrast, unknown AF can be identified in the population over 65 years using a simple precise pathway and a multidisciplinary approach.
Germany

Renate Schnabel, Johannes Brachmann, Guenter Breithardt, Stefan Kaab, Carlos Martinez, Moritz Sinner, Rolf Wachter

Germany has an aging Western society with a projected significant increase in atrial fibrillation prevalence. Most results from prior studies in Western populations should be applicable to German conditions. There is a high potential to detect untreated atrial fibrillation, in particular, in older adults. Based on health insurance data, annual direct costs of atrial fibrillation are 3300 EUR. Almost 10,000 strokes annually could be prevented in Germany by optimal atrial fibrillation diagnosis and treatment. In addition, screening for atrial fibrillation after cryptogenic stroke might further improve secondary stroke prevention in these patients. Few German trials have addressed this issue. The FIND-AF study could demonstrate that 7-day Holter monitoring for atrial fibrillation screening after stroke is most efficient in older adults. One of the largest efforts currently is the standardized MONitoring for Detection of Atrial Fibrillation in Ischemic Stroke (MonDAFIS) study. It will evaluate whether a prolonged and systematic ECG monitoring during the initial in hospital stay has an impact on secondary stroke prevention.

To date, no nationwide policy or country-specific recommendations of the German Cardiac Society exist that atrial fibrillation screening in primary prevention should be offered. Physicians follow the guidelines for opportunistic screening of the European Society of Cardiology. Ninety-nine percent of general practitioners offer resting electrocardiograms. Thus, nationwide implementation of the guidelines should be feasible. No data exist on the actual guideline adherence. The new prevention law of 25 July 2015 (Präventionsgesetz-PrävG) does not specifically address atrial fibrillation as a disease for health promotion and screening.

Statutory health insurances offer an annual check-up from age 35 years on for cardiovascular disease, renal dysfunction and type 2 diabetes mellitus which does not explicitly include rhythm assessment or atrial fibrillation.

Few health insurance driven projects have addressed screening for atrial fibrillation in short-term and regional projects. E.g. since 2008 the KKH (Kaufmännische Krankenkasse) has offered a screening program in individuals aged 50 years or older with additional atrial fibrillation risk factors. In a regional project in Rhineland-Palatinate with about 1,000,000 inhabitants systemic screening for atrial fibrillation will be performed over 4 weeks per participant with a hand-held device. Participants with no prior atrial fibrillation will be included if they have a CHA2DS2-VASc score >1 or symptoms of an irregular pulse or had have a prior stroke of unknown origin.

The Atrial Fibrillation Network (AFNET, http://www.kompetenznetz-vorhofflimmern.de/de/afnet), a registered society initially funded by the Federal Ministry of Education and Research, is intended to improve the management of atrial fibrillation. It has a nationwide impact. Part of its mission is to increase the awareness of atrial fibrillation, e.g. during the international AF Aware Week. To improve atrial fibrillation awareness and screening in Germany structured nationwide action would need to be taken that should then be implemented at the federal and local state and in communities.
Greece

There is one member from Greece. Population screening for AF has been reported by Ntaios et al in the Arcadia study performed in 5 villages in rural Greece, using 12-lead ECG and clinical examination and history.101
**Hong Kong**

*Bryan Yan, Chung-Wah (David) Siu*

In Hong Kong, >90% of the 7 million population are serviced by the public healthcare sector which include 41 hospitals and institutions, 47 specialist out-patient clinics, and 73 general out-patient Clinics managed by the Hong Kong Hospital Authority. Public medical outpatient clinics have a high volume of elderly patients and seem ideally placed for screening for AF. In 2014-2015, ~5.9 million attended public general medical outpatients clinics across Hong Kong of which ~30% (1.77 million) are >65 years old (See Hospital Authority Statistical Report 2014-2015: [http://www.ha.org.hk/haho/ho/stat/HASR1415_1.pdf](http://www.ha.org.hk/haho/ho/stat/HASR1415_1.pdf)). Currently, there are at least 3 large AF screening programs in Hong Kong (each involving more than 20,000 patients) using a handheld ECG and/or photoplethysmographic (PPG) devices. One group led by Siu CW, recently published their results using the Cardio Rhythm (Cardio Inc. Cambridge, MA) smartphone PPG application for AF screening in 1,098 patients in a primary care setting and found AF in 2.76% of patients. Another group led by Yan BP, has an ongoing program which uses the AliveCor single-lead ECG device for AF screening in >25,000 patients aged 65 years and above attending medical outpatient clinics (NCT02409654). Preliminary results showed that newly identified AF was found in 1.5% (n=121/9046) on a single screen, and an additional 1.2% (n=15/973) was detected in those screened on multiple occasions.

**India**

*Dorairaj Prabhakaran, Nitish Naik*

There is a dearth of reliable data on population prevalence of atrial fibrillation in India. There is presently no systematic published data that has documented with reasonable precision the exact burden of atrial fibrillation in the country. Published data is largely representative of the clinical profile of patients with established atrial fibrillation. For example, the RE-LY Atrial Fibrillation Registry reported demographic data on 15,400 patients from high, medium and low income countries presenting to the emergency department with atrial fibrillation or atrial flutter as either the primary reason for their visit or as a secondary diagnosis. A total of 2536 patients were enrolled from India with a mean age of 57 years, nearly a decade younger than patients enrolled from the west. Patients with valvular heart disease constituted 31.5% of these patients. Since rheumatic heart disease is still a significant contributor to the cardiovascular disease burden in India, young patients account for a sizeable proportion of atrial fibrillation in India.

Since atrial fibrillation can often be asymptomatic and not require hospital visits, screening programs that are community based may offer a more realistic assessment of its the burden. A survey of all adults over 50 years through a representative proportionate sampling (such as multistage cluster random sampling) in multiple districts in different states would be able to capture data on persistent and chronic atrial fibrillation. In addition, systematic sampling of adults (>20 years) attending hospitals would provide opportunistic screening for persistent and chronic atrial fibrillation. We have established a cohort of nearly 70,000 adults >20 years spread over 9 districts in 5 states (Delhi, Tamil Nadu, Haryana, Andhra Pradesh and Uttar Pradesh) across north, south, central and west India in addition to a network of physicians spread over nearly 200 hospital across the country. This dual approach would provide a reasonable strategy for assessing prevalence of atrial fibrillation in India.
Ireland
Joseph Harbison, David Keane, Gerard Bury

Ireland is perceived as having a substantial problem with atrial fibrillation and AF related stroke. The Irish Longitudinal Study of Ageing (TILDA) studied a representative population of Irish people >50 years and found an overall prevalence of AF of 3% but a prevalence of 19.3% in men and 5.9% of women aged 80 years and older. The North Dublin Population Stroke Study reported that 31.2% of strokes reported were associated with AF and that 54.2% of subjects had known AF but were frequently not adequately anticoagulated. More recently the National Stroke Audit published in January 2016 showed that 44% of patients had AF identified on investigation (McElwaine, P. McCormack, J. Harbison, J. on behalf of the National Stroke Programme Audit Steering Group Irish Heart Foundation/HSE National Stroke Audit: http://www.lenus.ie/hse/handle/10147/596575 ). An AF screening study with 7262 participants was performed under the direction of the National Stroke Programme in 2014. The study was conducted in a predominantly rural area of the West of Ireland and found a 10.9% prevalence of AF (0.8% unknown, 10.1% known). Another study with 566 participants by Bury and colleagues using a 3 lead ECG in general practices found a 2.1% prevalence of new AF and 9.5 prevalence of known AF.

A health technology assessment of AF screening by digital pulse checking in primary care was conducted by Patrick Moran and colleagues of the Health Information and Quality authority showed that AF screening was likely to be effective and a proposal has been developed to introduce this as part of a new primary care contract for family practitioners based on protocols developed for the screening study.
Italy

Giuseppe Boriani, Irene Marzona, Sakis Themistoclakis

In Italy healthcare is provided to all citizens and residents by a national health service, which is organized under the Ministry of Health and is administered on a regional basis. The national health service provides universal coverage and is based on tax funding. Life expectancy at birth in Italy was 82.3 years in 2012, which is over two years above the OECD average. The type of organization of the Health care system, which is organized for many general aspects at a national level, but financially administered on a regional basis, makes difficult the planning in the whole country of initiatives of prevention/screening that require specific public funding.

A recent survey promoted in Italy by 233 general practitioners (GPs) found among 295,906 screened patients a prevalence of diagnosed AF of 2.04% that was 2 times greater than previously reported. AF occurred in 0.16% of patients aged 16 to 50 years, 9.0% of those aged 76 to 85 years, and 10.7% of those aged ≥85 years. AF was symptomatic despite therapy in 74.6% of patients and was associated with heart disease in 75%.

A dedicated HTA (Health Technology Assessment) document, delivered in 2014 by an Agency of the Italian Minister of Health (Adapted HTA REPORT Efficacia dello screening sistematico per la diagnosi di fibrillazione atriale, Roma, Luglio 2014) concluded that in the 12 Italian Regions belonging to the Italian Network of HTA no screening programs for detection of asymptomatic AF was planned at the time of document release.

In the 2011 an awareness campaign on the importance to check the pulse for AF screening in order to detect AF was performed in several Italian cities (http://www.alleanzalfa.org/stopfa_day.htm)

More recently the general practitioners (GPs) in Bologna screened for AF 12,294 patients using automatic sphygmomanometers with embedded algorithms to detect irregular heart beat and possible AF. The use of these device improved the detection of AF as compared to normal practice.

Another project is currently ongoing in some Italian cities, on a local basis, for opportunistic screening of AF, with a first selection in pharmacies on the basis of blood pressure (BP) devices with algorithms for AF detection, followed by in-hospital ECG for subjects with suspected AF.

Other initiatives for AF screening have been proposed on a local basis:

http://www.aliceitalia.org/ictus_alice_italia_articolo_mese.php?id_contenuto_pagina=451&attiva_blog=1

Several other Italian initiatives on AF screening have been published.

Mexico

Arturo Guerra

In Mexico the CEREBRAL VASCULAR DISEASE (CVD), is a very serious public health problem. In fact, among the diseases of vascular origin, CVD is considered the third leading cause of death, after diabetes mellitus and ischemic heart disease.
According to national statistics from governmental sources, in 2014, more than 60 thousand deaths were recorded for this cause. In Mexico, the systemic arterial hypertension is among the factors for development of this disease. Smoking, diabetes mellitus and atrial fibrillation are considered as main factors.

We have carried out nationwide systemic arterial hypertension detection campaigns for more than 10 years, as well as detection of diabetes mellitus campaigns; but very little has been done to educate the physicians in general as well as the population about the serious consequences that people may be suffering from atrial fibrillation. It is estimated that at least 1 million Mexicans suffer from atrial fibrillation, however exact numbers are not completely known.

Against this background, we believe that we must make massive campaigns to disseminate this serious disease. This would consist on:

1. - Alliances with government agencies (to sensitize them of the problem).
2. - Partnerships with different medical societies of all levels (cardiologists, neurologists, electrophysiologists, but in a special way with physicians of first contact).
3. - Mass media campaigns, to teach the public in general how to check their pulse.
4. - Train nurses, social workers, and first contact physicians, to develop campaigns for Atrial Fibrillation detection.
5. - Make brochures to deliver in all government and private clinics and hospitals, with clear and simple information about how to detect arrhythmia.

These 5 measures could cause an impact in Mexico, of sufficient magnitude to decrease morbidity and mortality resulting from this condition.
Family physicians and cardiologists share the responsibility for detecting and diagnosing atrial fibrillation (AF). This task becomes increasingly important, as the population is ageing; 18% is 65 years or older. The overall prevalence of AF in medical files of family physicians is 0.5% and increases to respectively 4.5% and 4.3% among men and women aged 75 years and over. AF is probably underreported, because asymptomatic and/or paroxysmal AF are difficult to detect.

The guideline on AF for family physicians does not recommend systematic screening, but advises to judge the heart rhythm when measuring blood pressure. A case vignette study showed that 40% of the responding cardiologists screens for AF with a 12-lead resting ECG in high risk patients. European guidelines for cardiologists mention that screening may be useful but there is no general scheme for screening.

Current screening studies in primary care:
- D2AF: Detecting and Diagnosing Atrial Fibrillation, a multicenter cluster randomized controlled trial (RCT) in primary care. Case-finding using pulse palpation, WatchBP Home A and MyDiagnostick is compared with usual care.
- IDEAL-MD: Improving Detection of Atrial fibrillation in family practices with the MyDiagnostick, an RCT evaluating the number of new cases of AF detected with the MyDiagnostick compared to care as usual in primary care.
- Kaasenbrood et al. screened a Dutch population (n=3.269) during the flu vaccination by means of a handheld ECG device and found 37 (1.1%) new cases of AF. This program saved €2660,– and 0.28 QALY’s for each AF patient detected.

Current screening studies in secondary care:
- CRYSTAL-AF: a randomized prospective study in Europe, Canada, and the United States evaluating long-term monitoring for AF detection with Reveal Subcutaneous Cardiac Monitor in patients with cryptogenic stroke.
- REVEAL AF: a prospective, single-arm, open-label study in the US, Austria, Slovenia and the Netherlands, evaluating the incidence of AF in high risk patients based on symptoms and/or demographic area by implanting the Reveal.
- SCARF: Extended Rhythm Screening for Atrial Fibrillation in Cryptogenic Stroke Patients, evaluating the percentage of patients with documented AF based on Reveal registration after cryptogenic stroke.
- RATE PALM: Screening for Atrial fibrillation in undiagnosed Patients in chronic heart failure outpatient clinic through Mydiagnostick.
- VIP-HF: Ventricular Tachyarrhythmia Detection by Implantable Loop Recording in Patients With Heart Failure and Preserved Ejection Fraction.

Currently, there is no national screening program for AF, but there are some regional initiatives. In Groningen screening for AF with the MyDiagnostick by family physicians is part of ‘Ketenzorg AF’ (integrated care for AF). Furthermore family physicians will screen 50.000 patients during the next flu vaccination (2016). In order to establish a national screening program for AF, the results of D2AF and IDEAL-MD must be available. Moreover the local initiatives must be successful and health insurers must support a national screening program.
New Zealand
Katrina Poppe, Robert N Doughty, N Walker, R Jackson

New Zealand is a multi-ethnic island nation in the Southwest Pacific region. Of the 4.67 million people, 74.6% are NZ European, 15.6% Māori (indigenous population), 12.2% Asian and 7.8% Pacific peoples (www.stats.govt.nz). Cardiovascular disease is the leading cause of death in NZ despite a decline in age standardized mortality rates. There are long-standing ethnic and socioeconomic disparities in NZ, with Māori and Pacific people having higher prevalence of CVD at young ages and with worse outcomes.

Several sources of data are available with regard to AF in NZ:

- Among rural Māori, urban Māori and urban non-Māori with a mean age of 46 years, AF was present in 2%, 1.2% and 0.4% respectively.\(^{128}\)
- Among patients in a primary care cohort aged > 55 years (n=31,607), AF was present in 7.3% of Māori, 4% of Pacific and 4.1% non-Māori/non-Pacific. (Gu H, personal communication)
- Among a primary care cohort (12,500 people) aged 35-74 years, AF was present in 4.4% of Māori, 2.5% Pacific and 2.8% of NZ European.\(^{130}\)
- Among people of advanced age (> 80 years, n=937)), the prevalence of AF was 30% among Māori, compared with 21% among non-Māori.\(^{131}\)

Patients with AF are predominately managed in primary care health services (fee-for-service basis), medications, such as anticoagulants, are publicly subsidized by a national funding agency (PHARMAC), and specialist evaluation/investigations are available by referral to publicly funded secondary care services. Available data suggest a significant burden of AF among people in NZ, particularly for Māori and Pacific peoples, in whom AF can occur 20 years earlier than non-Māori/non-Pacific. Currently, no systematic screening programs for AF are available in NZ. Several research studies are planned to determine optimal screening approaches for the detection of AF in NZ.
To date, there has been no attempt to implement screening for AF in Norway. One research project investigated the benefit of systematic 12-lead ECG screening among 75 years old individuals in two counties west of Oslo, identifying 10 previously undiagnosed AF cases in the 916 individuals screened (1.1 %). Another ongoing study is investigating the benefit of a two-week intermittent “thumb”-ECG screening in 65 years old subjects. Compliance with national and international guidelines for antithrombotic treatment is relatively high.

Norway has a well-organized primary healthcare system, where all citizens have been assigned to a personal primary care physician. Of note, there is high awareness of AF among primary care physicians. All Norwegian citizens have their own unique 11-digit national identifier and are registered in a national civil registry with name and current address, facilitating access to all citizens. However, centralization of AF screening may be complicated by the fact that most of Norway is rural, with few densely populated areas.

AF screening is currently under evaluation in Norway; however, more data is needed to define the preferred method of AF detection, age groups to target, and screening intervals. Thus, it is too early to give firm recommendations regarding screening for AF in Norway.
Singapore

There are no AF-SCREEN members in Singapore, but there has been a community screening study performed a decade ago using a standard ECG as part of a longitudinal ageing study, but with a younger patient population than usual, starting at age 55.\textsuperscript{133}
Sweden

*Emma Svennberg, Marten Rosenqvist, Leif Friberg, Johan Engdahl*

**Country:** Sweden  
**Population:** 9.9 million

**Screening**
Population-based AF screening in Sweden was initiated by a stepwise AF screening program inviting all 75/76-year olds, n=1330, residing in the municipality of Halland in the southwest region of Sweden to AF screening. The attendance was 64%, and screening was performed by one initial 12-lead ECG followed by intermittent ECG recordings for a fortnight in individuals with CHADS2 ≥2. Of the 403 participants who completed the entire screening programme new AF was detected in 7.4%.

Screening using twice daily handheld ECGs for 28 days in 928 individuals in the primary care/outpatient setting with CHADS2≥1, mean age 70.7 years, detected 3.8% AF.

Inclusion in a randomised mass-screening study in 75/76-year olds, the STROKESTOP study, was completed in June 2014 and included residents in the capital region of Stockholm and the rural Halland region. Of 1331 participants invited to screening 54 % (7 173) attended the screening program, which included 14 days twice daily intermittent 1-lead ECG recordings. Of the screened population new AF was detected in 218 participants (3 %), and in addition 2.1 % were found to have undertreated known AF. Of participants with new AF > 90% were commenced on oral anticoagulants. The screening program was found to be cost-efficient, with a cost of €4 313 per gained QALY. The Swedish government agency of Dental and Pharmaceutical Benefits concluded that the benefits of primary preventive screening with thumb ECG in 75-year olds is large enough to justify costs of screening.

**National implementation**
Healthcare in Sweden is funded by the government, and financed mainly through taxes from the municipalities and county councils. Screening would likely reduce costs for the entire society, however the initial costs for the county councils (who pay for screening and acute stroke care) might increase. The costs for rehabilitation after stroke is carried by the municipalities and would likely be reduced.

The Swedish National Board of Health and Welfare are in the process of deciding if population screening for atrial fibrillation should be initiated. One caveat is that the final results from the STROKESTOP study are not yet complete, and the endpoint of reduction of ischemic stroke and mortality are yet to be addressed.
Switzerland

David Conen, Derk Krieger

Switzerland has one of the highest life expectancies worldwide, it is therefore expected that AF is and will be a major public health issue. Unfortunately, specific data on AF prevalence and incidence in Switzerland are currently lacking. One major current effort is the establishment of a large national cohort study of patients with AF, focusing on the association between AF, structural brain damage and cognitive decline. Swiss-AF is funded by the Swiss National Science Foundation and most large hospitals in Switzerland are participating.

We are not aware of any current or previous efforts to screen for previously unknown AF in Switzerland. European guidelines for AF management currently recommend taking the pulse in individuals aged 65 years or older, and these recommendations are regularly highlighted in a non-systematic way by experts in Switzerland.

If future efforts for AF screening in Switzerland want to be successful, they have to involve health care providers, professional organizations, health insurance companies and political stakeholders. One of the advantages of the Swiss health care system is compulsory health insurance coverage for all individuals living in Switzerland. One of the key disadvantages is the federal structure giving a lot of independence to individual states for deciding on health related issues, such that a national campaign or policy will be more difficult to implement.
Incidence of AF, unknown AF in Thailand & use of OAC

About 30% of Thai elderly age > 65 years is likely to have asymptomatic AF. Phrommintikul Arintaya surveyed and obtained ECG from 1,277 of 10,805 who were older than 65 years from Maerin districted in Chiang Mai. The mean age 73.1 ± 6.4 years and female 46.4%. AF was found in 24 subjects with the prevalence of 1.9% (95% CI: 1.12%-2.48%). 17 of these 24 were previously know to have AF. Incidence of AF increase with age 1.5% for 65-74 years, 2.2% for 75-84 years and 2.8% for patient older than 85 years. Patients with AF were significantly older (75.4 ± 6.5 years vs. 73.1 ± 6.4 years), had higher prevalence of heart failure (20.8% vs. 0.1%), ischemic heart disease (16.7% vs. 1.1%), valcular heart disease (29.2% vs. 0.1%), chronic obstructive pulmonary disease (16.7% vs. 2.6%), hyperthyroidism (8.3% vs. 0.9%) and prior stroke (16.7% vs. 0.8%), all P-value < 0.05. 17 of 24 patient had NVAF among these, 16/17 has CHA2DS2-VASc >= 2, mean 3.4±1.2. Of these NVAF patients 3(17.6%) had previous stroke/TIA, only 7(41.2%) were on OAC.140

Close to half of patient with acute stoke and AF are likely to be asymptomatic AF. Sutamnartpong looked at 204 consecutive patient with acute stoke, 46 (22%) were found to be in AF or PAF from ECG or during monitoring. Of these 46 patients 22(47%) were not know of AF, presumably these were asymptomatic patients.

AF is one of a major medical issues in Thailand. Narongrit Kasemsap studied the Thailand national reimbursement databases from the universal coverage system (cover 75.2% of Thai population) during the fiscal year 2004-2012. The total number of ischemic stroke in in-patients was 277,291 patients and 30149(8.1%) of 277,291 patients who suffered ischemic stroke had AF. Mortality rate in AF group was significant higher than non-AF group (14.1% vs 6.2%; p<0.001). The expenditure per patient in AF group was significant higher than non-AF group (36,192 bath vs 18,816 bath; p<0.001).142

Apiyasawat also looked at the Thai government provided health insurance database from 2005-2010. The hospitalization rate for AF was 15.5 per 100,000 person-years. By the 72-month follow-up (average 46 months), 3948 patients (44.0%) had died.143

The use of OAC is reasonable, Jedsadayanmata identified 369 NVAF from 531 AF patients, there were 138 (37.4%) had CHADS2 score > or =2. Among high-risk patients, 70.3% were prescribed warfarin while 19.6% received only antiplatelets and 10.1% received no antithrombotic therapy.144

AF screening program and results

As part of APHRS effort to increase public awareness on atrial fibrillation (AF) in Asia-pacific region, APHRS initiated a joint collaboration with its member countries to achieve the objective. Simultaneously on July 2, 2016, Taiwan, Singapore and Bangkok organized an event to raised public awareness on AF and its association with stroke. In Bangkok, under the leadership of Associated professor Khanchit Likkitthanasombat, the chief of Thai EP club and president elected of the Thai heart association of Thailand under the royal patronage of H.M. the King, arranged the 1st “AF day”
a 5 km free walk/run event with public forum in the early hour of July 2, 2016. To reach out to more population, pre-event programs were used including TV and radio interviews, morning TV news, and health magazine article on AF. As well as social networking to reach out We coined a new term in Thai for AF “ hui jai ten rarik” a more catchy term, to make AF more memorable for the public.

During the campaign there were 3 key messages:
1. AF is a common cause of severe stroke
2. Stroke from AF is preventable
3. AF could detect by checking one’s pulse

The result of the campaign was difficult to determine, considering the cost of assessing AF harness survey would be quite costly. However we a planning to do this event annually.

Recommendations about AF screening in Thailand:
• anything that involved costly technology would be problematic.
• We should raise public awareness of AF and stroke.
• We should teach high risk population to check their pulse daily is.
Uruguay
Walter Reyes Caorsi

Uruguay borders on the west with Argentina and on the north and northeast with Brazil; on the east and south it borders the Atlantic Ocean and Rio de la Plata. It has a land area of 176,215 km² and topography of low, rolling hills, vast plains, and a fertile coastline. Its climate is temperate. The government is a representative democracy, with executive, legislative and judicial branches. The capital is Montevideo, and there are 19 administrative departments and 89 municipalities. See: Health in the Americas. PanAmerican Health Organization (PAHO), World Health Organization (WHO). 2012 Uruguay. www.who.int. Global Health Observatory (GHO) Data

AF screening attempts
With the support and background of Arrhythmia Alliance (www.aa-international.org/uy), a “Check your Pulse” program was initiated in 2012 in a school of the Department of Colonia (west coast of the country) teaching children of 10-12y.o. about this maneuver and its importance. Children were committed to check the pulse of their relatives and neighbors.

Material of support from Arrhythmia Alliance was translated and handed off in every activity. With the most motivated children, “Check your Pulse” activities were performed in Shopping Malls, Fairs, etc. The program won an award from the University of the Republic and the project was presented and published in the “VI Joint Conference about Learning Technologies” in June 2014 in the Humboldt International University, Miami, USA. Also, the program was declared of special interest by local political authorities.

Some isolated experiences were also performed in Montevideo (Capital City) schools. The target is to try and implement this program in all the schools across the country. In addition, I performed activities to promote the program such as: the media, in diverse non-Medical events and Fairs, in Cardiology Meetings, as well as with relatives of patients admitted in the Hospital. We have always received the support of the “Uruguayan Society of Cardiology” and of the “Honorary Commission of Cardiovascular Health”.

To my knowledge there are not others programs of AF screening in the country.

Limitations
Limited budget support: a pharmaceutical company covered the cost of printing brochures and organizing a few events. We are yet to receive support from government entities. So far it has been a personal project.

Approximately 925,000 patients are recorded on general practitioners register (QOF - 2014/2015: http://www.hscic.gov.uk/catalogue/PUB18887) with a diagnosis of AF – prevalence of 1.63%. Public Health England and the National Cardiovascular Intelligence Networks (http://www.ncvin.org) estimate the true prevalence closer to 2.4%. Therefore, approaching half a million patients are estimated to have as yet undiagnosed AF.

Nationally, National Institute for Health and Clinical Excellence (NICE) produced guidance on the management of atrial fibrillation and whilst general population screening was beyond the scope, the guidelines state that targeted/opportunistic screening of symptomatic patients or those with risk factors may allow identification of AF patients.

However, in May 2014, a report for the national screening committee on screening for atrial fibrillation in people aged 65 recognised that whilst the proposal would produce more benefit than harm at population level, there was uncertainty as to whether such a programme would be cost-effective (http://legacy.screening.nhs.uk/policydb_download.php?doc=446). They also raised that current NHS management of AF that is detected through routine clinical practice is known to be frequently poor, both because patients who should receive anticoagulants do not receive anticoagulants, and because treatment with warfarin is often problematic.

They summarised that before introducing a screening programme, the NHS should first demonstrate that it is managing AF much better than it has done to date, because it would be unethical to introduce a screening programme without being confident that screen-detected patients would be well managed. The policy is schedule for review in 2017.

However, despite the formal position, there are numerous research projects to demonstrate the cost-effectiveness and high prevalence of AF, and regional variations within the UK. Scotland for example has undertaken a national AF screening pilot which is being reported to National Advisory Committees, whereas across the remaining home countries, there are better and less performing areas. The Arrhythmia Alliance and AF association has led on ‘know your pulse’ campaigns (http://www.hearthrhythmalliance.org/aa/uk/know-your-pulse) working in partnership with GP surgeries, pharmacies and schools to raise awareness of AF.

With the interest of medical technology, NICE has produced a medical technology guidance on WatchBP (WatchBP Home A for opportunistically detecting atrial fibrillation during diagnosis and monitoring of hypertension NICE medical technology guidance [MTG13] Published date: January 2013) and a medtech innovation briefing (MIB) on the AliveCor Heart Monitor and AliveECG app for detecting atrial fibrillation. AliveCor was also selected to be part of the NHS Innovation Accelerator. The aim of which is to create conditions and cultural change necessary for proven innovations to be adopted faster and more systematically through the NHS, and to deliver examples into practice for demonstrable patient and population benefit.
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