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Review

Screening for atrial fibrillation with automated blood pressure measurement: Research evidence and practice recommendations

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ABSTRACT

Several guidelines recommend opportunistic screening for atrial fibrillation (AF) in subjects aged ≥65 years using pulse palpation during routine blood pressure (BP) measurement. However, this method has limited diagnostic accuracy. A specific algorithm for AF detection during automated BP measurement was developed and implemented in a novel oscillometric device (Microlife WatchBP Home-A). In 2013, the UK National Institute for Health and Care Excellence (NICE) recommended this device for AF screening during routine office BP measurement in primary care in subjects ≥65 years. A review and meta-analysis of the evidence on the diagnostic accuracy of this algorithm were performed. Six studies (n = 2332) investigated the accuracy of AF detection using the Microlife BP monitor and estimated a pooled sensitivity at 0.98 (95% CI 0.95, 1.00) and specificity 0.92 (0.88, 0.96). Analysis of 4 studies (n = 1126) showed more readings to improve specificity (from 0.86 to 0.91) and sensitivity (from 0.97 to 0.99). Taking 3 sequential readings with at least 2 detecting AF gave the highest diagnostic accuracy. A single study (n = 139) of paroxysmal AF screening with home BP monitoring (3316 days) showed sensitivity 99% and specificity 93%. Another study (n = 46) of AF screening with 24 h ambulatory BP monitoring showed that AF detected in >15% of all readings has high probability of AF diagnosis requiring confirmation by 24 h electrocardiography. AF detection with routine automated BP measurement is a reliable screening tool in the elderly, which requires confirmation by electrocardiography. Paroxysmal AF might also be detected by routine automated home or ambulatory BP monitoring.

1. Introduction

Atrial fibrillation (AF) is the most common sustained cardiac arrhythmia and an important risk factor for stroke [1]. Its prevalence is estimated at 1–2% of the general population [2,3] and increases with age from 0.5% at 40–50 years to 5% in subjects over 65 years, and 14% in those over 85 years [4,5]. However, there is evidence that the true prevalence of AF is much higher [6,7]. The reasons why AF frequently remains undetected are straightforward. Approximately one third of people with AF have no clear symptoms [8,9], and even in symptomatic cases, these are attributed to other reasons. In addition, in case of paroxysmal AF (pxAF), episodes of the arrhythmia may be of short duration and therefore difficult to detect [8]. These issues suggest the need of more extended and reliable AF screening [10].

2. Screening for AF

The importance of AF screening is increasingly recognized and recommended by most cardiovascular societies [11–16] (Table 1). Since hypertension is the most important risk factor of AF and showed to affect up to 90% of the participants in AF trials [17], most guidelines recommend pulse palpation to be performed in primary care clinics during routine blood pressure (BP) measurement in patients aged 65 years and older; so-called opportunistic screening [18].

Pulse palpation, although inexpensive, has moderate diagnostic accuracy with sensitivity and specificity values of 87 and 81%, respectively [19]. The consequence of this low sensitivity might be an increase in AF related morbidity and mortality. Moreover, low specificity comes at high costs and an increased burden for health care. Due to the low prevalence of AF of approximately 8% in subjects of 65 years and older [19] low specificity leads to too many false positive findings. Since patients in whom an arrhythmia is detected need to be referred for a 12-lead electrocardiography (ECG) for confirmation [18] (£31, $46; prices NHS 2011) this comes at higher costs. The SAFE study

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Table 1
Recommendations for screening of AF from scientific societies.

ESC 2012 [11]	Opportunistic screening for AF in patients ≥65 years of age using pulse-taking followed by an ECG is recommended.
AHA/ACC/HRS 2014 [12]	ECG documentation is recommended to establish the diagnosis of AF.
CSS 2010 [13]	It is incumbent upon the physician to document AF in at least one ECG lead, when "irregularly irregular" palpations are perceived.
AAN 2014 [14]	In patients with cryptogenic stroke without known non-valvular AF clinicians might obtain outpatient cardiac rhythm studies, to identify patients with occult AF.
NICE 2014 [15]	An ECG must be performed in all people, whether symptomatic or not, in whom AF is suspected because an irregular pulse has been detected.
NICE 2013 [16]	WatchBP Home A should be considered for use in people with suspected hypertension and those being screened or monitored for hypertension, in primary care. People suspected of having AF after use of WatchBP Home A should have an ECG.

AF, atrial fibrillation; ESC, European Society of Cardiology; AHA, American Heart Association; ACC, American College of Cardiology; HRS, Heart Rhythm Society; CSS, Canadian Cardiovascular Society; AAN, American Association of Neurology; NICE, UK National Institute of health and Care Excellence.

showed that, only one in every 5.7 referrals for an ECG due to an irregular pulse identified with palpation, was confirmed as having AF [19].

Another practical problem with pulse palpation as a screening method for AF during routine BP measurement in the office is the fact that the auscultatory BP monitors (mercury and aneroid) are being progressively banned from clinical use and are usually replaced by automated electronic devices [20,21]. Unless the latter devices are able to automatically detect AF, or a physical examination by the doctor is performed during each visit (which is usually not the case in routine practice), there is a risk that cases with asymptomatic AF might be missed during the clinic visit. Thus, there is much room for improvement, which may be accomplished by replacing manual pulse palpation with a more accurate technological innovation for AF screening.

Apart from the importance of the diagnostic accuracy of a screening test (sensitivity, specificity), in the case of AF screening there is an additional issue due to patients having pxAF, which carries similar risk of stroke as permanent AF. Thus, screening at multiple time points, e.g. using 24-h Holter ECG, an event loop recorder (ELR) system or an implantable cardiac monitor may significantly improve AF detection [6,7,22,23]. Indeed, the application of innovative devices in patients with cryptogenic strokes demonstrated increased detection of AF by a factor of more than five [6] and seven [7] compared to standard practice after an extended screening period of 30 days and 3 years, respectively.

It is important to note that although the ECG certainly remains the gold standard for AF diagnosis, this is very accurate only when carried out by a specialist. This was clearly shown in a study that compared the AF diagnosis made by general practitioners, and a computer software algorithm using a 12-lead ECG, versus a reference diagnosis made by two cardiologists [24]. The general practitioners' diagnosis proved to be imperfect with a sensitivity of 80% and specificity of 92%. When taking into account the general practitioner's diagnosis together with the interpretative software (either or both positive), the diagnostic performance was improved, but only reached a sensitivity of 92% and specificity of 91% [24]. The investigators concluded that many primary care professionals cannot accurately detect AF on an ECG, even when helped by an interpretative software [24]. Self-diagnosis by patients of the pulse irregularity as a screening test for the detection of AF has been evaluated in a community education program with 4322 participants [25]. Unfortunately, 27% of the trained participants could not find their pulse, and of those who did, 9% could not tell whether it was irregular [25]. Table 2 provides an overview of the diagnostic results of several standard methods for AF screening that are used in clinical practice [19,24–26].

3. Arrhythmia detection during automated BP measurement

Several BP monitors with irregular heartbeat (IHB) detector (also called arrhythmia detectors) are available on the market for a long time. These devices generally have an algorithm which signals when the heartbeat rhythm varies by more than 25% from the average heartbeat detected during BP measurement [27]. A few clinical studies investigating the accuracy of IHB in detecting AF showed high specificity for IHB but at a cost of low sensitivity [28–30] which led to the conclusion that the IHB detector should not be used for AF screening [30].

The US Food and Drug Administration (FDA) has provided clearance (otherwise known as a 510(k)) for several of these IHB detector BP monitors. According to the FDA, specific manufacturer's claims should be accompanied by respective and appropriate evidence [31]. In that context it may seem strange that these IHB detecting monitors were cleared without clinical evidence supporting the diagnostic accuracy of the IHB detecting algorithm. The reason for this is because, according to the FDA, an "irregular heartbeat detection feature" claim does not present a "disease" diagnosis. The main purpose of the IHB detector, therefore, is not to diagnose arrhythmias but rather to serve as a warning message indicating that the BP reading may not be accurate because of the presence of arrhythmia [32].

4. AF detection during automated BP measurement

An "AF detector" is considered to be a tool specific for AF screening. In contradiction to "IHB", the claim "AF" represents a disease diagnosis according to the FDA. Therefore, its clinical application and performance must be supported by adequate research evidence for obtaining FDA clearance. The available clinical evidence for the AF detecting algorithm resulted in the FDA clearance "by prescription" which means that reasonable assurance of the device's safety and effectiveness for detecting AF has been provided. The difference between IHB and AF becomes straightforward with full understanding of both algorithms and their purpose. However, in daily practice it appears that most consumers and even clinicians do not recognize this difference. This not only leads to confusion and misuse, but can also have important clinical consequences when the IHB algorithm is used for AF screening [30] since it is not designed and approved for this indication (Personal communication).

There is only one algorithm for the evaluation of pulse irregularity during automated BP measurement which has been specifically developed for AF detection (Microlife AG, Switzerland) [33]. The AF detecting

Table 2
Standard methods for atrial fibrillation screening and diagnosis.

Method/trial	N	Age (years)	Outcome
Self-pulse palpation by trained patients [25]	4322	>50	27% could not find their pulse and of those who did, 9% could not tell whether it was irregular.
Pulse palpation during office blood pressure measurement [19]	3278	≥65	Sensitivity 87%, specificity 81%
12-lead ECG by General practitioner [24]	2595	≥65	Sensitivity 80%, specificity 92%
12-lead ECG by General practitioner and interpretative software [24]	2595	≥65	Sensitivity 92%, specificity 91%
One-lead ECG with auto-analysis [26]	1000	≥75	Sensitivity 99%, specificity 87%

ECG, electrocardiography.

algorithm is distinct from that for BP measurement, and its accuracy requires verification against ECG [26,34,35]. Since, the AF detector operates independently of the BP measurement algorithm, it is not restricted to a single device but can be implemented in other BP monitors. The AF detector functions as follows: the device measures the last 10 pulse intervals during cuff deflation and calculates the mean and standard deviation (SD) of the intervals. Each of the 10 pulse beat intervals that is 25% longer or 25% shorter than the mean time interval is discarded, in order to reduce the effect of premature beats. The remaining time intervals are used to calculate the irregularity index, defined as the SD divided by the mean of the time intervals [34]. If the irregularity index exceeds a threshold value of 0.06 [34], an AF symbol is displayed on the LCD screen of the monitor indicating that the patient has AF [34,35].

To date, 6 published clinical trials investigated the diagnostic accuracy of AF detection with automated BP measurement [26,30,34–37]. All these studies compared the results of the BP monitor against 12-lead ECG interpreted by cardiologists and reported sensitivity, specificity and accuracy values (Table 3).

The diagnostic accuracy of AF detection during automated BP measurement depends on the number of readings obtained. Thus the devices designed for office or home use automatically perform 3 sequential BP measurements and provide the average BP value together with a yes/no report for AF presence. There are 3 reasons in favor of triplicate BP measurement for AF detection. First, clinical studies suggested that 3 measurements provide a better estimation of a patient's true BP as compared to single measurements. Both the AHA [38] and ESC [39] guidelines recommend taking at least two BP measurements, and additional measurements if the first two are "quite different" [39] or differ by at least 5 mmHg [38]. Second, due to the problematic estimation of BP in patients with AF, at least 3 sequential BP measurements are recommended [40]. Third, the diagnostic accuracy of the AF detecting algorithm (sensitivity and specificity) is improved with triplicate measurement [41].

A meta-analysis of the 6 relevant studies (n = 2332), as presented in Table 3, was performed using "direct pooling" of aggregate-level data for estimating sensitivity and specificity in AF detection [42]. Random rather than fixed effects models were performed as more appropriate for balancing weights across large and small studies and to allow for variation in study effects, due to the expected dispersion in the effect size across studies. Meta-analysis was performed using the Stata/SE 11, Texas, USA software. Results were pooled weighted with inverse variances. The analysis revealed pooled estimates for sensitivity at 0.98 (95% CI 0.95, 1.00) and for specificity 0.92 (95% CI 0.88, 0.96) (Fig. 1). The required number of readings used for AF diagnosis was 2 out of 3 readings in 3 studies, 2 out of 2 in 1 study, and 3 out of 3 readings in 2 studies (Table 3). Four studies provided comparative data on the diagnostic accuracy of a single reading versus 2 out of 2, or 2 out of 3 readings in terms of sensitivity and specificity. By using a larger number of readings, a small improvement was achieved in sensitivity (from 0.97, 95% CI 0.93, 1.00 to 0.99, 95% CI 0.97, 1.00; Fig. 2) and in specificity (from 0.86, 95% CI 0.84, 0.89 to 0.91, 95% CI 0.89, 0.93; Fig. 3).

In the studies of the diagnostic accuracy, two different protocols have been used to define the AF diagnosis after taking 3 sequential BP readings: the so-called "majority rule" (2 of 3 readings should be AF positive to define AF) and the "3 out of 3 rule" (all 3 readings should be AF positive). The majority rule appears to lead to higher sensitivity at a cost of lower specificity compared to the 3 out of 3 rule. More specifically, the pooled sensitivity and specificity for the 3 studies (n = 676) using the "majority rule" were 0.98 (95% CI 0.95, 1.00) and 0.90 (95% 0.87, 0.93) respectively, whereas the respective values for the 2 studies (n = 1206) using the "3 out of 3 rule" were 0.94 (95% CI 0.88, 0.99) and 0.95 (95% CI 0.86, 1.00).

The majority rule appears to be more suitable for the clinic setting whereas the "3 out of 3" rule is probably more appropriate for long-term home monitoring. This is because in the clinic setting the number of visits and the opportunity to screen for AF are limited to a few times a year, so that a higher sensitivity would be required to compensate for the risk of missing AF. On the other hand, at home, where more frequent measurements are routinely taken, the chance of detecting AF is much higher. In addition, false positive readings can induce anxiety, which can be lessened by applying a measurement protocol with higher specificity.

5. Indications for AF screening with automated BP measurement

Opportunistic screening, i.e. pulse palpation in patients 65 years and older during a general practitioner (GP) consultation for any reason, followed by an ECG in case of irregularity, is the recommended screening method according to the guidelines of the European Society of Cardiology [3]. Opportunistic screening appears to be more effective than routine practice (OR 1.57, 95% CI 1.08 to 2.26) and less costly than systematic screening [43]. The effectiveness of screening in people younger than 65 years of age is thought to be low because of the low prevalence of AF in this population. Studies investigating the effect of screening in younger age groups are lacking and caution needs to be taken when extrapolating the results of screening studies from older to younger subjects [43]. However, screening for AF in very young patients has been shown to be problematic due to many false positive findings related to the high prevalence of sinus arrhythmia. Since the prevalence of AF for those younger than 55 years of age is estimated at 0.1% [44], screening for AF in younger subjects is not recommended. Another reason not to screen for AF in a young healthy population would be that this population would have a CHA_2DS_2-VASc score of 0 or 1 and thus no benefit

Table 3
Clinical trials assessing the diagnostic accuracy of AF detection algorithm of the Microlife automated blood pressure monitor, against 12-lead electrocardiography interpreted by cardiologists.

	Patients	Age (years)	AF Prevalence (%)	Readings Used	Readings used for diagnosis≠	Sensitivity (95% CI)	Specificity (95% CI)	Accuracy (%)
Wiesel 2004 † [36]	450 Outpatients	69	53 (12)	1	1	1.00 (0.97–1.00)	0.84 (0.81–0.86)	86
				2	2	1.00 (0.94–1.00)	0.92 (0.87–0.93)	92
Stergiou 2009 [35]	72 Outpatients	71	27 (37)	1	1	0.93 (0.74–0.99)	0.89 (0.76–0.96)	90
				2	1	1.00 (0.84–1.00)	0.76 (0.60–0.87)	85
				3	2	1.00 (0.84–1.00)	0.89 (0.75–0.96)	93
Wiesel 2009 [34]	405 Outpatients	73	93(23)	1	1	0.95 (0.93–0.98)	0.86 (0.84–0.89)	87
				3	2	0.97 (0.91–0.99)	0.89 (0.85–0.92)	91
Wiesel 2014 [30]	199 Outpatients	74	30 (15)	1	1	0.97 (0.81–1.00)	0.90 (0.84–0.94)	91
				3	2	1.00 (0.86–1.00)	0.92 (0.86–0.96)	93
Kearley 2014 [26]	999 Primary care	80	79 (8)	3	3	0.95 (0.88–0.99)	0.90 (0.88–0.92)	90
Gandolfo 2015 [37]	207 Stroke*	78	38 (18)	3	3	0.89 (0.77–0.96)	0.99 (0.96–1.00)	97

AF, atrial fibrillation; ≠, Number of readings indicating AF which are required for AF diagnosis; *, 4 subjects had atrial flutter which the device detected as AF and were considered by the researchers as false negative; †, The Microlife AF detector was implemented in a different device.

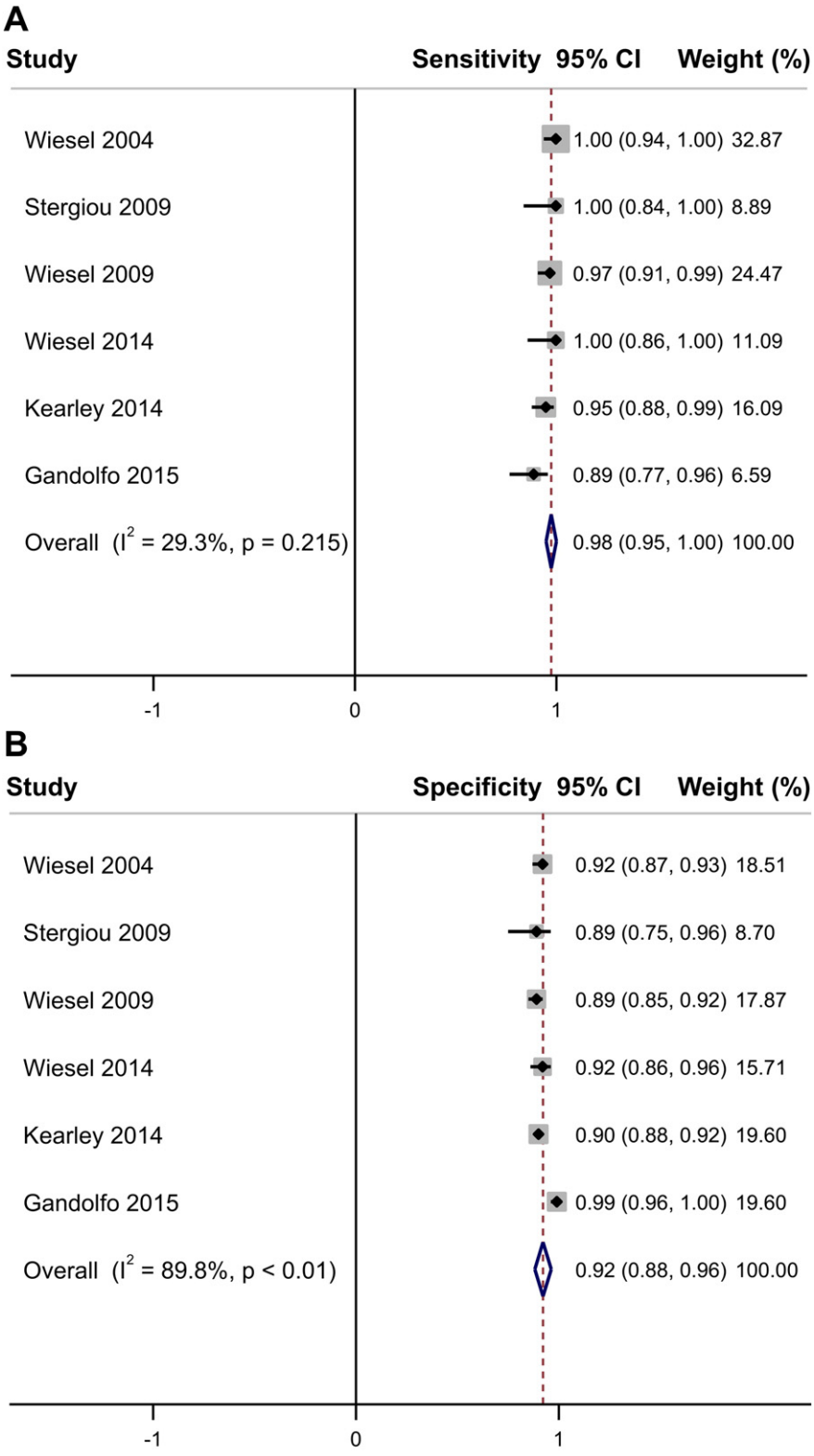

Fig. 1. Forest plot of pooled estimates for sensitivity (A) and specificity (B) of AF diagnosis with automated BP measurement.

would be anticipated from routine administration of oral anticoagulant agents in case of AF [45].

Although the AF detector during automated BP measurement appears to be modestly capable to distinguish AF from several other arrhythmias, the chance of false positive findings may be increased in the presence of multiple premature ventricular (specificity 62%) or atrial (43%) beats and also with sinus arrhythmia. Therefore, the oscillometric BP monitor with AF detector is not suitable for use in children [46] or pregnancy because in these cases sinus arrhythmia is common [47,48].

It may be considered also appropriate to screen patients aged >50 years with cardiovascular risk factors because, as compared to the general population, diabetes leads to a 1.4- and 1.6-fold (men and women) risk, and hypertension to a 1.5- and 1.4-fold risk for developing

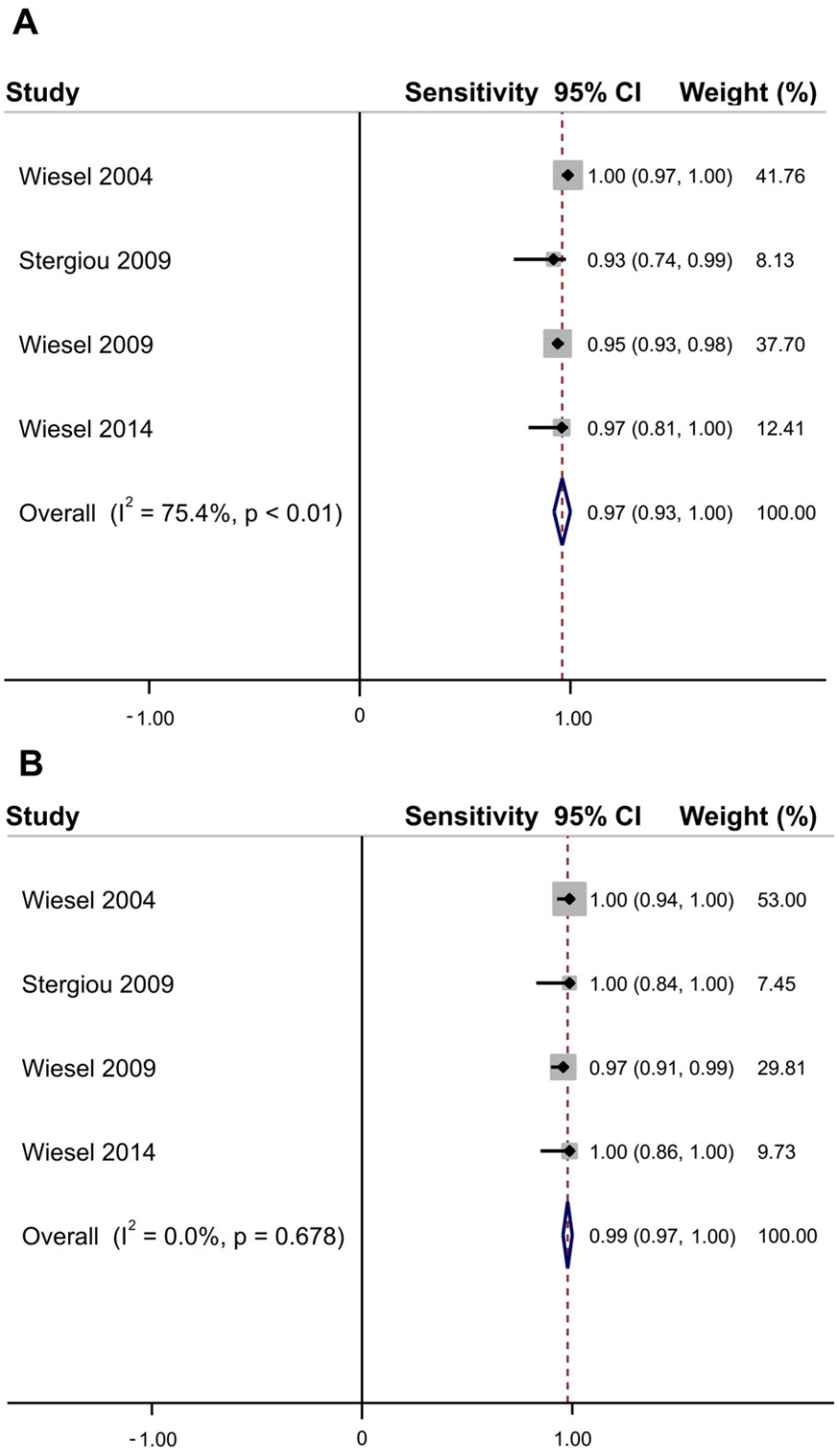

Fig. 2. Forest plot of pooled estimates for sensitivity of AF diagnosis with automated BP measurement by using a single (A) or more than one reading (B).

AF, respectively [49]. However, presently there is no such recommendation for these high-risk subjects.

6. AF detection during automated out-of-office BP monitoring

Since AF is often asymptomatic or paroxysmal, the potential of screening the elderly hypertensives in multiple occasions out of the office during routine BP monitoring appears challenging. Both self-home and 24-h ambulatory monitoring offer the opportunity of repeated evaluation for AF in the usual environment of each individual.

Subjects suspected of having pxAF (e.g. those with transient ischemic attack or minor stroke), are evaluated with 24–48 h ECG (Holter), which might be followed by an ELR system for several weeks [6,22,23]. The disadvantage of the ELR is that it is costly, mainly due to the need of a technician and data transmission [50]. AF detection during

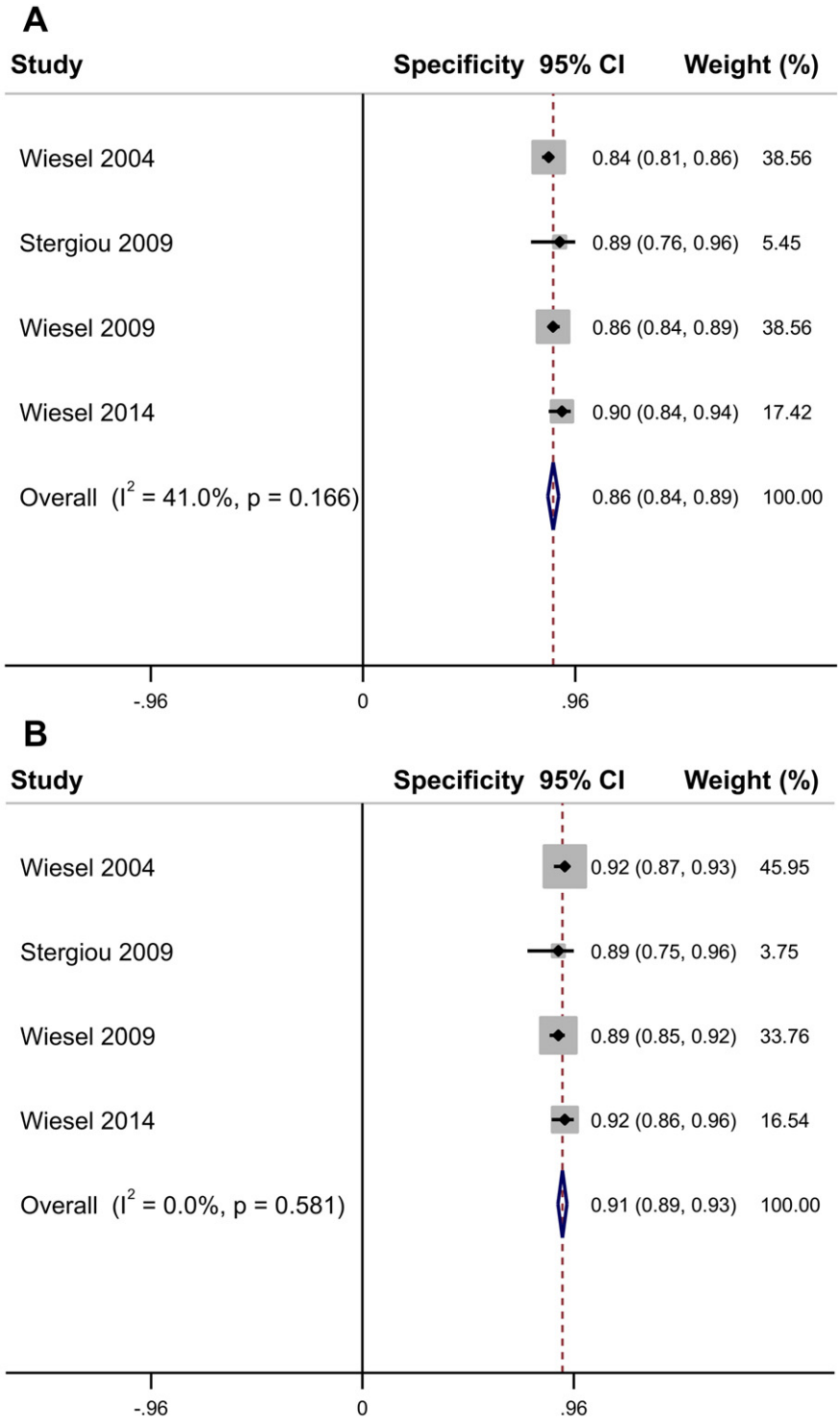

Fig. 3. Forest plot of pooled estimates for specificity of AF diagnosis with automated BP measurement by using a single (A) or more than one reading (B).

routine self-monitoring of BP using automated devices by hypertensive patients at home has the advantage that it can be widely used in the population to screen for AF and may be a more cost effective alternative to the current screening approach. When considering that hypertension is the most important cardiovascular risk factor for AF [49] and approximately 80% of AF patients have hypertension [17], it is expected that many patients at high risk for AF already have hypertension and are familiar with self-home BP monitoring. AF detection with automated BP measurement at home has been compared against ELR for detecting pxAF in a population of 139 outpatients (14 with known AF) at risk of stroke aged 65 years and older with hypertension [51]. Participants measured themselves daily at home using the BP monitor with AF detection and these readings were compared with ELR. At the end of the study there was a total of 3316 days with BP monitor readings and ELR. On the basis of the daily BP measurements, the BP monitor demonstrated sensitivity of 99% and specificity of 93% for detecting AF. In addition, two subjects with no histories of AF were detected with the BP monitor [51].

Twenty-four hour ambulatory BP monitoring is more reliable and cost-effective than office BP measurement for diagnosing hypertension [52]. Several guidelines recommend ambulatory monitoring for confirming the office BP elevation [16,39] and the UK National Institute for Health and Care Excellence (NICE) guidelines have recommended this method for all subjects with suspected hypertension [18]. Consequently, an increasing number of patients are evaluated with ambulatory BP monitoring in routine clinical practice.

The AF detecting algorithm has been implemented in an ambulatory BP monitor (WatchBP O3 AF, Microlife AG) aiming to facilitate the identification of pxAF. A preliminary study investigated 46 elderly hypertensives with simultaneous 24-h ambulatory BP with AF detector and 24-h ECG (Holter) [53]. In those with permanent AF on average 5.1 ± 2.5% of all BP measurements were false negative, and in those with sinus rhythm 7.3 ± 8.2% of the readings were false positive for AF. One patient with history of minor stroke and sinus rhythm in the office was diagnosed with pxAF confirmed by both the Holter ECG and the ambulatory BP device. Seven non-AF subjects had >15% of their BP readings with false positive AF (mean 33 ± 17%). One of them had constant Mobitz I atrioventricular block, whereas in the others the main arrhythmia was frequent supraventricular premature beats, mainly in the form of couplets. In a reading-to-reading analysis compared to ECG, sensitivity and specificity in diagnosing AF were 91% and 85% respectively (unpublished data). The authors suggested that a threshold of >15% AF positive readings might be proposed to require 24-h Holter ECG recording for confirming AF or other important arrhythmias. However, these results are preliminary and more research to define the optimal diagnostic approach based on ambulatory BP monitoring is required.

7. Automated BP measurement accuracy during AF

Whether BP can be measured accurately with an oscillometric device in patients with AF is still a matter of debate [40,54,55]. A meta-analysis of rather heterogeneous trials demonstrated that the oscillometric devices are relatively accurate in measuring systolic but not diastolic BP [56]. However, this meta-analysis is based on comparisons to manual BP measurement which is also prone to errors in the presence of AF [57]. Pagonas et al. performed a cross-sectional study in 102 patients (50 with AF) to assess the accuracy of oscillometric BP measurement as compared to invasive BP measurement and showed that both systolic and diastolic BP values (mean of 3 readings) did not significantly differ in the presence or absence of AF [57]. The authors concluded that the current guidelines recommending repeated BP measurements using sphygmomanometry in AF may also apply to oscillometry.

8. UK NICE recommendation on AF detection with automated BP measurement

The UK NICE which provides guidance for medical decisions in the National Health Service (NHS), has implemented a Medical Technologies Guidance programme (MTG) [58], which evaluates innovative medical technologies aiming to assist the NHS in adopting efficient and cost effective medical devices and diagnostics more rapidly and consistently. In 2013 the NICE recommended the automated oscillometric BP monitor WatchBP Home A (Microlife AG, Widnau, Switzerland) for routine office BP measurement in patients aged 65 years and older in primary care [16,59]. It is important to note that this indication by the NICE is specific to the Microlife WatchBP AF detecting algorithm and does not apply to any other arrhythmia detector implemented in BP monitors [16,59]. Given the high diagnostic accuracy of the AF detector as shown in the abovementioned clinical studies (sensitivity and specificity 90–100% [26,30,34,37]), the NICE anticipates that this will lead to stroke prevention (between 53 and 117 fewer fatal strokes, and 28 and 65 fewer nonfatal strokes) and cost savings due to lower hospital costs for stroke treatment (£2.98 [$4.77 for subjects aged 65–75 years] and £4.26 [$6.82, for those ≥75 years] [60].

Table 4
Recommendations for AF detection with automated BP measurement.

Measurement	Recommendation
Office BP	• Indicated for AF screening in subjects aged ≥65 years (NICE). No evidence for indication for younger subjects • Obtain 3 consecutive BP measurements. If ≥2 suggest AF, the diagnosis is highly possible and should be confirmed by ECG.
Home BP	• Long-term self-monitoring of BP by elderly hypertensives might allow early detection of asymptomatic AF. • Repeated monitoring might identify paroxysmal AF.
Ambulatory BP	• Might detect paroxysmal AF during routine evaluation of BP in elderly hypertensives. • Preliminary results suggest that AF detected in >15% of 24 h readings has high probability of AF diagnosis and requires confirmation by ECG.

AF, atrial fibrillation; BP, blood pressure; ECG, electrocardiography; NICE, UK National Institute of health and Care Excellence 2013 [16].

A recent study by Kearley et al. assessed the performance of the WatchBP Home A and two single-lead ECG devices, as diagnostic triage tests for the detection of AF among 1000 ambulatory patients aged ≥75 years from 6 General Practices in the UK (AF prevalence 7.9%) [26]. As compared against the reference standard (12-lead ECG, independently interpreted by cardiologists) all three devices had a high sensitivity (93.9–98.7%) and are thus useful for ruling out AF. However, the authors concluded that WatchBP is a better triage test than Omron autoanalysis because it is more specific; 89.7% (95% CI 87.5% to 91.6%) compared to 78.3% (95% CI 73.0% to 82.9%), respectively. Because this would translate into lower ECG referral the authors supported the NICE recommendation and confirmed the usefulness of the WatchBP Home A monitor in primary care [26].

9. Conclusion

Screening for AF in primary care is recommended for subjects aged 65 years and older. AF detection during automated BP measurement is feasible in primary care and appears to be superior to pulse palpation in terms of diagnostic accuracy for AF, and might be more accurate and cost-effective than 12-lead ECG by general practitioners. The AF detector differs from all other arrhythmia detectors implemented in many automated BP monitors in that it is specific for AF. The other arrhythmia detectors are rather warning signals that the BP measurement may not be accurate, than to diagnose arrhythmias. AF detection during automated BP measurement in clinical practice should be applied as follows (Table 4): Screening for AF is indicated in subjects aged 65 years and older. In younger subjects currently this is not recommended due to lack of evidence and increased prevalence of false positive results induced by sinus arrhythmia. Three sequential measurements should be taken and AF diagnosis should be confirmed by ECG. In suspected pxAF, repeated automated home BP monitoring with AF detector may be considered to increase the chance of AF diagnosis. AF detection during routine ambulatory BP monitoring in elderly hypertensives who are at increased AF risk might identify asymptomatic or paroxysmal AF.

Conflict of interest

WJV: is an employee of Microlife.

SO: Received lecture fees from Colpharma, the Italian distributor of Microlife AG.

AK: The author reports no relationships that could be construed as a conflict of interest.

GSS: Received consultation fees from Microlife AG and honoraria for educational lectures from Omron Healthcare.

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