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Screening and detection of atrial fibrillation in primary care: current practice and future perspectives

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Atrial fibrillation (AF) is a common arrhythmia associated with an increased risk of stroke, which can be effectively reduced by prophylaxis initiation and integrated care to reduce cardiovascular risk and AF-related complications. Screening for AF has the potential to improve long-term clinical outcomes through timely AF detection in asymptomatic patients. With the central role of primary care in most European healthcare systems in terms of disease detection, treatment, as well as record keeping, primary care is ideally situated as a setting for AF screening efforts. In this review, we provide an overview of evidence relating to AF screening in primary care. We discuss current practices of AF detection and screening, evidence from AF screening trials conducted in primary care settings, stakeholder views on barriers and facilitators for AF screening in primary care, and important aspects that will likely shape routine primary care AF detection as well as AF screening efforts. Finally, we present a potential outline for a primary care-centred AF screening trial coupled to integrated AF care that could further improve the benefit of AF screening.

Introduction

Atrial fibrillation (AF) is a common arrhythmia, with incidence increasing with age.[1] Patients with AF have a five-fold higher risk of ischaemic stroke.[2] Once AF has been established in a patient, effective prophylaxis and holistic cardiovascular care can be initiated. However, diagnosis of AF can be challenging due to its sometimes paroxysmal and asymptomatic forms.[3] Screening could therefore be a solution to close the gap between asymptomatic occurrence of AF and complications arising from the arrhythmia.[4]

Primary care has a central role in many healthcare systems. With a low threshold for patient encounters, and with medical specialists reporting their findings back to primary care, general practitioners (GPs) are well situated for early signalling of symptoms of progressing cardiovascular disease, as well as for having an adequate overview of patients' risk factors.[5] Furthermore, primary care is important for the follow-up of chronic diseases and for supporting treatment adherence, including in AF. This makes primary care one of the settings with high opportunities to perform screening interventions for AF. In the following paragraphs, we will provide an overview of the current literature on different aspects relating to screening for AF in primary care settings, followed by a glimpse into the potential role of primary care within future AF screening efforts.

The European Society of Cardiology guidelines and national implementation: towards screening in primary care?

The European Society of Cardiology (ESC) guidelines for the diagnosis and management of AF[3] recommend opportunistic

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AF screening by pulse taking or electrocardiogram (ECG) rhythm strip in patients ≥65 years of age (Class I recommendation) and to consider systematic AF screening in individuals aged ≥75 years or in those at a high risk of strokes (Class IIa recommendation). As a consequence, most European national guidelines integrated the ESC's recommendations on opportunistic case finding. For instance, the Dutch national guidelines recommend pulse palpitation with each blood pressure measurement, although this is not recommended only for patients ≥65 years of age but for every person.[6] Also, the National Health Services guidelines of the UK recommend an assessment of the heart rhythm in health check-ups among patients between 40 and 74 years old and the performance of manual pulse palpation followed by an ECG or Holter if indicated, in patients presenting for symptoms related to AF.[7,8]

Although opportunistic case finding is thus firmly anchored within European national guidelines, systematic AF screening programmes have generally not yet been recommended.[6,9] A recent study on perceptions by European GPs on AF screening found that only 12% of the participating GPs, based in Eastern, Western, Southern, and Northern Europe and UK/Ireland, indicated that an AF screening programme was established in their respective regions. The need for standardized AF screening was rated high (82.7 points on a scale from 0 to 100).[10]

Screening and detection of atrial fibrillation: current practice in primary care

Screening for unknowns and detection of suspected AF occur throughout the continuum of healthcare specialties. In some settings, the emphasis on screening is relatively high. For instance, in patients with recent ischaemic stroke, it is commonly accepted to systematically screen for AF as a cause of stroke and to potentially optimize secondary prophylaxis.[3,11] In primary care, given the broader spectrum of patients and reasons for encounter, screening and symptomatic detection more often go hand in hand. It is estimated that the majority of AF detection currently takes place in primary care when patients present with symptoms.[12] However, with changes in guidelines and through regional initiatives, opportunistic screening is increasingly encouraged, e.g. through awareness campaigns and the dissemination of single-lead ECG devices for AF detection among GPs and GP surgery staff.[13,14] Also in some settings, GPs even engage in what can be classified as systematic screening, e.g. by performing a 12-lead or single-lead ECG at annual check-ups in patients with diabetes mellitus or an otherwise elevated cardiovascular risk profile.[15]

Where and by whom is atrial fibrillation usually detected?

A thorough analysis of where and by whom AF is detected in routine practice was provided for the Dutch setting, in a *post hoc* analysis of the Detecting and Diagnosing AF (D_2AF) trial with inclusion and follow-up in 2015–18.[16,17] This showed that the irregular heartbeat leading to an eventual AF diagnosis was observed in primary care in 55% of cases, with 60% of those leading to an AF diagnosis by GPs themselves. Of all newly diagnosed AF cases, one in three was detected by GPs, approximately half by cardiologists, and the remainder by other physicians. Symptoms were the trigger for rhythm investigation in two-thirds of incident AF cases, 3.5% of new cases were detected after a recent stroke, and one in three was an incidental finding through routine care or screening (silent AF). Palpitations were the most commonly reported symptom in those with AF detection triggered by symptoms, with palpitations being reported significantly more often in patients aged 65–74 than in those aged ≥75 years. The most common device for AF confirmation at the time of analysis was 12-lead ECG (94% of cases), with Holter or event monitor and other methods (e.g. single-lead ECG) constituting the remaining 6% of cases.[16] A few other studies have assessed the chain of AF detection in such detail, but corroborating evidence on AF detection settings and the percentage of symptomatic patients can be found, e.g. in registry data on real-world patients with AF.[18,19]

Diagnosing atrial fibrillation in primary care: technical and practical considerations

A recent European-wide survey of GPs indicated that 72% of respondents had a 12-lead ECG device at their practice, with 10% also having a single-lead ECG device.[10] One in five did not have any ECG device at their disposal. Device availability was not equal among different European regions, with 12-lead ECG being available in almost all respondents from Northern Europe and UK/Ireland vs. approximately half of respondents from Eastern Europe, with single-lead ECG device availability being vastly more common among UK/Irish GPs (64%) compared with GPs elsewhere in Europe (2–11%).[10] Over past years, the availability of 12-lead ECG in Western Europe and the UK seemed to have increased compared with previous reports from these regions.[20,21] In a survey among Dutch GPs, almost all respondents indicated being able to order a 12-lead ECG without cardiologist interference, e.g. through their own ECG device or through commercially available diagnostic providers.[21] A significant proportion of GPs also reported direct access to prolonged monitoring devices such as Holter or event monitoring.[21]

In several studies on experiences and preferences for AF detection in primary care, almost all GPs indicated having sufficient 12-lead ECG skills and experience to diagnose AF independently.[20,21] This is supported by work where GPs' interpretation of 12-lead ECG was compared with cardiologist or expert panel interpretation, where GPs struggled with diagnosing repolarization disorders but were highly accurate in AF detection.[22–24] Practice nurses felt less confident in diagnosing or ruling out AF than GPs.[20] The emergence and dissemination of single-lead devices has provided a new challenge in terms of independent ECG interpretation by GPs, as accuracy in diagnosing AF has so far been less accurate,[25] prompting the recommendation to have suspected positive AF single-lead ECG readings confirmed by a cardiologist.[3] For tips and pitfalls in the interpretation of smartphone ECG devices in primary care, there are multiple publications that can be used as a guide.[26,27]

Atrial fibrillation screening trials in primary care: key results

Opportunistic vs. systematic screening

Early research on AF screening in primary care focused on the question of whether to invite patients systematically or whether to perform opportunistic screening—when eligible patients visit their practice on their own initiative.[28] While some work suggested a higher AF yield through systematic invitation, the Screening for Atrial Fibrillation in the Elderly (SAFE) study, one of the first larger randomized controlled trials (RCTs) on AF screening in primary care, found that opportunistic and systematic screening methods resulted in similar AF yields. In SAFE, systematic and opportunistic AF screening achieved similarly high AF incidence during their 1-year intervention (1.6%), with both being significantly higher than routine care at 1.0% newly detected AF in one study year.[29] Given the observed higher participation rate, as well as the lower amount of effort involved in the opportunistic screening arm vs. the systematic screening group, it was concluded that opportunistic screening was a viable method for AF screening in primary care settings.[29]

Single time-point screening vs. prolonged measurement

Different types of AF screening interventions have been researched in primary care settings. Several RCTs compared single time-point AF screening with usual care, with differing results. The aforementioned SAFE trial used 12-lead ECG as the screening instrument and saw a significantly higher 1-year AF incidence than routine care (1.6 vs. 1.0%, see above).[29] However, these results of an increased AF yield in intervention vs. control sites could not be replicated in later studies in primary care where the intervention consisted of mostly single time-point interventions.[17,30] The reasons for these discrepancies could have been a higher awareness of AF and an evolving standard of routine care AF detection in the later trials, or the relatively low participation rate diluting the screening effect in the intention-to-screen populations. Subsequent trials that used repeated single time-point measurements or even continuous rhythm monitoring saw a further increased AF yield through screening.[31–33] Although repeated or prolonged measurements potentially require more resources and training among GP staff than single time-point opportunistic interventions, these results indicated that AF screening implementation in primary care could be feasible using different screening scenarios. More results on AF screening trials performed in primary care are expected in the following years.[34–37]

Patient selection

Early AF screening trials in primary care selected patients for the intervention mainly by age. The aforementioned SAFE and D_2AF trials included all patients 65 years or older without AF or established contraindications for oral anticoagulation for a single time-point intervention, and the Systematic ECG Screening for AF (STROKESTOP) study included all 75- and 76-year olds from a region in Sweden for ambulatory repeated single-lead ECG measurements.[17,29,38] More recent primary care AF screening trials have started to use other risk factors or even multivariable risk models in addition to age for patient selection, with higher AF yields as a result.[35,39–41] In parallel, an increasing body of work has emerged on the value of prediction models for AF as a triage test in primary care and community settings.[42,43]

Improved outcomes after atrial fibrillation screening?

Most of the previous AF screening trials set in primary care were not powered for outcomes such as stroke, bleeding, and mortality. The STROKESTOP and mHealth Screening to Prevent Strokes studies did show a small beneficial effect on such outcomes, indicating that AF screening can be safe and effective.[33,44] In the Atrial Fibrillation Detected by Continuous ECG Monitoring Using Implantable Loop Recorder to Prevent Stroke in High-risk Individuals, MI, myocardial infarction (LOOP) study, however, this effect was not found in the overall trial population.[41] A systematic review of the long-term effects of AF screening on clinical outcomes indicated a modest but positive effect.[45] It remains unclear, however, which AF screening interventions are most effective in particular primary care settings and whether all patients with AF detected through such screening would actually find clinical benefit relative to routine care.[41]

Stakeholder views on atrial fibrillation screening in primary care

Primary care as an optimal setting for atrial fibrillation screening

If AF screening were to be implemented in primary care settings, it is important to understand stakeholders' views on AF screening. Engler *et al.* performed a qualitative study of stakeholders' (cardiologists, regulators, and GPs) views in 11 European countries about feasible approaches for the implementation of AF screening. The majority of the participants considered primary care as the most appropriate location for AF screening and considered single time-point opportunistic screening with single-lead ECG devices the most feasible.[12]

Barriers and facilitators for opportunistic screening

A number of qualitative and mixed-model studies focused on GPs' and primary care nurses' views on AF screening, resulting in an overview of perceived barriers and facilitators for AF screening in primary care. The overall attitude towards opportunistic AF screening in primary care was positive. Among the perceived barriers to opportunistic single time-point AF screening implementation were insufficient qualified staff and resources, a lack of education and guidelines, insufficient time and a high workload, a lack of financial compensation, and a current lack of evidence to support large-scale AF screening.[10,12,20,46–49] In terms of choice for a screening device, some work indicated that GPs had lower levels of trust in devices in which they were unable to immediately assess the rhythm recording themselves, and they had to rely on the device for a dichotomized 'AF'

or 'no AF' indicator.[46] Among the perceived facilitators were training in diagnosing and managing AF, the availability of less time-consuming devices than 12-lead ECGs, public awareness campaigns, prompts, and visual aids integrated into the computer system to know which patients to screen, and a clear programme structure with integrated agreed referral or advice pathways for screen-detected AF. Some participants saw opportunities by incorporating AF screening into other healthcare programmes such as flu vaccination, but others disagreed because of the already high workload during such campaign time.[10,20,46-49] Implementation of opportunistic screening should aim to minimize the degree of disturbance arising from consultation hours for performing unplanned confirmatory 12-lead ECG.[46]

Views on screening using continuous monitoring or patient-initiated devices

In a study by Vermunicht *et al.*,[10] two-thirds of responding GPs indicated that opportunistic AF screening using an ECG patch for 2 weeks should be possible in their current practice. However, in the study by Engler *et al.*,[12] the stakeholders found that continuous patch monitoring would be expensive, difficult to use, and must be shown to be cost-effective before implementation, suggesting the use of continuous monitoring only in symptomatic patients or in those who had suffered cryptogenic stroke. Participants in this study emphasized that individuals who did not routinely visit their GP would be excluded from opportunistic screening and would benefit more from systematic AF screening, but at the same time considered systematic AF screening too difficult due to the extra time involved to identify and invite patients and the additional consultation time needed. Stakeholders in the study by Engler *et al.*[12] did not see consumer-led screening as an option as they felt that it would lead to a high workload in primary care and high false-positive cases.

Potential future of primary care atrial fibrillation screening

Consumer-led atrial fibrillation detection

A relatively recent phenomenon has been the increasing availability of patient-owned AF screening devices such as smartwatches or single-lead ECG devices among the general population.[26,50] The number of smartwatches distributed worldwide is projected to further increase in the coming years.[51] With this, the number of patients presenting to their GP with abnormal findings from their self-owned device will likely increase. This then raises questions about whether such patients should undergo similar workups and treatments as patients with symptomatic AF or with AF detected through opportunistic screening by physicians.[50] Literature has shown that the validity of smartphone technologies for AF detection is comparable with that of conventional AF screening devices.[52] Given that patient-owned single-lead ECG recordings lack a standardized expert review of algorithm results before a physician consultation, some have warned of potential data overload due to false-positive device readings, while the same can be said for false reassurance in the case of false-negative or inconclusive smartwatch or single-lead ECG results.[12,26] That smart devices potentially lower the threshold for rhythm monitoring vs. devices with chest patches could be especially beneficial in patients with suspected paroxysmal AF, as shown in a large trial with ECG patch provision to patients with a positive smart watch reading.[53] Results from studies further investigating the additional value of smart devices for AF screening and reduction of stroke and mortality outcomes are necessary to further assess their place in primary care, and AF screening in particular.

Regional initiatives to improve atrial fibrillation detection in primary care

As discussed above, there is a perceived need for a more systematic approach to AF screening among GPs that is currently not (yet) supported by national guidelines or screening trial results. This has led to a number of local initiatives by GP cooperatives or local healthcare bodies to devise their own regional approach. Common in these initiatives seems to be organizing local GPs through regular education events to increase AF awareness, sharing of knowledge through, e.g. social media platforms where GPs can securely share ECGs among themselves and with cardiologists to get quick feedback on the presence or absence of AF and best practices for further workup or treatment, and the dissemination of devices to lower the threshold for AF detection, e.g. single-lead ECG devices.[13,14,54] A benefit of these initiatives is that best practices from previous trials are already being disseminated among real-world healthcare professionals. A risk is that with a rising level of AF detection throughout primary care, the results of screening trials that investigate an active intervention vs. routine care (no additional intervention) will see a lower relative benefit, with a risk of falsely concluding the ineffectiveness of an intervention and impeding comparisons with results from trials with a lower standard of routine care.

Use of electronic healthcare record data for patient selection

With the advent of new computation techniques, the increased availability of routine care datasets, and the trend towards a greater use of risk factors other than age alone in AF screening, there has been an increased focus on the use of primary care electronic health record (EHR) data to assess the likelihood of AF detection as a triage test for AF screening.[43] The question whether conventional risk models, such as CHARGE-AF,[55] or novel risk models incorporating variables specific to the likelihood of AF detection through screening vs. detection through routine care will be the order of the day will be the subject of future work in this field.

Potential outline for a primary care-centred atrial fibrillation screening and integrated atrial fibrillation care intervention

When combining the topics discussed in this review with other developments in AF, particularly integrated, holistic treatment after AF diagnosis,[56,57] one could begin to sketch the outlines for a future AF screening intervention with a high potential of further improving long-term outcomes after AF screening (*Figure 1*).

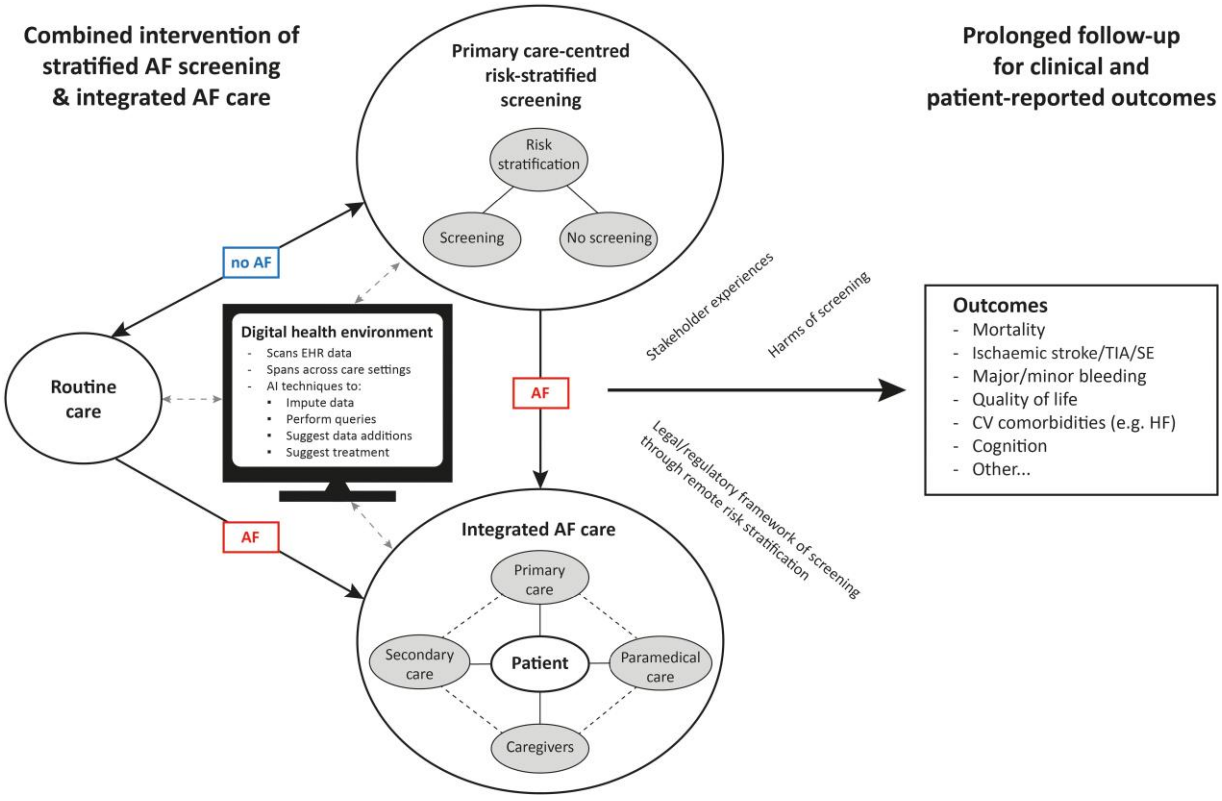

Figure 1 The potential outline of a primary care-centred atrial fibrillation screening trial. AF, atrial fibrillation; CV, cardiovascular; EHR, electronic health record; HF, heart failure; SE, systemic embolism; TIA, transient ischaemic attack.

Primary care, with its central role in healthcare provision, as well as in retrieving data back from specialist encounters, features in this intervention at the centre of patient selection and screening. Patient selection should be further supported by the use of routinely as well as purposefully collected EHR data, in continuous feedback with a digital health environment that uses the latest standard in data processing and modelling techniques. In all patients with newly detected AF, whether through screening or through routine (primary, secondary, or consumer-led) care, the trial will ensure integrated, holistic care to an optimal lowering of both symptoms and the risk of complications from AF and related morbidity. Clinical outcomes to assess trial efficacy should not be confined to traditional outcomes such as stroke, major bleeding, and mortality, but should cover the wider spectrum of morbidity and patient-reported aspects related to AF, including heart failure, depression, and cognition. Given the emphasis of integrated AF care on cardiovascular risk reduction relative to the traditional focus on immediate reduction in stroke risk, follow-up should encompass an extended period of time compared with currently published trials for the reduction in cardiovascular risk to translate into improved outcomes. Finally, the potential harms of screening, stakeholder experiences, as well as ethical and legal considerations regarding risk-stratified screening using remotely assessed eligibility, should be incorporated into the trial from the outset, to optimize patient experiences with the trial as well as better assess potential implementation in routine care.

Conclusions

In this review, we have provided an overview of aspects relating to AF screening in primary care. We discussed the current practice of AF detection and screening, evidence from AF screening trials conducted in primary care settings, stakeholder views on barriers and facilitators for AF screening in primary care, and important aspects that will likely shape routine primary care AF detection as well as AF screening efforts. Finally, we presented a potential outline for a primary care-centred AF screening trial coupled to integrated AF care that could further improve the benefit of AF screening.

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Data availability

There are no new data associated with this article.

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