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Screening for Atrial Fibrillation in Community and Primary Care Settings: A Scoping Review

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Abstract

Background: Atrial Fibrillation (AF) is the most common tachyarrhythmia and is associated with increased risk of stroke, morbidity and mortality. AF is responsible for up to a quarter of all strokes and is often asymptomatic until a stroke occurs.Screening for AF is a valuable approach to reduce the burden of stroke in the population.

Objectives:The motivation for this review was to synthesise and appraise the evidence for screening for AF in the community. The aims of this scoping review are 1). To describe the prevalence of newly diagnosed AF in screening programmes 2). Identify which techniques/ tools are employed for AF screening 3). To describe the setting and personnel involved in screening for AF.

Eligibility Criteria: All forms of AF screening in adults (≥18 years) in primary and community care settings.

Methods: This review was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping reviews (PRISMA-ScR).

Results:Fifty-nine papers were included; most were cross-sectional studies (n=41) and RCTs (n=7). Prevalence of AF ranged from 0-34.5%. Screening tools and techniques included the 12-lead ECG (n=33), the 1-lead ECG smartphone based Alivecor® (n=14) and pulse palpation (n=12). Studies were undertaken in community settings (n=30) or in urban/rural primary care (n=28). Personnel collecting research data were in the main members of the research team (n=31), GPs (n=16), practice nurses (n=10), participants (n=8) and pharmacists (n=4).

Conclusion: Prevalence of AF increased with advancing age. AF screening should target individuals at greatest risk of the condition including older adults ≥65 years of age. Emerging novel technologies may increase the accessibility of AF screening in community and home settings. There is a need for high quality research to investigate AF prevalence and establish accuracy and validity for traditional versus novel screening tools used to screen for AF.

Introduction

Atrial fibrillation (AF) is the most common, sustained, progressive tachyarrhythmia worldwide and is associated with increased risk of stroke, systemic embolism and increased morbidity and mortality[1, 2]. AF is associated with higher morbidity and mortality rates than other cardiac arrhythmias[3]. AF represents a significant public health problem that places a burden on health resources and constitutes a public health challenge with high comorbidity [5]. The most frequent co-morbidities associated with AF are hypertension, diabetes mellitus, congestive heart failure, ischaemic heart disease and valvular heart disease[4]. Male gender is an established risk factor for AF however due to greater longevity in females the prevalence across both genders is equivalent [4]. The clinical presentation of AF varies significantly in severity and type[4]. Symptoms are often related to tachycardia and can include palpitations, dizziness, chest pain and dyspnoea[5]. However, symptoms can be non-specific or absent. Thus, up to one third of AF cases are not recognised because they are asymptomatic and have silent or subclinical AF [4].

The global prevalence of AF was 191.3 rate per 100,000 in 2013[4] with approximately 1-3% of the population affected [5]. Both the prevalence and incidence of AF increase markedly with advancing age[5] with reports of AF prevalence of 4.2% in people aged 60-69 years of age[6]. Hence, due to an ageing population the prevalence of AF is increasing; it is predicted that AF will affect 6-12 million people in the USA by 2050 and 17.9 million people across Europe by the year 2060[7]. However, it can be argued that the true prevalence of AF is unknown. This may be due to a lack of, or limited access to screening for AF and the fact that AF is often asymptomatic or silent[4]. AF often remains

Key Words

Atrial fibrillation, Opportunistic screening, Systematic screening, Arrhythmia, Community, Primary Care,

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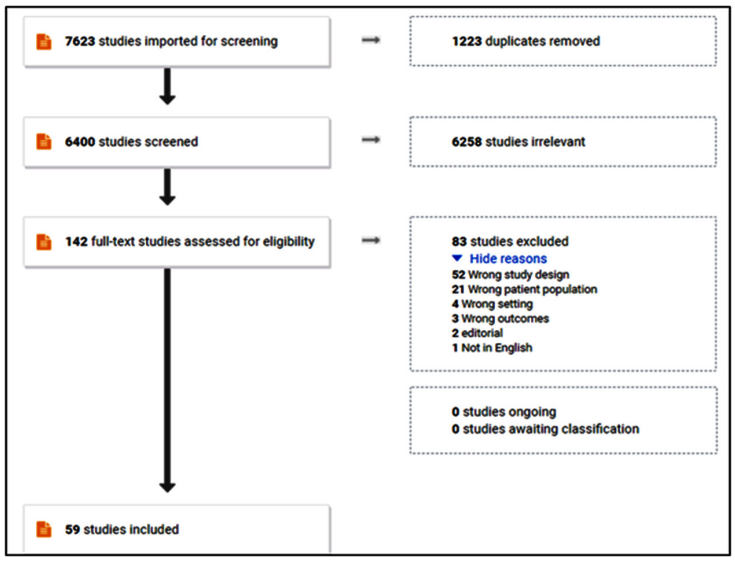

Figure 1: **PRISMA Flowchart.**

undiagnosed and untreated which can lead to devastating outcomes. AF is associated with increased risk of systemic embolism and stroke, in fact AF is found in one third of all ischaemic strokes[7].Early identification of AF allows for early antithrombotic treatment which can reduce the incidence of stroke and premature death in patients with AF[2]. AF is also associated with significant morbidity, as measured by disability-adjusted life years [7]. Screening for AF is recommended in European guidelines in all patients >65 years of age[8]. The main rationale for AF screening is to prevent stroke in the population by identifying those with the condition and allowing for early anticoagulation treatment and thus prevent ischaemic events and reduce morbidity and mortality [4]. Opportunistic screening is defined as a screening programme that uses a health care professional to check for AF during routine consultations. Whilst systematic screening is defined as a programme where all people above a certain age or who reach set criteria are invited to attend a location for screening[9]. Various clinical techniques can be employed to screen for AF including pulse palpation and 12 lead ECG with expert interpretation[10]. The advent of novel technologies including devices such as portable smartphone ECGs and photoplethysmography are emerging which, will make AF screening more accessible in community and homesettings. However, currently the most effective method of screening for AF remains unclear and given the diverse approaches to AF screening and the tools and techniques employed there is a need to review the current evidence-base[10]. The scoping review did not aim to assess technical or statistical aspects of existing and novel technologies for AF screening. Rather, the motivation for this review is to explore the breadth and extent of the literature, synthesise, appraise the evidence for screening for AF in community settings and inform future research. Therefore, a scoping review methodology was chosen. The aims of this scoping review are 1). To describe the prevalence of newly diagnosed AF in screening programmes 2). Identify which clinical techniques/ tools are employed for screening for AF 3). To describe the setting and health professionals involved in screening for AF in community and primary care settings.

Methods

Protocol

We performed a scoping review in a structured manner, to synthesise the available evidence. We followed the methodology of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping reviews (PRISMA-ScR)[11].

Eligibility Criteria

Inclusion Criteria: Research articles published between the years 2000-2020 and written in the English language. The search timeframe was chosen to ensure currency of the evidence in relation to the tools used in AF screening. All forms of screening for new diagnosis of AF in adults (≥18 years) in primary and community care settings were included.

Exclusion Criteria: Studies not in the English language and those out with the period under investigation. Systematic reviews, meta- analyses, reports, pilot studies or unpublished studies were excluded. Participants must not have had a previous AF diagnosis. Studies that consisted of follow-ups for patients that had obtained treatment for AF, studies where AF screening was conducted in an acute/hospital setting, studies where AF was identified post stroke/surgical intervention, studies where AF was diagnosed after a period of monitoring were all excluded.

Information Sources

We carried out a systematic search of databasesincluding Scopus, Google Scholar, Pubmed, Science Direct, Medline and Embase. A grey literature search of the literature was conducted. The literature searches took place in April 2020.

Search Strategy

We used a population, intervention, and outcomes-based approach to identify our search strategy. The population under investigation were people with AF, the intervention was opportunistic or systemic screening and the outcomes were the prevalence of AF, screening tools used, and the setting and health professionals involved in screening for AF. The search commenced on 2nd of April 2020. The databases included were Pubmed (02.04.2020), Scopus (02.04.2020), Google Scholar (06.04.2020), Science Direct (09.04.2020), Medline (09.04.2020) and Embase (10.04.2020). The last search took place on 28.04.2020. This final search included papers identified through reference lists of included papers. All papers were imported into Covidence and duplicates were removed.

The search used the mesh terms generated from the PICO question

Table 1: **Keywords used for the literature search .**

Population	Intervention	Outcome
Atrial Fibrillation Or Cardiac abnormality Or Cardiac arrhythmia Or Uncoordinated atria contractions Or Vascular Disease	Opportunistic Screening Or Systematic Screening Or Pulse palpation Or ECG Rhythm Strip Or Smartphone ECG 12- ECG	Diagnosed AF Or Identifying AF

Table 2: Boolean Operators employed

1 :EXP atrial fibrillation
2 :Cardiac* Abnormality/
3 :EXP arrhythmia*
4 :Uncoordinated atria contraction adj3
5 :Vascular Disease/
6 :1 or 2 or 3 or 4 or 5
7 :EXP opportunistic* screen*
8 :EXP systematic* screen*
9 :pulse palpation
10 :ECG rhythm strip
11 :12* lead ecg
12 :smartphone ecg
13 :7 or 8 or 9 or 10 or 11 or 12
14: diagnose* atrial fibrillation adj3
15: identify* atrial fibrillation adj3
16: 14 or 15
17: 6 and 13 and 16

to identify studies (table 1). The Boolean operators used are detailed in table 2.

Selection of Sources of evidence

The systematic review management system Covidence was used for the study selection process (www.covidence.org). The review was carried out in four stages: import references, title and abstract screening, full text screening and extraction. On import into Covidence, duplicate papers were automatically removed. Two authors independently screened all titles and abstracts (EC, CMcI, CMacG), any disagreement on papers were discussed between authors until consensus was reached. In phase two,potentially eligible articles were reviewed in full text and any disagreements were resolved between co-authors (EC, CMcI, CMacG).

Data Charting Process

One author (EC) extracted data using a standardised data extraction form in Excel and a second author (CMcI, CMacG) then independently verified the extracted data. The data extraction form was based on JBI guidelines on data extraction for scoping reviews[12].

The following study characteristics were extracted: year of publication, country, setting, study design, participant recruitment, screening tool, data collectors, screening type, eligibility criteria, sample size, gender, risk factors, number of participants with new AF diagnosis, prevalence of AF.

Critical Appraisal of Individual Sources of Evidence

We undertook a narrative synthesis of the research literature assessing systematically and comprehensively the results of each study, highlighting important characteristics of the included studies without quality assessment or extensive data synthesis [13].

Results

We included 59 studies. A PRISMA flow chart (see figure 1) displays the flow of papers and reasons for exclusion.

Studies were conducted across 22 different countries. The majority of studies were conducted in the USA (n=10), the UK (n=7), Italy (n=5), Hong Kong (n=5), Spain (n=4) and Sweden (n=4), other countries included Australia (n=3), Ireland (n=3), Germany (2), Norway (n=2), China (n=2), Canada (n=2) Denmark (n=1), New Zealand (n=1),

Table 3: Country of research, age, sample size and prevalence of newly diagnosed AF in the research studies

Study	Location	Age	No. of Participants	AF Prevalence %
Perez et al., 2019[37]	USA	Not reported	415787	Not reported
Yan et al., 2018[26]	Hong Kong	Not reported	217	34.50%
Lau et al., 2013[43]	Australia	>/65	109	27.80%
Soliman et al., 2010[44]	USA	21-74	3257	18%
Heckbert et al., 2018[34]	USA	>/57	1415	17.50%
Ghazal et al., 2018[27]	Sweden	70-74	324	15.40%
Engdahk et al., 2013[26]	Sweden	75-76	848	14.30%
Wiesel Abraham and Messineo 2013[45]	USA	>/65	139	13.43%
Walker et al., 2014[27, 46]	New Zealand	>/65	121	12.40%
Svennberg et al., 2015[27]	Sweden	75-76	7173	12.30%
Cunha et al., 2020[26]	Portugal	>/40	205	11.20%
Salvatori et al., 2015[25]	Italy	>/65	304	11%
Kearley et al., 2014[47]	UK	>75	999	11%
Clua-Espuny et al., 2013[48]	Spain	>60	1043	10.90%
Smyth et al., 2016[49]	Ireland	>/65	7262	10.90%
Bury et al., 2015[11]	Ireland	>/70	566	10.30%
Scalvini et al., 2011[50]	Italy	Not reported	1719	9.70%
Scalvini et al., 2005[51]	Italy	Not reported	7516	9.60%
Hobbs et al., 2005[24]	UK	>/65	14802	8.08%
Gonzalez Blanco et al., 2017[52]	Spain	>/65	6990	7.90%
Loehr et al., 2019[53]	USA	Not reported	2434	7.15%
Baber et al., 2010[33]	USA	>/45	26917	6.77%
Lowres et al., 2014[54]	Australia	>/65	1000	6.70%
Morgan and Mant 2002[35]	UK	>/65	1538	5.30%
Huang et al., 2018[32]	China	>/80	1038	5.30%
Turakhia et al., 2015[55]	USA	>/55	75	5.30%
Grubb et al., 2019[23]	UK	>/65	1805	5.10%
Jaakkola et al., 2017[22]	Finland	>/75	215	4.90%
Wiesel and Salomone 2017[56]	USA	>/65	11	4.90%
Berge et al., 2018[6]	Norway	63-65	3706	4.50%
Rhys Azhar and Foster 2013[57]	UK	>/65	573	4%
Godin et al., 2019[23]	Canada	>/65	7585	4%
Orchard et al., 2016[58]	Australia	>/65	972	3.80%
Kaassenbrood et al., 2016[59]	Netherlands	>60	9450	3.70%
Bacchini et al., 2019[2]	Italy	>/50	3071	3.20%
Ostgren et al., 2004[60]	Sweden	>/40	1739	3.20%
Schnabel et al., 2012[61]	Germany	34-74	5000	3.20%
Frewn et al., 2013 [21]	Ireland	>/50	4902	3%
Habizadehet et al., 2004[31]	Iran	>50	463	2.80%
Quinn et al., 2018[62]	Canada	>/65	2054	2.70%
Steinhubl et al., 2018[63]	USA	>/65	2054	2.70%
Chan et al., 2016[19]	Hong Kong	>/65	1013	2.60%
Halcox et al., 2017[64]	USA	>65	1001	2.50%
Chan et al., 2018[30]	Hong Kong	>50	11574	2.40%
Suzuki et al., 2015[23]	Japan	40-90	12410	2.40%
Benito et al., 2015[5]	Spain	>/65	928	1.83%
Omboni and Verberk 2015[36]	Italy	>/18	220	1.80%
Chan et al., 2017[29]	Hong Kong	>/18	1322	1.80%
Fitzmaurice et al., 2007[10]	UK	>/64	14802	1.60%
Soni et al., 2018[22]	India	>40	2100	1.60%

Yap, Pin and Ong 2007[21]	China	>/55	1839	1.50%
Chan et al., 2017[28]	Hong Kong	>/65	5969	1.20%
Hald et al., 2016[20]	Denmark	>/65	970	1.03%
Gill et al., 2011[19]	UK	Not reported	5408	0.95%
Berge et al., 2018[4]	Norway	>65	1510	0.90%
Dewhurst et al., 2012[14]	Tanzania	>70	2232	0.67%
Brunner et al., 2017[18]	Germany	>18	7159	0.66%
Rodriguez-Captain 2017[65]	Spain	Not reported	13179	0.40%
Muthalay et al., 2018[14]	Uganda	>18	856	0%

Finland (n=1), Japan (n=1), India (n=1), Tanzania (n=1), Netherlands (n=1), Uganda (n=1), Portugal (n=1),Iran (n=1) (table 2).

Setting

The majority of studies were undertaken in community settings (n=30) or in urban/rural primary care (n=28). Only one study used multiple different settings.

Study Design

Of the 59 studies included there were n=41 cross sectional studies, n=7 randomised controlled trials,n=6 longitudinal studies, n=2 observational cohort studies, n=1 pseudo longitudinal study n=1 parallel arm cluster controlled study and n=1 prospective pragmatic study.

Prevalence of newly diagnosed AF

The mean prevalence rate of AF across the 59 studies was 6.2%. The prevalence of newly diagnosed AFwas wide ranging across the studies at 0-34.5%. African and Asian countries showed the lowest prevalence; in the African studies the prevalence ranged from 0-0.67%[14, 15]. A low prevalence of AF was also observed in a UK study that screened minority ethnic groups(0.95%)[16]. Studies conducted in Asian countries generally showed lower prevalence figures ranging from 1.2-5.3%[17-25] with the exception of one study based in Hong Kong where the prevalence of AF was 34.5% (26). Participants in this study were recruited directly from Cardiology clinics. European and American countries showed the highest prevalence rates. In Europe, studies conducted in Sweden reported the highest prevalence rates of AF ranging from 12.3-15.4%(27-29)(Table 2).

Screening tool

A range of tools were used to screen for AF; the majority of studies used the 12 lead ECG (n=33), the 1 lead ECG- smartphone based Alivecor® (n=14) and pulse palpation (n=12), other tools employed included the 7 lead (n=1) and 3 lead ECG (n=1), 1 lead handheld portable ECG (Zenicor®) (n=4), 1 lead CardioCard® (n=1), 1 lead Cardio-A Palm® ECG (n=1), 1 lead MyDiagnostick® (n=1), 1 lead Omron monitor® (n=1), 1 lead HeartCheck® (n=1). Thirty-one studies used only one tool, twenty-three studies used two tools, four studies used three tools and one study used five tools.Several studies employed more than one screening tool; thirty one groups used one tool, twenty two groups used two tools, four groups used three tools and one group used four tools (31(1) +22(2) + 4(3) +4 = 91) (table 3).

Data Collectors

In the majority of studies the personnel collecting the research data were members of the research team (n=31), this was followed by GPs (n=16), practice nurses (n=10), participants themselves (n=8), pharmacists (n=4), trained non-medical volunteers (n=4), cardiac nurse (=2), health care worker (n=1) and Clinical Events Adjudication Committee (n=1). In some studies, multiple personnel were involved in data collection. Cardiologists reviewed ECG readings in 31 studies.

Screening Type

The majority of studies employed systematic screening (n=29) and opportunistic screening (n=26), four studies used both opportunistic and systematic screening.

Discussion

We report the findings of a scoping review, a form of structured evidence collation, used to address a broad research question[12].The objective of this scoping review was to broadly synthesise and appraise the evidence for screening for AF in community settings. More specifically, we set out to describe the prevalence of newly diagnosed AF in screening programmes, identify which clinical techniques/ tools are employed for screening for AF and to describe the setting and health professionals currently involved in screening for AF in community and primary care settings.

Prevalence of AF

The mean prevalence rate of AF across the 59 studies was 6.2%, however the prevalence of newly diagnosed AF was wide ranging from 0-34.5% across the studies and therefore the mean prevalence should be interpreted with caution. The highest prevalence for AF was reported in a Hong Kong based study (34.5%) (27). This study used a novel method of AF screening using an iPhone camera to detect and analyse photoplethysmographic signals from the face by extracting subtle beat to beat variations of skin colour that reflect the cardiac pulsatile signal [27]. However, participants in this study were recruited directly from cardiology services, which, is likely to have inflated the prevalence of AF given the population under investigation.There is a high chance of selection bias in this study given the methodological approaches employed. The lowest prevalence of AF was 0%; this low prevalence was reported following a screening programme set in community health fairs, targeting eight villages in rural Uganda [14]. Residents of Nyakabare Parish were invited to free community health fairs and 856 (47.2%) adults in the area attended.The patients underwent a 10 second seated ECG recording using a portable ECG machine (CardioCard Digital ECG Box®)[14]. The authors conclude that AF appears to be less prevalent in rural Uganda than in developed countries and this may be due to genetic and/or environmental factors or related to survivorship bias. However, the profile of the population under investigation was

Table 4: Prevalence AF Risk Factors

Risk Factors	Range (%)
Hx of Hypertension	4.5-100%
Hx of Diabetes Mellitus	2.3- 45.9%
Hx of Tia/Stroke	1-18.9%
Hx of Heart Disease	1.1-50.7%
Hx of Smoking	2.7-50.9%
Hx of Heart Failure	0.3- 32%

Table 5: Summary of the Data Collection Tool employed in the Research Studies

Data Collection Tool	Study	Total
12-lead ECG	Brunner et al., 2017, Baber et al., 2010, Berge et al., 2018, Chan et al., 2016, Dewhurst et al., 2012, Frewn et al., 2013, Ghazal et al., 2018, Godin et al., 2019, Habibzadehet et al., 2004, Salvatori et al., 2015, Chan et al., 2017, Clua-Espuny et al., 2001, Fiztmaurice et al., 2007, Engdahk et al., 2013, Gill et al., 2011, Blanco et al., 2017, Hald et al., 2016, Hobbs et al., 2005, Huang et al., 2018, Jaakkola et al., 2017, Kearly et al., 2014, Lau e al., 2012, Loehr et al., 2019, Morgan and Mant 2002, Orchard et al., 2016, Ostgren et al., 2004, Quinn et al., 2018 Rhys Azhar & foster 2013, Rodriguez-Captain et al., 2016, Scalvini et al., 2005, Scalvini et al., 2010, Schabel et al., 2012, Smyth et al., 2016, Solimon et al., 2010, Yan et al., 2018	35
7- lead ECG	Baber t al., 2010	1
3- lead ECG	Bury et al., 2015	1
1 lead ECG – smartphone based alive cor	Brunner et al., 2017, Chan et al., 2016, Chan et al., 2017, Godin et al., 2019, Grubb et al., 2019, Chan et al., 2018, Chan et al., 2017, Cunha et al., 2020, Halcox et al., 2017, Jaakkola et al., 2017, Lau et al., 2012, Lowres et al., 2014, Orchard et al., 2016, Soni et al., 2018	14
1 lead handheld portable ECG Zenicor	Berge et al., 2017, Chazal et al., 2018, Engdahk et al., 2013, Svennberg et al., 2015	4
1 lead CardioCard	Muthalay et al., 213	1
1 lead Cardio-A Palm ECG	Omboni and Verberk 2015	1
1 lead MyDiagnostick	Kassenbrood et al., 2016	1
1 lead Omron Monitor	Kearly et al., 2014	1
1 lead HeartCheck	Quinn et al., 2018	1
Pulse Palpation	Benito et al., 2015, Cunha et al., 2020, Fitzmaurice et al., 2007, Blanco et al., 2017, Hald et al., 2016, Hobbs et al., 2005, Jaakkola et al., 2017, Lowres et al., 2014, Morgan and Mant 2002, Quinn et al., 2018, Rhys, Azhar and Foster 2013, Smyth et al, 2016	12
Cardiac Examination	Berge et al., 2018	1
24-48 hour Holter Monitor	Salvatori et al., 2015, Loehr et al., 2019, Quinn et al., 2010	3
Medical Records	Clua-Espuny 2013	1
Cardio Rhythm Smartphone 3PG waveforms	Chan et al., 2016 Yan et al., 2018	2
MicrolifeAFIB (BP monitor used to detect AF)	Bacchini et al., 2019, Chan et al., 2017, Kearly et al., 2014, Omboni and Verberk 2015, Quinn et al., 2018, Wiesel, Abraham and Messineo 2013, Wiesel and Salomone 2017	7
Zio Patch XT (single channel ECG patch monitor)	Heckbert et al., 2018, Steinhubl et al., 2018, Turakhra et al., 2015	3
Applewatch Photoplethysmography	Perex et al., 2019	1
Heartrak 2 (ECG event monitor)	Wiesel, Abraham and Messineo 2013	1

*Some studies employed more than one methods of screening

young. The sample consisted of 320 (37.5%) men; the mean age was 42.3 ± 17.5 years. Only 127 (14.8%) participants were aged >65 years old [14]. AF prevalence is known to increase significantly with advancing age and therefore the reported 0% prevalence should be interpreted with caution.

Prevalence rates of AF varied across continents, which, could be due to genetic or environmental factors. The prevalence of primary AF risk factors, for instance hypertension and diabetes, are increased in racial and ethnic minorities [30]. However, it has been shown consistently in epidemiological studies and clinical trials, that there is a lower incidence and prevalence of AF in ethnic and racial minorities[30,31]. In this study, it was apparent that prevalence rates were generally lower in low and lower middle-income countries compared to upper middle income and high income countries. Ethnic and racial minorities are less likely to be insured and have primary care providers andthe limited participation of minorities in trials for AF management and stroke prevention has previously been recognised[30,31].

Only two community-screening studies took place in African countries (Tanzania and Uganda)[15,16]. In both studies,screening took place in rural villages. It is feasible that many older people with comorbidities and at high risk of AF might not have had the means to travel to the centres to partake in the screening programme hence the younger profile of the study participants [14].As AF is often asymptomatic, AF may be viewed as less of a public health concern therefore screening initiatives may not be a priority in lower income countries with limited health resources. Opportunistic screening is often reliant on patients attending paid appointments, or a government-funded appointment. People in lower income countries are more likely to have limited resources to access healthcare making opportunistic screening challenging in these populations[31].Clinicians have also argued that AF might be lower in ethnicity minority groups due to AFpresenting differently in these individuals. There is evidence to suggest that ethnic minority individuals may be more likely to have paroxysmal AF rather than persistent AF [63]. Paroxysmal AF screening lacks research across all ethnicities due to its more time constraining screening process. The U.N projects that the average life expectancy in Tanzania is 65.46 years and in Uganda is 63.41 years. Therefore, lower life expectancy and survivorship bias could be another factor that links ethnic minorities to lower AF prevalence levels[31].

Across all studies, it was evident that the prevalence of AF significantly increased with advancing age. Higher prevalence was observed when targeted screening of older adults occurred, as evidenced in the prevalence studies conducted in Sweden [28-30] which had the highest prevalence rates in Europe. They targeted individuals aged 70-76 years of age and therefore the higher prevalence rates are expected given the population under investigation.As the goal of medical screening is detection of cases with an elevated probability of having the disorder of interest then future studies should target individuals at greatest risk of AF including older adults >65 years of age which is consistent with European guidelines whereby screening is recommended in all patients >65 years of age [8].

Setting

The majority of researchers collected data in either community or urban/rural primary care settings. Primary care mainly consisted of GP practices. Community screening consisted mainly of screening centres, home visits and pharmacies. Only one study took place across multiple different settings. Using multiple different settings showed signs of inconsistencies and higher risk of bias because researchers employed different protocols, methods and data collection tools in each of the settings. Furthermore, participant recruitment varied in the multiple settings, with one site using cardiologists who already knew the patients' medical history prior to opportunistically screening for AF[32].

Type of Screening

Four studies used both opportunistic and systematic screening studies [29, 33-35]. Overall, no significant difference was evident in the outcomes of studies that used opportunistic versus systemic screening. Therefore, neither approach is considered superior. Both approaches have strengths and limitations but both forms are effective if executed in an appropriate manner. Systematic screening can be conducted over a shorter timeframe than opportunistic screening; however, opportunistic screening can be more cost effective than systematic screening [10]. Furthermore, primary care providers, including general practitioners, community health workers and pharmacists, are in a unique position to be proactive with their patients and actively seek patients with AF through opportunistic screening programmes [3, 11].

Data Collectors

The research team, cardiologists and general practitioners most frequently conducted data collection. Approximately half of study teams used at least one cardiologist to review ECG readings and confirm AF diagnoses. Most papers highlighted the importance of using the resources of a cardiologist to review new AF diagnoses. However, the use of a cardiologist was not feasible or attainable in some studies due to limited resources. In the absence of an expert cardiologist in the research team to confirm diagnoses, participants were told to contact a GP/cardiologist for review. In the majority of studies, the data collector(s) were either research personnel or a health professional, however, in four studies, layperson volunteers were trained to use portable ECG devices to screen for AF[15, 17, 20, 36]. Furthermore, in eight studies, participants were the data collectors, and one project a Clinical Events Adjudication Committee was employed.

Novel technologies

The emergence of various novel technologies has significantly widened the scope for ECG monitoring and detection within the community based setting. SMART technologiesfor AF detecting and monitoring include the Cardiio Rhythm Smartphone®[19, 26], Apple watch photothermography[37] and Alivecor® which was the most frequently utilised SMART technology in the literature(n=14)[17, 38, 39]. In a recent systematic review, the Alivecor® was found to be convenient, valid, and a feasible means of monitoring for AF that can be successfully implemented into both opportunistic and systematic screening strategies for AF[40]. The advent of SMART devices will undoubtedly increase the opportunities for AF screening across a range of settings but especially in the community and home setting. Additional advantages of these technologies over traditional methods include accessibility, low cost and ease of use. The latter is particularly encouraging as this means that a wider range of health and social care professionals and patients, can use these devices and proactively partake in AF screening. It is important however, that high quality research is conducted to establish accuracy and validity for these emerging devices. If being used independently, appropriate support is required to ensure patient safety.

Strengths

Scoping reviews have been described as a process of mapping the existing literature or evidence base [41]. We followed the methodology of the Preferred Reporting Items for Systematic Reviews and MetaAnalyses extension for Scoping reviews (PRISMAScR)[11] and systematically and comprehensively searched, analysed and synthesised the research literature on screening for AF in community settings and primary care settings.

Limitations

Scoping reviews differ from other types of systematic reviews in that they provide an overview of the existing literature without quality assessment or extensive data synthesis [41]. Due to high heterogeneity across studies in terms of prevalence of AF and the different population screened and the diversity of methodological approaches employed in AF screening research it is not possible to conduct a meta-analysis and pool data [42].Instead, we present a narrative synthesis of the findings and an overview of the existing literature without quality assessment.

Conclusion

Despite the significant range in the prevalence of newly diagnosed AF cases across the studies (0-34%), the prevalence of AF was consistently found to increase with advancing age across the studies thus demonstrating the association between higher prevalence of AF and advancing age. Future studies of opportunistic or systematic screening for AF should target individuals at greatest risk of the condition including older adults >65 years of age. In the main, studies took place in community settings primarily in primary care and GP practices. The 12-lead ECG was the most frequently employed clinical technique employed in screening for AF. This was followed by smartphone based AliverCor® (1 lead ECG) and pulse palpation. Emerging novel technologies will undoubtedly increase the opportunities for AF screening across a range of settings, including community and home settings, which will increase the accessibility of AF screening and allow for more health and social professionals to partake in opportunistic screening of high-risk populations. Furthermore, SMART technologies also have the potential for greater self-monitoring in home settings. There is a need for larger scale, high quality studies investigating AF screening, with robust methodologies across a wider demographic, to provide accurate prevalence data for AF and to establish the accuracy and validity of the various traditional approaches versus new and novel technologies for AF screening.

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