Mobile ECG Device Project

Learnings from south London

Stroke Prevention in Atrial Fibrillation Programme

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Health
Innovation
Network
South London

Contents

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Executive Summary

The NHS Long Term Plan includes the major ambition to prevent 150,000 strokes, heart attacks and dementia cases in England over the next 10 years. Improving the detection and treatment of the high-risk conditions of atrial fibrillation (AF), hypertension and high cholesterol has the potential to unlock considerable health gains. Although treatment of these conditions reduces the risk of cardiovascular events, there are many people who are undiagnosed or sub-optimally treated.

Stroke is the fourth leading cause of death in the UK with approximately 100,000 people having a stroke each year. Atrial fibrillation (AF) contributes to 1 in 5 strokes in the UK and is associated with greater disability and mortality that non-AF-related strokes.

To complement the NHS Long Term Plan, the CVD Prevention System Leadership Forum have developed specific ten-year cardiovascular ambitions for England for the detection and management of the high-risk conditions. A five-year vision for London has been developed by the CVD Prevention Partnership (CVDPP) to help systems meet the regional requirement to produce a plan showing how, by the end of 2023, they will deliver on the vision and ambitions for CVD Prevention in London.

In 2017, NHS England commissioned the 15 Academic Health Science Networks (AHSNs) across England to undertake a system-wide procurement initiative to promote the uptake of digital technology. This novel approach to facilitate innovation adoption also aimed to reduce the incidence of stroke through increased detection of AF, alongside ongoing work to increase anticoagulation treatment rates in England.

6000 mobile ECG devices were distributed across the county by the AHSNs, allowing a greater range of healthcare and non-healthcare settings to offer opportunistic pulse rhythm checks to asymptomatic groups at increased risk of AF. The Health Innovation Network (HIN) as the AHSN for the 12 boroughs of south London was responsible for the distribution of 400 mobile ECG devices.

Kardia Mobile and WatchBP ECG devices were distributed to a wide range of clinical and non-clinical settings to offer opportunistic pulse rhythm checks to asymptomatic individuals at increased risk of AF. A pathway for timely diagnosis with 12-lead ECG and treatment with anticoagulants was necessary to reduce the incidence of AF-related stroke.

Across south London, a total of 14,835 pulse rhythm checks were recorded between January 2018 – March 2019, detecting 597 people with possible AF. This report aims to provide insight into the feasibility and effectiveness of opportunistic testing for AF across a wide range of settings using mobile ECG devices, supporting the HINs role in real world validation.

Background

Cardiovascular disease (CVD) causes a quarter of all deaths in the UK and is the largest cause of premature mortality in deprived areas. Given that most CVD cases are preventable, there is a huge opportunity to make a difference by improving CVD outcomes for people in south London.

The NHS Long Term Plan includes the major ambition to prevent 150,000 strokes, heart attacks and dementia cases in England over the next 10 years. Improving the detection and treatment of the high-risk conditions of atrial fibrillation (AF), hypertension and high cholesterol has the potential to unlock considerable health gains. Although treatment of these conditions reduces the risk of cardiovascular events, there are still many people undiagnosed or sub-optimally treated.

Stroke is the fourth leading cause of death in the UK with approximately 100,000 people having a stroke each year.[1] This human burden is mirrored by the cost to treat stroke, accounting for approximately 3-5% of all healthcare expenditure, [2] with stroke costing health care services an average of £13,452 at one year post stroke, increasing to £22,429 for both health and social care costs at one year post stroke, and £46,039 in health and social care costs over 5 years.[13]

AF contributes to one in five strokes in the UK and is associated with greater disability and mortality that non AF-related strokes.[1] Having AF leads to a significantly increased risk of stroke, heart failure and renal disease and increases mortality when compared to those without AF.[7] While two thirds of people with AF experience symptoms, one third do not, [3] with many only becoming aware of the condition when they have a stroke.[4] AF is relatively easy to diagnose, and treatment with anticoagulants can reduce the risk of stroke by two thirds.[5] Despite this it is estimated that up to 500,000 people in the UK have undiagnosed AF,[6] and with an ageing population, it is predicted that the number of people aged >55 years living with AF will more than double by 2060. [8]

10-year CVD ambitions for England

To complement the NHS Long Term Plan, the CVD Prevention System Leadership Forum have developed specific 10-year cardiovascular ambitions for England for the detection and management of the high-risk conditions.[19] These ambitions are underpinned by the need to do more to reduce health inequalities.

The England ambitions for AF are:
- 85% of the expected number of people with AF are detected by 2029
- 90% of patients with AF who are already known to be at high risk of stroke are to be adequately anticoagulated by 2029.

Five-year CVD vision for London

To support the 10 year cardiovascular ambitions for England, a five year vision for London has been developed by the CVD Prevention Partnership (CVDPP), [20] which brings together the London Clinical Networks, NHS RightCare, Public Health England, the British Heart Foundation, the Stroke Association and the three London Academic Health Science Networks. The CVDPP reports into the London Cardiac and Stroke Transformation Board and wants to help systems meet the regional requirement to produce a plan showing how, by the end of 2023, they will deliver on the vision and ambitions for CVD Prevention in London.

The London vision for AF is:
- Detect 85% of the expected population with AF
- Protect 87% of all people with AF at risk of stroke with anticoagulant therapy (which recognises that anticoagulant therapy is not appropriate for all people)
- Perfect anticoagulant pathways to ensure 90% of people with AF are considered for anticoagulant therapy within one week of referral.

Detect

The number of people in south London with a diagnosis of AF (QOF AF001) against the expected number has increased from 60% (in 2015-16) to 65.2% (2017-18). This equates to 6,958 patients added to the AF register, an average 2,319 patients per year. A breakdown of these figures by CCG can be seen below. Despite these increases, there is much to do across south London to meet the 85% national and local detection ambitions.

Detection of AF in south London for 2015/16, 2016/17 and 2017/18 as a % of predicted prevalence Quality Outcome Framework (QOF) AF001

Legend: ■ AF detection 2015/16 ■ AF detection 2016/17 ■ AF detection 2017/18
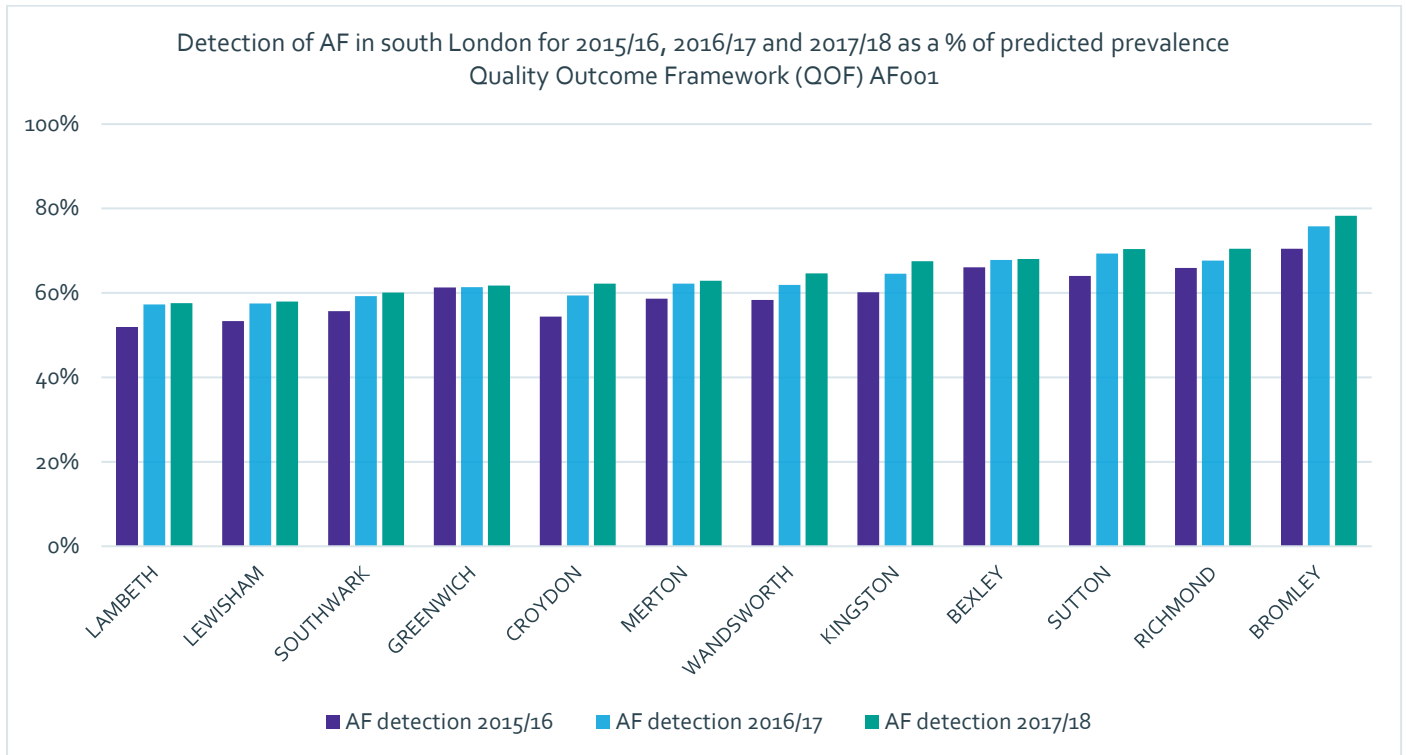
Protect

The number of people in south London with AF at risk of stroke (CHA2DSVasc score of 2 or more) and receiving anticoagulation (QOF AF007) has increased from 75.2% (in 2015/16) to 81.6% (in 2017/18). A breakdown of these figures by CCG can be seen below. Despite these increases, further improvements are required to meet the London ambition of treating 87% of people with AF at risk of stroke with anticoagulants by 2023, and the national ambition of treating 90% of people by 2029.

South London Rates of Anticoagulation of AF Patients at Risk of Stroke (CHA$_2$DS$_2$VASc > 1) Quality Outcome Framework (QOF) AF007

- ■ % anticoagulated (no exceptions) 2015/2016
- ■ % anticoagulated (no exceptions) 2016/2017
- ■ % anticoagulated (no exceptions) 2017/2018
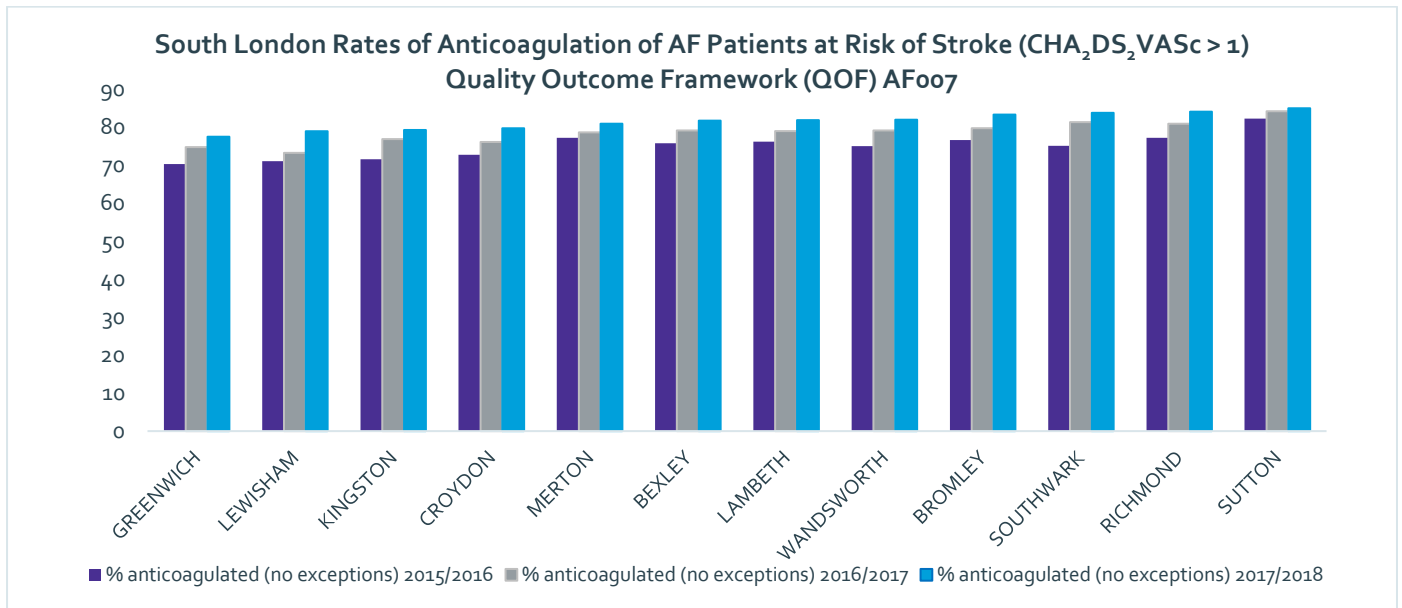
AF-related strokes

The increased detection of people with AF, and the increased number of those with AF at risk of stroke receiving treatment with anticoagulants, has coincided with a reduction in AF-related strokes in south London. Across the twelve boroughs of south London, the number of strokes in people with AF has decreased from 627 in 2016/17, to 547 in 2018/19, [21] a 12.7 % reduction over three years, compared to a 0.6% reduction nationally over the same period. The percentage of strokes in people with known AF and not being anticoagulated has also reduced during this time from 42.6% in 2016/17 to 29.7%, a 12.9% reduction over 3 years, compared to a 7.7% nationally over the same period.

Number of Strokes with known Atrial Fibrillation (2016/17 - 2018/19)
Sentinel Stroke National Audit Programme (SSNAP

■ 2016 - 2017   ■ 2017 - 2018   ■ 2018-2019

Percentage of Strokes with known Atrial Fibrillation Not Anticoagulated
(2016/17 - 2018/19)
Sentinel Stroke National Audit Programme (SSNAP)

■ 2016 - 2017   ■ 2017 - 2018   ■ 2018-2019
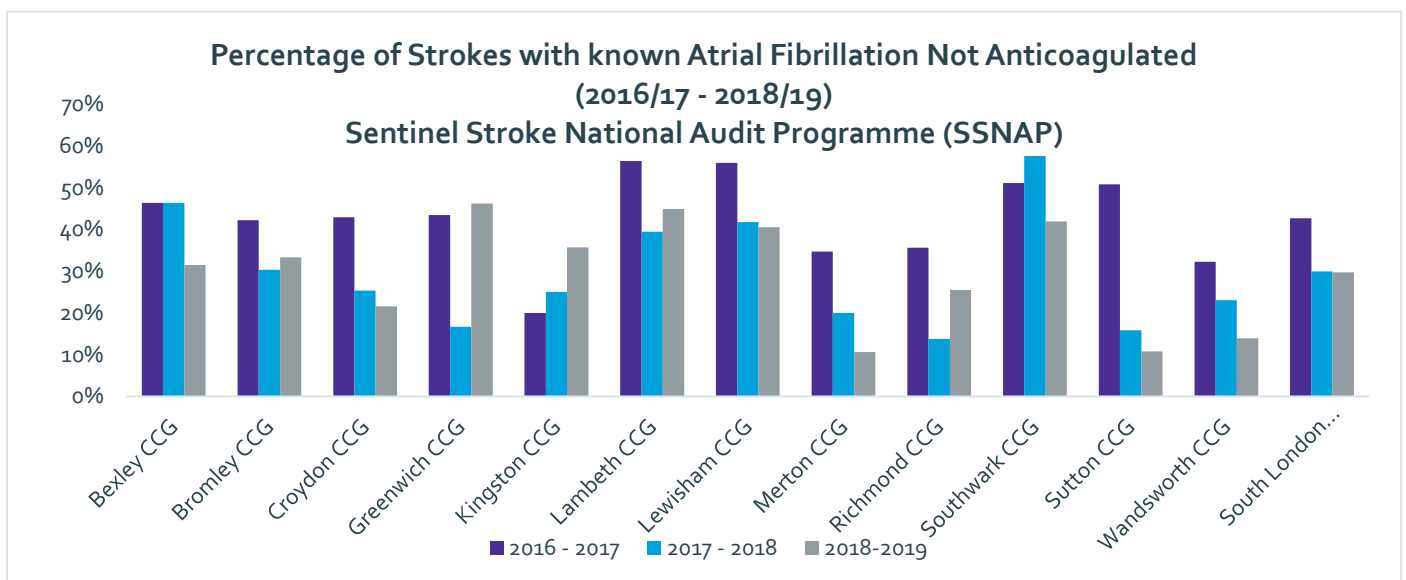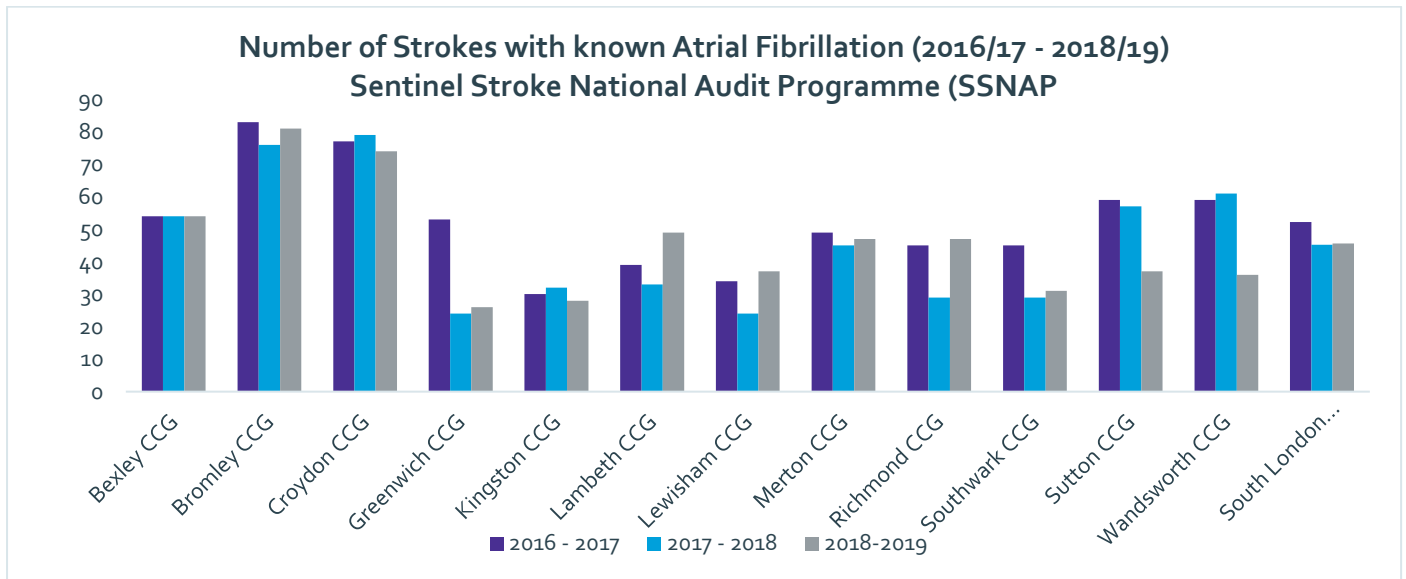
There are many different stakeholders across south London working to improve the detection and treatment for people with AF, leading to a reduction in AF-related strokes. While there has been progress, there remains variation in AF detection and treatment across different geographies. This presents an opportunity for ongoing improvements to further reduce AF-related strokes in the south London population and to reduce health inequalities.

Mobile ECG devices

In 2017, NHS England commissioned the 15 Academic Health Science Networks (AHSNs) across England to undertake a system-wide procurement initiative to promote the uptake of mobile digital technology for AF detection.

This novel approach to facilitate innovation adoption also aimed to reduce the incidence of stroke through increased detection of AF in England. As a result, 6000 mobile ECG devices were distributed across the county by the AHSNs, allowing a greater range of healthcare and non-healthcare settings to offer opportunistic pulse rhythm checks to asymptomatic groups at increased risk of AF.

The HIN, as the AHSN for south London was responsible for the distribution of 400 mobile ECG devices across the twelve boroughs of south London. Of the 6 mobile ECG devices available through the project, three-quarters of devices selected by HIN were Kardia (Alivecor. Inc) a credit card sized, single lead ECG device that uses ultrasonic signal that is received via the microphone of a compatible smartphone or tablet. The app has a built-in AF detection algorithm that provides a 30 second single lead ECG interpretation and a PDF of the trace that can be printed or emailed securely. The remaining 100 devices were WatchBP Home A (Microlife Health Management Ltd.), an automated blood pressure sphygmomanometer with a built-in AF algorithm. These two devices were selected by HIN based on a superior sensitivity and specificity, ease of use and/or their lower unit price compared to other available devices. Systematic review and meta-analysis have found both device types to have increased sensitivity and specificity compared to manual pulse palpation. One additional MyDiagnostick ECG device was provided for London Fire Brigade, as this was a more suitable device for their fire safe and well checks. MyDiagnostick (Medical B.V.) is a single lead ECG recorder, which is shaped as a stick with metallic handles encompassing the electrodes, which an individual grips to record an ECG rhythm strip. It has a built-in AF algorithm that will provide a 60 second interpretation of the results on connection of the device to a computer via USB.

The HIN's comprehensive single time point case finding for AF review provides more information on these, and other mobile ECG devices, and can be viewed at https://bit.ly/32hPAQG.
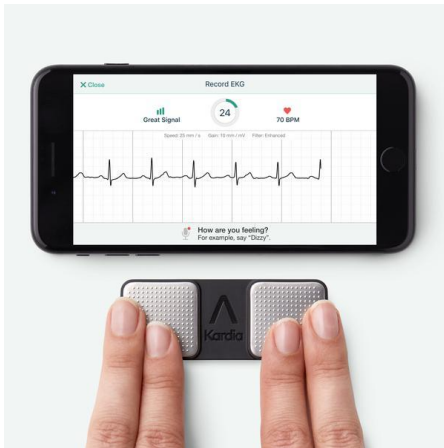
Kardia Mobile

WatchBP Home A

MyDiagnostick

Expressions of interest were invited from south London CCGs and local partners with a clear vision of how these devices would be used to test high numbers of people at increased risk of AF. Several additional settings were included during the project as interest in the devices spread. This enabled mobile ECG device to be used in a range traditional and some more novel settings, to assess the feasibility and effectiveness in each setting. The wide range of settings that received mobile ECG devices can be seen in table 1.

Devices were gradually rolled out across the 12 boroughs of south London between January 2018 and March 2019, when the project concluded. The HIN provided face to face training for the ECG devices and a range of supporting resources, which included the AHSN Network's project guidance covering information governance and a range of other considerations for their use. The training and recommendations for use were adapted for the type of device received and for each type of setting. We recommended pulse rhythm checks using mobile ECG devices were offered opportunistically to all people deemed at increased risk of AF that they encountered. Specifically, those at increased risk were identified as all those aged >65 years, or those aged <65 years with pre-existing CVD risk factors.

Table 1. Settings that received mobile ECG devices

Q4 2017/18	Q1 2018/19	Q2 2018/19	Q3 2018/19	Q4 2018/19
Oxleas Community Podiatry Team	Guy's & St Thomas' Community Podiatry Team	St George's Hospital Arrhythmia Team	Lambeth & Southwark Community Nurses	Croydon Community Heart Failure Nurses
Oxleas Mental Health Teams	One You Merton	The Furzdown Project Activity Centre for Older People in Wandsworth	Lambeth Community Pharmacists	St George's Hospital Stroke Team
Lambeth & Southwark integrated care pharmacy team	Merton Community Nurses	Greenwich GPs	Lambeth Community Opticians	South West London & St George's Mental Health NHS Trust Quality Improvement Team
HMP Brixton	London Fire Brigade Merton	Bexley Health Checks	Lambeth Early Intervention & Prevention Service	Kingston GPs
Southwark GPs	Merton GPs	Central London Community Healthcare Heart Failure Nurses	Wandsworth GPs	
Bexley CCG Pharmacists	Guy's & St Thomas' Neurovascular Clinic	Bexley GP Pharmacists	Sutton GPs	
Greenwich Community Pharmacies	Princess Royal University Hospital Stroke Clinic	Charlton Athletic Community Trust		
Lewisham GPs	Wandsworth Pop Up Shop (run by CCG and Local Authority)	Richmond GPs		
Croydon Rapid Response Team	Guy's & St Thomas' Urgent Care Centre	Richmond Intermediate Care Team		

Settings already offering pulse rhythm checks to individuals at lower risk of AF, for example to individuals aged >40 years during NHS health checks, manual pulse palpation was replaced by a pulse rhythm check using a mobile ECG device. Settings were instructed to test each person only once using the mobile ECG device. Exceptions to this were if they received an unreadable result from Kardia Mobile, which was usually due to noise

interference and common in loud environments. In these cases, users were advised to test in a quieter area where possible or revert to manual pulse checks where feasible. At the time of use, an unclassified result on Kardia Mobile was reported when the subject was tachycardic (heart rate >100bpm) or bradycardic (heart rate <50bpm), regardless of heart rhythm. In such cases users were advised to wait a few minutes and then retest up to twice. If unclassified readings persisted, users were advised to treat in the same way as a possible AF finding. In such cases, a PDF of any abnormal traces detected using Kardia Mobile could be printed or emailed for advice from a GP, or appropriately trained healthcare professional depending on the setting.

Possible AF highlighted by WatchBP or MyDiagnostick were treated the same way as if an irregular pulse had been detected manually. These devices were used for non-healthcare settings without an NHS Mail email address which was required to securely transfer the PDF of the trace from Kardia Mobile. As each device identifies 'possible AF', pathways for onward referral for 12-lead ECG to provide diagnosis were confirmed, ensuring timely and appropriate referral.

Kardia Mobile usage was captured and reported monthly through the national AHSN Network project. Watch BP usage was collected manually by users and reported monthly to the HIN. This usage data was shared regularly with the local project leads and users of the mobile ECG devices. Mobile ECG device users were invited to a community of practice to discuss their experiences and were also invited to complete a questionnaire to provide their feedback on the project.

It was important to view the mobile ECG devices in the context of the whole patient pathway, with a process for timely 12-lead ECG to confirm diagnosis, and referral for initiation of anticoagulation where appropriate. A key aim of the project was to review the feasibility of using mobile ECG devices in a range of settings for opportunistic testing for asymptomatic groups at increased risk of AF. It also aims to provide insight into the effectiveness of different settings at detecting possible AF, with the purpose to help identify new potential settings for opportunistic testing for AF, and for future commissioning intentions for AF detection where they are in place.

Findings

All 400 mobile ECG devices were distributed across the 12 boroughs of south London between January 2018 and March 2019, with the majority being deployed between May 2018 and March 2019. A total of 14,835 pulse rhythm checks were recorded using the of mobile ECG devices, detecting 597 people with possible AF.

Kardia Mobile was used to test 10,413 people, detecting 537 number of people with possible AF. WatchBP was used to perform 4,422 number of checks, finding 60 number of possible AF. A breakdown of usage by device can be seen by table 3. As only 86% of Kardia Mobile users registered their devices with the AHSN Network, any activity performed by the remaining 14% of users (42 Kardia Mobile devices) that were not registered was not captured, which would have increased these numbers further.

Figure 1. The cumulative number of possible AF detected by mobile ECG devices during the project

Cumulative number of possible Atrial Fibrillations detected
South London
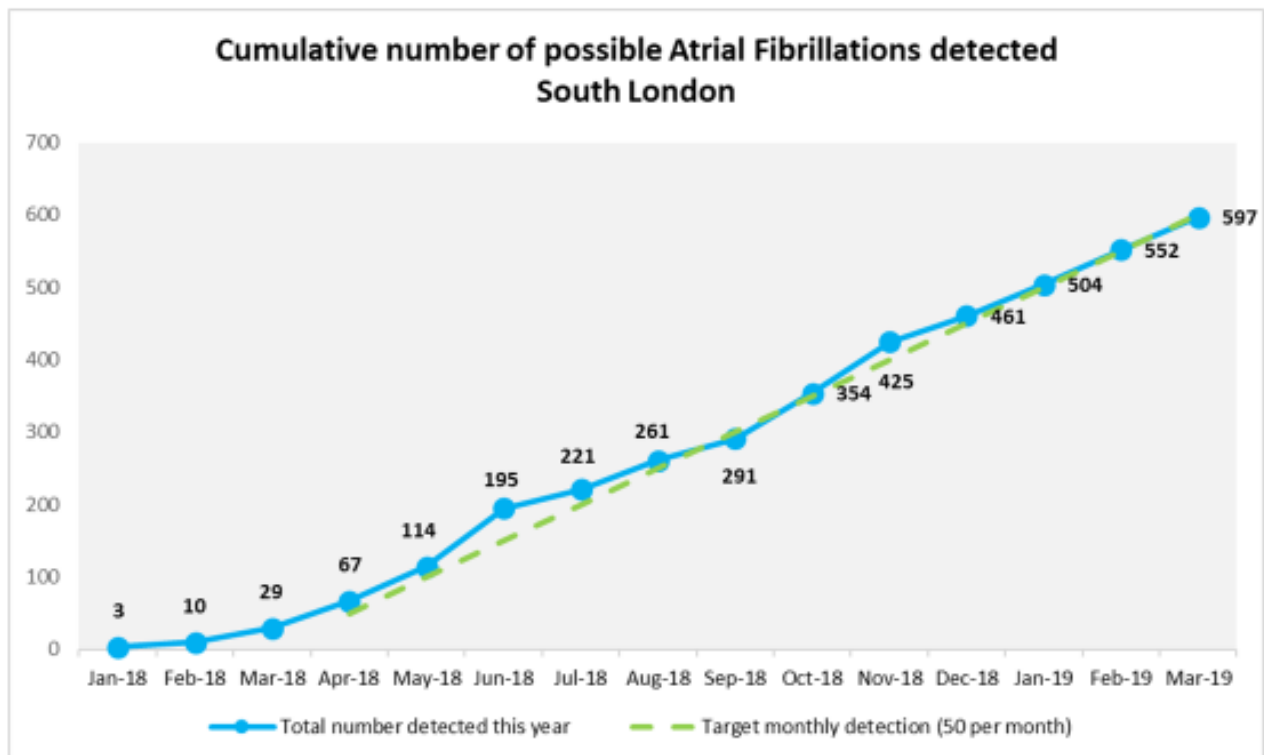
Device usage was fed back to users each month and learning was collected, allowing training materials and processes to be regularly improved. The mobile ECG devices were grouped into similar settings where possible to enable interpretation into the effectiveness of different settings at identifying possible AF. This enabled the estimation of the detection rate and prevalence of possible AF in each setting which can be seen in table 2. Some of the settings are discussed in more detail below.

Table 2. The impact of mobile ECG devices across the different settings in south London

	Device type	Pulse rhythm checks	Possible AF	Detection prevalence	Detection rate
Older persons community teams	Kardia Mobile	369	53	14.3%	1 in 7
Hospital outpatient clinics	Kardia Mobile	667	67	10.0%	1 in 10
GP Practices	Kardia Mobile	4494	264	5.9%	1 in 17
Community podiatry	Kardia Mobile	767	35	4.6%	1 in 22
Fire safe and well	MyDiagnostick	25	1	4.0%	1 in 25
Mental Health	Kardia Mobile	1182	45	3.8%	1 in 26
Community therapy teams	Both	404	13	3.2%	1 in 31
Community nursing team	Both	549	14	2.6%	1 in 39
Pharmacy	Both	2820	57	2.0%	1 in 49
Community outreach	WatchBP	2393	44	1.8%	1 in 54
Urgent Care	Kardia Mobile	391	3	0.8%	1 in 130
Prison	WatchBP	774	1	0.1%	1 in 774
Total		**14,835**	**597**	**4.0%**	**1 in 25**

Table 3: A breakdown of usage by device

	Number of devices	Pulse rhythm checks	Possible AF	Detection prevalence	Detection rate
Kardia Mobile	300	10,413	537	5.1%	1 in 19
WatchBP	100	4,422	60	1.4%	1 in 73
Total	**400**	**14,835**	**597**	**4.0%**	**1 in 25**

High impact settings

Housebound older people

The high prevalence of possible AF in housebound older people is highlighted by the mobile ECG device usage of community geriatricians, nurses and therapy teams.

The Rapid Response Team at **Croydon Health Services NHS Trust** performed pulse rhythm checks for new referrals received from the hospital or GP. Using Kardia Mobile to test housebound older people at increased risk of AF, they performed 389 pulse rhythm checks finding 56 cases of possible AF.

Community podiatry

Podiatrists are ideally placed to carry out opportunistic checks for undiagnosed AF as part of a routine podiatry assessment and when encountering visual symptoms that suggest an underlying circulatory disorder. The increased detection rate in podiatry may be due to patients in being older, and often with diabetes and existing cardiovascular risk factors. A routine appointment with a community podiatrist is typically between 15-20 minutes, which provides a greater opportunity to undertake a pulse check than some other settings which may have shorter appointments. The community podiatry team at **Guy's & St Thomas' NHS Foundation Trust** built opportunistic testing for AF using Kardia Mobile into treatment templates to ensure that all patients receiving community podiatry were offered a manual pulse check on their first appointment. Any 'possible AF' was communicated to the GP over the phone and in writing, with a PDF of the trace being posted or emailed to the GP practice ensuring timely and appropriate onward referral for 12-lead ECG and initiation of anticoagulation where appropriate.

Mental health teams

People with a serious mental illness have a life expectancy 15-20 years less than the general population. [17] This staggering healthcare inequality is the equivalent of the average life expectancy for people born in the UK in the 1950s. People with a serious mental illness aged 15-74 are nearly twice as likely to suffer a stroke as the general population.[18] Part of the reason for this is that of the recognised risk factors for stroke, prevalence of hypertension, diabetes, smoking and alcohol consumption are all greater in those with a serious mental illness. **Oxleas NHS Foundation Trust** used Kardia Mobile ECG devices alongside a small number of community and hospital-based services, to offer opportunistic testing for AF alongside existing physical health checks for service users at increased risk of CVD. For service users receiving some psychotropic medications who required ECG monitoring and had refused or been unable to access a 12-lead ECG, Kardia Mobile enabled clinicians to look for potentially dangerous ECG changes and prescribe medication safely.

General practice

The most common setting that mobile ECG devices were used in during the project was in general practice. Opportunistic heart rhythm checks were offered alongside a range of existing clinics in surgeries in eight boroughs. The practice nurse at **Dun Cow Surgery in Southwark** used Kardia Mobile in a range of interactions with older people including during NHS Health Checks, travel clinics and learning disability assessments, testing an average of 40 patients each month and finding 1-2 cases of possible AF per month. In one month alone and supported by a local incentive from the GP Federation, **Wells Park Surgery in Lewisham** offered 157 pulse rhythm checks using Kardia Mobile alongside NHS Health Checks, finding 4 patients with possible AF. As general practice is a setting familiar with offering manual pulse palpation to detect irregular pulse rhythm, processes for diagnostic 12-lead ECG and initiation of treatment should be well established.

Flu vaccination clinics

Annual flu vaccination clinics in general practice or community pharmacy provide the opportunity for a high volume of older people with increased risk of AF attending an appointment. Some GP practices used flu vaccination clinics to offer opportunistic pulse rhythm checks using a mobile ECG device to the over 65s. Practice nurses at **Hampton Medical Centre in Richmond**, offered opportunistic pulse rhythm checks to 260 patients using Kardia Mobile alongside their annual flu vaccination clinics, detecting 11 people with possible AF.

Moderate impact settings

Pharmacy

Mobile ECG devices were used in several community pharmacies and domiciliary pharmacy teams. In Greenwich, as part of a British Heart Foundation grant awarded to **Greenwich CCG** and **Greenwich Public Health** to perform 10,000 blood pressure checks in the borough over two years, eight community pharmacies were incentivised to use WatchBP, offering 1266 bloods pressure and pulse rhythm checks over 12 months, detecting 12 people with possible AF.

Community Outreach

Mobile ECG devices were used in several community settings including at AF awareness events, third sector organisations offering health checks, alongside activity centres for older people, a pop-up health shop on the high street, and a range of events for NHS staff.

One You Merton, a health improvement service in Merton, used WatchBP devices to offer adults a combined blood pressure and AF check at a range of public events across the borough. By adding an AF check to existing blood pressure checks, they were able to identify several asymptomatic clients with possible AF, who were referred to their GP for further investigation.

In preparation for introducing Kardia Mobile into clinical practice, **South West London & St. George's Mental Health NHS Trust** offered opportunistic pulse rhythm checks to staff at an AF awareness event using Kardia Mobile ECG, testing 290 members of staff and detecting 4 people with possible AF who were provided with written information and advised to visit their GP for further investigations.

A pop-up health shop commissioned by **Wandsworth CCG** and Wandsworth local authority occupied a vacant shop on the high street in a socially deprived area of the borough, with healthcare professionals offering mini-health checks to members of the public over a two-week period. As part of these health checks, Kardia Mobile was used to test over 259 people, detecting 9 cases of possible AF.

Lower impact settings

Prison

WatchBP was used at **HMP Brixton** to offer inmates AF checks as part of their established health checks. A total of 774 people were offered a joint blood pressure and heart rhythm check, detecting 1 person with possible AF. The young population within the section of the prison that the checks were performed in likely explains the low detection rate observed. Using WatchBP devices in prisons, or sections of prisons, with an older population may increase the detection rate, and this setting should not be discounted in this case. Using Kardia Mobile in prison was not an option as the accompanying smart phone or tablet were not permitted.

Urgent Care Centre

Supported by a specialist arrhythmia nurse, two nursing students from **King's College London** offered opportunistic heart rhythm checks to people attending **Guy's & St Thomas' NHS Foundation Trust** Urgent Care Centre over a four-week period using Kardia Mobile. A total of 391 people were tested, detecting 3 individuals with possible AF, who were followed up in the hospital's rapid AF clinic. Testing for AF in urgent care with Kardia Mobile was feasible and acceptable to staff and service users. The younger population (mean age of 40 years) may account for the low detection rate observed in this setting.

Discussion

This project provides insight into the opportunities and challenges across a wide range of settings for providing opportunistic testing for AF using mobile ECG devices in asymptomatic groups.

A previous systematic review of screening for new AF reported that undiagnosed AF was found in 1% of the overall population (1 in 100) and 1.4% in those aged 65 years or older (1 in 71).[13] A further study focusing on an older population found prevalence increasing to >13% in those aged over 85 years.[14] Using mobile ECG devices across a wide range of settings, allows the estimation of the numbers of people needed to test in each setting to detect possible AF.

Perhaps unsurprisingly, settings which offered opportunistic testing for AF in groups of older people, and those with existing CVD, found a greater prevalence of possible AF. These included housebound older people, and those tested in a range of specialist hospital-based medical outpatient clinics, and in general practice. Community podiatry and mental health settings were both more effective at detecting possible AF than those previously reported.[13] Our findings suggest that it is feasible to use mobile ECG devices in a range of healthcare and non-healthcare settings, in the hands of both healthcare professionals and non-healthcare professionals alike. They are effective in detecting possible AF in several novel high impact settings. As a large proportion of the population does not have regular contact with healthcare services, it is important to utilise a range of non-healthcare settings for pulse rhythm checks and make efforts to target harder to reach groups.

Although 400 mobile ECG devices were distributed across south London, there was significant variation in their uptake and use. Some settings grasped the device very quickly and embedded the pulse rhythm checks into their practice on a regular basis, using the monthly data to drive usage. Some settings used the devices sporadically, without fully embedding their use into practice and being dependent on certain interested users, while some settings who received devices did not use them at all. Those who successfully embedded mobile ECG devices used strategies that made their use routine and easy, such as building prompts into existing templates, adding them to established health checks and using a dedicated work device that the Kardia device could be attached to for a constant reminder to use them. The format of training also made a difference, with training at individual level or small group sessions proving more effective than at larger events such as neighbourhood meetings or protected learning time events. Getting the balance between

the optimal group size and the training resources available was an important consideration.

As Watch BP provides both a blood pressure reading and a heart rhythm check, patients who have their blood pressure measured using this device will receive an additional pulse rhythm check. In traditional settings where blood pressure is routinely measured, such as in NHS Health Checks, community pharmacies, hospital clinics and at public health awareness events, replacing existing sphygmomanometers with WatchBP will provide the opportunity to deliver a high volume of pulse rhythm checks to test for AF in high risk, asymptomatic groups.

Limitations

It is important to recognise the limitations of this project. The small sample sizes in some settings limits the reliability of findings, which need to be interpreted with caution. While users were discouraged from testing people who already had a diagnosis of AF, it is not possible to ensure this advice was consistently followed. It was outside the scope of this project to follow up what proportion of those identified with possible AF went on to receive an AF diagnosis. Further investigation is therefore required to confirm the predicted conversion rate from a finding of possible AF on a mobile ECG device to a diagnosis of AF from 12-lead ECG.

It was not possible to capture the activity from all 400 devices. As only 86% of Kardia Mobile users registered their devices with the AHSN Network, any activity performed by the remaining 14% of users (42 Kardia Mobile devices) that were not registered was not captured, which would have increased these numbers further.

A limitation of Kardia Mobile is that it works through an app which needs to be downloaded on smart phone or tablet. While some healthcare professionals had access to a work device which can be used alongside Kardia Mobile, many did not. A small number of settings purchased a device specifically for this project. WatchBP also has limitations. The blood pressure is measured three times and reports the average of these three, meaning it takes longer to perform the measurement than using traditional sphygmomanometers. For this reason, settings where appointments with patients were short reported it difficult to embed their use into practice.

There was also a noticeable difference in the technological readiness and willingness across the different settings. Those with poor readiness (e.g. poor internet access, a lack of work smartphones or tablets with Kardia Mobile, no access to NHS.net email accounts, lack of confidence or poor digital literacy) had poorer device utilisation making Kardia Mobile a challenge to embed in some areas, limiting its use and effectiveness.

Other considerations

Where areas do not have access to mobile ECG devices, a 30 second manual pulse palpation remains an effective method of detecting an irregular pulse. This project helps inform those organising healthcare services on the effectiveness of different settings for offering pulse rhythm checks, either with mobile ECG devices where they are available, or through manual pulse palpation where they are not. For every 25 people diagnosed with AF and treated with anticoagulants, one AF-related stroke is prevented.
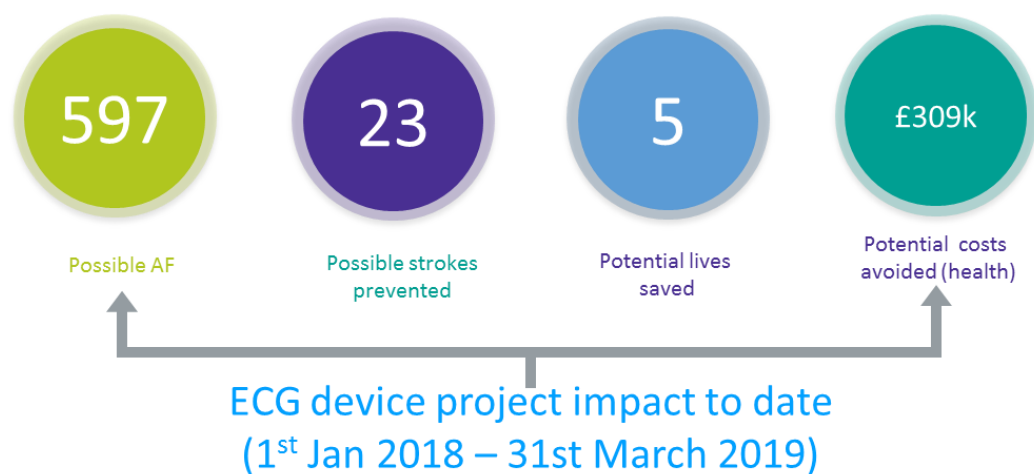
Although the innovative ECG devices are easy to use and popular with patients, they are only effective within the context of the whole patient pathway. A clear local process that enables timely access to 12-lead ECG, diagnosis and treatment is paramount if a reduction in AF-related strokes is to be achieved.

Conclusion

By capturing the number of pulse rhythm checks and the number of possible AF detected, it is possible to estimate the impact of the project (figure 2).

It is estimated that for every 25 people found to have AF and appropriately treated with anticoagulants will prevent one stroke, and for every four strokes prevented saves one life.[15] As well as the human burden of stroke, the financial cost of stroke is significant. The healthcare costs in the first year following the average stroke is £13,452,[13] The mobile ECG device project detected 597 people with possible AF, preventing 23 possible AF-related strokes, with over £300,000 of potential healthcare costs avoided over one year.

Figure 2. Potential impact of mobile ECG device project in south London

597	23	5	£309k
Possible AF	Possible strokes prevented	Potential lives saved	Potential costs avoided (health)

ECG device project impact to date
(1st Jan 2018 – 31st March 2019)

These findings therefore support further exploration of pulse rhythm checks in different settings across south London as means to achieve the local and national ambition of detecting 85% of the population who have AF. Such an approach will benefit the people of south London, helping reduce the misery and costs caused by AF-related stroke.

The NHS Long Term Plan advocates increased working with voluntary sector partners, community pharmacists and GP practices to provide wider opportunities for the public to tests for the high-risk conditions. By estimating the possible AF detection rates, this project highlights some additional settings which are feasible and effective to test for AF, which

warrants further exploration.

This project has prompted the HIN to undertake a further project testing models for the detection and treatment of AF in housebound older people, a population that is recognised at greater risk of suboptimal treatment. [12] The HIN have identified flu vaccination clinics, community podiatry ad mental health settings as priority areas for pulse rhythm checks in south London, with work underway to support our south London partners in these areas.

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