# Feasibility and acceptability of opportunistic screening to detect atrial fibrillation in Aboriginal adults

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## Abstract

**Objective**: Examine the feasibility and acceptability of an electrocardiogram (ECG) attached to a mobile phone (iECG) screening device for atrial fibrillation (AF) in Aboriginal Controlled Community Health Services (ACCHS) and other community settings.

**Methods**: Semi-structured interviews were conducted with ACCHS staff in urban, rural and remote communities in three Australian states/territories. Quantitative and qualitative questions identified the enabling factors and barriers for staff and Aboriginal patients' receptiveness to the device. Mean quantitative scores and their standard deviation were calculated in Microsoft Excel and qualitative questions were thematically analysed.

**Results**: Eighteen interviews were conducted with 23 staff across 11 ACCHS. Quantitative data found staff were confident in providing iECG screening and managing the referral pathway, and thought the process was beneficial for patients. Qualitative data highlighted the usefulness of the device to undertake opportunistic screening and acceptability in routine practice, and provided opportunities to engage patients in education around AF.

**Conclusion**: The iECG device was well accepted within ACCHSs and was feasible to use to screen for AF among Aboriginal patients.

**Implications for public health**: The device can be used in clinical and community settings to screen Aboriginal people for atrial fibrillation to help reduce rates of stroke and other cardiovascular diseases.

**Key words**: indigenous health, rural and remote health, primary health care, screening

Atrial fibrillation (AF) is an established antecedent for stroke and other forms of cardiovascular disease.[1] Cardiovascular disease is the main cause of mortality among Aboriginal and Torres Strait Islander people in Australia (hereafter Aboriginal people).[2]

Handheld electrocardiogram (ECG) devices have been recommended internationally as preferred screening tools for the diagnosis of atrial fibrillation.[3] These devices can attach to mobile phones, are typically referred to as iECG and have demonstrated effectiveness and acceptability in clinical and community settings such as dental vans, pharmacies[4] and in general practice.[5,6] Both systematic and opportunistic screening of adults for AF increased the detection rate of new cases compared with routine practice and opportunistic screening has greater cost-effectiveness than systematic screening.[7] Competence and confidence of nurses facilitated iECG screening whereas a lack of staff availability and technical issues obstructed screening.[6] A recent study found the majority of iECG-screened participants were satisfied with the device, finding it easy to use without restricting activities or causing anxiety.[8]

A scoping review on AF in Indigenous populations internationally found higher AF hospitalisation rates relative to other populations and occurrence at younger ages and with more comorbidity.[9] National data reports the AF rate, as either a principal or additional diagnosis, was 1.4 times as high for Aboriginal Australians as for other Australians.[10] One study in Western Australia reporting on AF as the primary outcome,[11] conducted in a hospital inpatient setting, found higher rates in comparison with non-Aboriginal counterparts. A further study of hospital admissions found AF to occur

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in Aboriginal people 15 years earlier than in non-Aboriginal people, as well as higher overall rates in comparison to non-Aboriginal people and higher long-term mortality rates among the Aboriginal patients.[12] However, little data on the prevalence of AF in Australian Aboriginal communities is available.

Given the limited available and inconsistent data on AF, and acknowledged importance as a risk factor for cardiovascular disease, early screening and detection holds promise in improving clinical and population outcomes. Early screening and detection usually occurs in primary health care settings and for Aboriginal people the Aboriginal Community Controlled Health Services (ACCHS) play a pivotal role in delivering health care in urban, regional and remote community settings. A key service performed by ACCHS is adult health checks, which are recommended every two years for Aboriginal adults aged 15-54 years and comprise screening of multiple health variables and risk factors including cardiovascular disease and health promotion.[13] The checks are typically conducted by Aboriginal Health Workers (AHWs) and pathways exist for subsequent referral to relevant health professionals and specialists, although these can be variable depending on location, remoteness and system factors.[14] The feasibility and acceptability of the iECG device to health staff working within the Aboriginal Community Controlled Health sector as a tool for determining AF prevalence among Aboriginal adults is unknown.
AF is not only often asymptomatic,[15] but Aboriginal Australians are more likely to delay accessing the healthcare system until later in a disease process or may not seek timely help in emergencies due to issues such as fear, racism and service access.[16,17] However, ACCHS can help overcome these barriers and has achieved better health outcomes for Aboriginal people than mainstream services.[17] This study aims to determine the feasibility and acceptability to health staff of opportunistic screening through the use of an iECG device to detect AF among Aboriginal adults within community controlled health settings.

## Methods

### Study design

The study adopted a mixed methods design and took place during 2017. It was co-designed and implemented with the participating communities and community services. The full protocol of a study to conduct opportunistic screening for AF among Aboriginal adults that included the examination of the feasibility and acceptability of the device has been described elsewhere.[18] The study was approved by Aboriginal Health and Medical Research Council (AHMRC) of NSW (1135/15), the Western Australian Aboriginal Health Ethics Committee (WAAHEC) (HREC706) and the Central Australian Human Research Ethics Committee in the NT.

### Participants

Interviewees were 18 ACCHS staff (Aboriginal and non-Aboriginal), including AHWs and registered nurses (RNs). They were purposefully sampled from the 11 ACCHS involved in the study due to their specific involvement in the full study as the ACCHS contact personnel and/or had responsibility through their professional role in conducting iECG screening with patients. Participating ACCHS were located in urban (major cities, N=2), regional (N=7) and remote (N=2) areas [19] within New South Wales (NSW; N=7), Western Australia (WA; N=3) and the Northern Territory (N=1). At the commencement of the study, staff received face-to-face training at their ACCHS in the use of the device, consent processes for patients, cardiovascular health promotion and treatment, data collection and the clinical pathway for patients with a non-normal result. The screening process involved using a dedicated smartphone with an iECG device to screen a patient and using the device software to transmit the ECG result to the study database via the telephone data network using an activated sim card. Internet connectivity was required to transmit the results to a secure website for data storage but was not required for the screening itself. Screening occurred from June 2016 to February 2018 and the iECG device was retained by ACCHS at the end of the full study for ongoing use in routine practice. All interviewees provided informed verbal and written consent to take part.

**Box 1: Qualitative open-ended questions.**

1. What aspects of the screening process do you think were useful for patients?
2. How did you feel the patients responded to the screening process?
3. Were there any things you liked about the screening process? Did you find it worked well?
4. Were there any aspects of the screening process that you did not like or were difficult for you? If so, can you describe these in more detail?
5. Can you suggest any ways of improving the screening process?

### Measures

The study measures were developed in partnership with Aboriginal investigators and communities in each of the three states/territories that the study was conducted in to ensure their contextual integrity. Face validity of the measures were also determined through this co-design process. Quantitative and qualitative questions identified the enabling factors and barriers for AHWs and other ACCHS staff using the iECG in their roles and Aboriginal patients' receptiveness to the iECG as perceived by the iECG screeners. Semi-structured interviews included seven quantitative five-point Likert question items (strongly agree, agree, neither agree nor disagree, disagree, strongly disagree). Staff were asked whether they felt they were provided with sufficient training for the study and their confidence in providing iECG screening, and in managing the pathway and treatment plan for patients who required follow-up. Interviewees were also asked whether they believed patients (who were subsequently diagnosed with AF) followed their treatment plan for the condition, whether the process was beneficial for participants (who were screened) and the time commitment required for the study. Five qualitative open-ended questions asked interviewees what they thought was useful for patients, how patients responded to screening, what interviewees liked and found challenging about the process and any suggestions for improvement (Box 1). Potential participants were able to choose to take part through a group interview if preferred.

### Procedure

Data collection occurred during the second half of 2017. Purposefully sampled interviewees in each ACCHS were approached by the researcher coordinating the study by telephone, face-to-face or by email, as appropriate, and invited to participate and/or suggest other suitable interviewees within the ACCHS. Interviews were conducted at a time and location convenient to the interviewees by one of five researchers (RM, HF, SH, KT, HF) with the exception of two interviews, which were conducted by two researchers following the community's

request. Each of the researchers had tertiary training in qualitative research methods and prior experience of conducting interviews. Face-to-face interviews were conducted where feasible and typically took place in private in the staff member's closed office, or interviews occurred by telephone where distance, travel or time constraints existed. Interviews were audio-recorded and transcribed verbatim, other than in the Northern Territory where no audio recording occurred for cultural reasons in the relevant remote community. In this interview, the participants and interviewer talked as a small group in an informal setting with respect to the participant cultural preferences, responses were agreed on among the group and data were recorded through the detailed field notes of the interviewer. Recruitment continued until no new information emerged from interviews. Interview duration was typically 30 minutes (minimum 15 minutes; maximum 60 minutes). Quantitative responses were recorded in a Microsoft Excel spreadsheet and qualitative responses were entered into QSR NVivo software version 10 (QSR International) for data management. Community members from each participating site were screened for AF using the iECG device, and details of this study component are provided in a separate forthcoming publication. In summary: participants were recruited from two states (NSW N=419; WA N=161) and the NT (N=39) and across three geographical location types (remote N=41, regional N=459; and urban N=119); 619 iECG screens were collected; and results were recorded as either Unclassified, Normal or Possible AF and referred locally for confirmatory 12 lead ECG where an Unclassified or Possible AF result was reported.

### *Data analyses*

For the quantitative questions, the five-level Likert question items were scored from 5=strongly agree to 1=strongly disagree. Mean scores and their standard deviation were calculated in Microsoft Excel. For the qualitative questions, thematic analysis[20] was used to capture key themes around feasibility and acceptability of the device within ACCHS, including perceived barriers and enablers to its use. An inductive approach was used to code the data transcripts and identify frequently occurring themes that emerged from the coded content. Data analyses were conducted and cross-checked by two researchers who had conducted the majority of the interviews. A member-checking[21] process was undertaken through consultation with the Aboriginal investigators and community members to finalise the results and include their correct interpretation.

## Results

Information on the geographical location and occupational characteristics of the interviewees as well as the type of interview is presented in Table 1.

### Quantitative data

Mean score and standard deviation of five-item Likert scale questions are presented in Table 2. Overall, interviewees reported they were provided with sufficient training for their role in the screening study and did not believe that the study took too much of their time. They expressed confidence in providing an iECG screening and in managing the referral follow-up pathway for patients where required. Most agreed that the process of screening to detect and manage AF in Aboriginal patients, regardless of the diagnosis, was beneficial for patients although less were convinced that most patients diagnosed with AF would follow their treatment plan.

### *Qualitative data*

Qualitative data outlining four main themes of feasibility; acceptability; use as an educational tool; barriers to use are described with exemplary quotes in Figures 1-4.

#### *Theme 1: Feasibility of the iECG for ACCHS screening*

The majority of interviewees spoke about the usefulness of the device to undertake opportunistic screening in their roles. Specifically, they found the iECG simple, quick and easy to use and liked its portable nature.

**Table 1: Interviewee characteristics (N=18).**

| Characteristic | Number |
|---|---|
| **State/ Territory** | |
| NSW | 12 |
| WA | 4 |
| NT | 2 |
| **Geographical classification** | |
| Urban | 2 |
| Regional | 13 |
| Remote | 3 |
| **Professional role** | |
| RN | 9 |
| AHW | 4 |
| AHW/RN | 2 |
| AHW/Manager | 2 |
| Manager | 1 |
| **Interview type** | |
| Face to face | 12 |
| Telephone | 6 |

Several interviewees also thought they could use the device in the future as part of standard adult health checks for Aboriginal patients.

#### *Theme 2: Acceptability of the iECG among staff and patients*

Most interviewees described how the device was acceptable for use with patients in their routine practice and enhanced diagnostic and other screening processes for early intervention and chronic disease management. They spoke of how the device was particularly useful beyond clinical settings in the community where it seemed to have greater acceptability among patients and provided more flexible options. This greater acceptability related to comfort and anonymity of community-based screening, with participants indicating how some patients could feel uncomfortable with perceived implications of screening results in the clinical setting. While all interviewees described how the device was generally well received by patients, some interviewees

**Table 2: Mean score and standard deviation of five-item Likert scale questions (5=strongly agree; 1=strongly disagree).**

| Question | Percent 'agree' or strongly agree' |
|---|---|
| 1. 'I was provided with sufficient training for my role in this study' | 88.9% |
| 2. 'I was confident in providing an iECG screening' | 100.0% |
| 3. 'I was confident in managing the referral pathway for patients who required a confirmation ECG by the GP' | 94.4% |
| 4. 'After a patient was diagnosed with Atrial Fibrillation, I was confident helping support their treatment plan' | 94.4% |
| 5. 'I believe most patients followed their treatment plan' | 61.1% |
| 6. 'I believe this process of screening to detect and manage AF in Aboriginal patients, regardless of the diagnoses, was beneficial for patients' | 83.3% |
| 7. 'I believe that this study took too much of my time' | 16.7% |

described worry or anxiety expressed by patients in anticipation of what the device might diagnose, or in response to a positive or unclassified result for AF.

There were also high levels of acceptability of the device and screening process among ACCHS staff, despite some challenges in establishing the project into their work patterns. Specifically, interviewees spoke of the time benefits of the iECG compared to a full ECG test and how it provided an opportunity to discuss broader aspects that promoted health with patients. In remote communities, the importance of AHWs in providing culturally-competent care in partnership with other health professionals and their expertise was described, taking account of complexities around community factors. While patients appeared to be most comfortable with AHWs, conflicting cultural issues relating to traditional views regarding the heart, AHW professional authority and caution around heart health and cultural boundaries relating to their professional and personal roles in the community were described by remote AHWs. These issues related to the management of patients and relationships with community members and the interactions of these factors with the roles of non-Aboriginal health professionals whose expertise and lack of cultural conflict could provide clarity for patients and support the initial screening by AHWs.

**Figure 1: Qualitative interviewee quotes: Feasibility.**

| |
|---|
| *"It worked very well, it was quick, results immediately, just so simplified and when you're in outreach and there's only 2 nurses, this sort of technology is good for us, especially when time management is difficult."* [Remote AHW/RN] |
| *"It's portable, provides opportunistic testing away from the main clinic, gave the patients a visual that they found interesting."* [Regional RN] |
| *"We really liked this because we can make this part of their adult health check."* [Remote AHW] |
| *"I can include the iECG in the regular routine with Blood Pressure etc."* [Remote AHW/RN] |

**Figure 2: Qualitative interviewee quotes: Acceptability.**

| |
|---|
| *"A very good tool for me as it was a fast way of diagnosis. It sped up the diagnostic procedure and sped up the treatment pathway."* [Urban RN] |
| *"If we were out in the field, on outreach so could have family do it where they felt more comfortable in their own home. Wherever we did it they were happy and it didn't take up too much time."* [Regional RN] |
| *"There was excitement through to the other end of the scale – absolute fear about what the iECG would actually disclose."* [Remote AHW] |
| *"I liked how it was simple, 30 seconds, much easier than a regular 12 lead ECG so that was really good."* [Regional RN] |
| *"I liked the fact that it a good tool for generating yarning about your heart and what was normal."* [Urban RN] |
| *"It's better to involve the nurse and doctor to talk about the treatment plan, because AHWs don't really know enough about this AF. Also some people don't like health workers involved because they worry about privacy because we are part of the community. Even though we know we have to keep things confidential, some people don't want to see us."* [Remote AHW] |

**Figure 3: Qualitative interviewee quotes: Use as an educational tool.**

| |
|---|
| *"Opening that dialogue around heart health, whether it was having that conversation if they had a preexisting condition, asking about what medication they are on. It was a good engagement tool for people who would otherwise not be engaged in that kind of conversation."* [Regional AHW/RN] |
| *"I would like more training in AF to be up to date about that heart problem and having cardiac resources around AF that are culturally appropriate and respectful and in language."* [Remote AHW] |

### *Theme 3: Use as an educational tool*

Several interviewees described how the iECG device provided unique opportunities to engage patients in education around AF and their heart, and to empower patients to find out more about their heart health. Some staff also spoke of how using the device for screening led them to want to learn more about AF and cardiovascular disease themselves in their professional role.

**Figure 4: Qualitative interviewee quotes: Barriers and enablers to use.**

| |
|---|
| *"Internet coverage is very slow for us, staff don't always have email, we shouldn't have to be faced with this stuff. I could personally see that if the ECG was ok but if I couldn't upload it to Dr in town I would have to have a backup plan."* [Remote AHW/RN] |
| *"The difficulty is that the 24-hour requirement to be followed up by the Dr is hard here as the Dr only comes here once a week."* [Remote AHW/RN] |
| *"The issue was getting them back to clinic for any follow up required."* [Regional RN] |
| *"Sometimes it [the device] couldn't decide the diagnosis when it was clearly sinus rhythm and that was a bit frustrating."* [Urban RN] |
| *"I think from screening tool without needing to have all the data entered into the phone. . . I think that would be really useful tool, just like taking blood pressure, taking pulse. I think it's just because this is a study that you have to collect data on the person, and getting consent all that sort of issues."* [Regional RN] |
| *"I think the best time was when you guys were here being a part of it, that was really valuable. It's difficult to overcome the barriers we did face, I can't think of a way other than having someone at the service that could solely do it."* [Regional RN] |
| *"Having cardiac resources around AF that are culturally appropriate and respectful and in language."* [Remote AHW] |

### *Theme 4: Barriers and enablers to using the device existed*

Some challenges or barriers were also described. These were a mixture of cultural and logistical issues, but many of the latter related to the requirements of the study protocol. A number of logistical issues were described across urban, regional and remote communities relating to the internet connectivity required to upload data collected by the device. Interviewees outlined some challenges in ensuring patients could receive appropriate follow-up within the required time period and that patients returned for follow-up of unclassified or positive readings, particularly when the device was used in the community setting. The consent process and paperwork requirements of the study were also described by interviewees as a barrier to both their and their patients' participation. Interviewees spoke about how training procedures delivered by the researchers and onsite assistance helped to overcome some of the barriers described. They also highlighted how educational resources would also help overcome barriers around knowledge of AF and the screening process.

## Discussion

Our findings demonstrate the feasibility and acceptability of a portable, handheld iECG device for the screening and detection of AF within ACCHS and related community settings across a range of urban, regional and remote areas in Australia.

Several studies have previously established the feasibility and acceptability of a range of screening tools among Aboriginal populations[22,23] as well as iECG devices in mainstream populations.[5,7] This study is the first to examine these factors in relation to the iECG screening tool in Aboriginal populations. Our quantitative data found that both Aboriginal and non-Aboriginal ACCHS staff were confident in providing iECG screening and managing the referral follow-up pathway, and felt the process was beneficial for patients. The feasibility and acceptability of screening tools within the ACCHS setting has been described previously[23] and our findings confirm the usefulness of screening in this setting across urban, rural and remote settings. Interviews confirmed the feasibility and usefulness of iECG screening in the community setting despite several barriers. These findings are consistent with the results

of the screening process that achieved recruitment of 619 Aboriginal patients aged 45 years and over across the 11 ACCHS, reported in detail separately.[18]

Community settings, such as events and home visits, gave opportunities to engage with patients' family members and the wider local Aboriginal community and to undertake broader preventive screening beyond the traditional clinical service. Given known barriers experienced by Aboriginal people in engaging with the health sector for health promotion,[24] iECG screening in community settings enhances opportunities for health promotion and engagement. This is particularly valuable in rural and remote settings where disparities in health service provision exist[25] as well as among Aboriginal populations broadly.[26]

Our qualitative data also highlighted the usefulness of the device to undertake opportunistic screening and its acceptability in routine practice, specifically in providing an easy-to-use resource to assist cardiac diagnosis that was favoured by patients. These are positive enablers to achieving greater access to, and update of, preventive and treatment services within primary care, known to be linked with better health outcomes.[26] A couple of interviewees suggested incorporating the iECG screening tool into Aboriginal adult health checks, which provide comprehensive health assessments and enable opportunities to provide health advice and risk factor modification.[27] This would align with the interviewee recommendations of the potential for the iECG device to be used as an educational tool for wider health promotion and a component of empowerment through improving health literacy[28]; we recommend the process of formal addition to adult health checks[13] be investigated further.

Several barriers to screening were described by ACCHS staff. These included a lack of time to complete screening, logistical and technical issues with the device, implementation of the protocol such as a lack of opportunity for timely follow-up with a doctor, and internet connectivity issues. Some of these barriers related only to the study protocol, not the use of the device itself, such as the requirement to upload data to the study and so would not be present in ongoing use or might be overcome with an upgraded smartphone. The 24-hour time period required for follow-up with a doctor was reported as challenging to achieve in remote areas where a doctor may only provide weekly community visits, yet the screening process was considered to have overall benefits in identifying patients potentially at risk of AF to ACCHSs staff that may not otherwise have occurred.

**Table 3: Future suggestions for iECG device use.**

| Finding | Future suggestion |
|---|---|
| Theme 1: Feasibility of the iECG for ACCHS screening | Provide up to date devices in ACCHSs |
| Theme 2: Acceptability of the iECG among staff and patients | Include in Indigenous adult health checks |
| Theme 3: Use as an educational tool | Provide further training to ACCHSs staff on the device |
| Theme 4: Barriers and enablers to using the device existed | Streamline screening & follow-up processes |

Few interviewees reported actual barriers to patient engagement with the device generally positively received. Only a small number of participants, mainly AHWs in remote areas, expressed patient concern, fear and confusion related to the device and its results. Strategies described to overcome these reported barriers included supporting the positive interpersonal relationships that provide trust between AHWs and patients.[29] The barrier related to obtaining participant consent and related research paperwork would not exist outside of the research processes. The protocol for this study[18] stated that the local Aboriginal healthcare workforce would collect the data, however, this was not the case in all participating sites (Table 1). This was due to a variety of reasons: AHW availability and role in the clinical setting; hesitancy from a few AHWs to collect the data, requiring more support and time to become confident in the use of the iECG than was feasible for the research team to deliver at the site; cultural issues around privacy; and concern about giving 'bad news' to participants.However, the final study sample gave a broader perspective of the ACCHS screening process including managers as well as AHWs and RNs.

Strengths of this study include the examination of a novel device in both a clinic and community setting, the multi-site recruitment of interviewees across three states/territories, urban, regional and remote areas and across a range of professional roles within ACCHS. The study was designed and implemented in close collaboration with communities and community services, an approach vital to achieving culturally relevant acceptance and engagement in cardiac care.[30] While the study participants gave many positive perspectives of the screening, some difficulties were also described such as the difficulty in obtaining consent and ensuring follow-up took place, as well as fear of the device and its results among some people. Overall, we therefore consider the study to give accurate data about the feasibility and acceptability of the device for screening. Our findings summary and suggestions for future use are outlined in Table 3.

## Conclusion

Overall, the iECG device was well accepted within ACCHS and was feasible to use to screen for AF among Aboriginal patients in both clinical and community settings. A number of barriers to screening within these settings were identified, but solutions to overcome these barriers emerged and the use of the device created interest in relevant training and educational resources. Screening through the iECG device is a feasible and acceptable way to look for untreated AF in a community or clinic setting. It has the potential, if widely utilised and followed up, to reduce the unfortunate outcome of stroke that is experienced at a younger age and higher rates by Aboriginal people, and to contribute to improving the health literacy and health of Aboriginal people.

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