

## Detection of atrial fibrillation and management of stroke risk

### Introduction

Atrial fibrillation (AF) is the commonest cardiac arrhythmia, affecting approximately 1% of the population<sup>1</sup>. The condition occurs when the upper heart chambers (the left and right atria) beat sporadically, causing an irregular and increased heart rate<sup>2</sup>. The sinoatrial node (SAN) initiates the electrical activity and sends electrical impulses to the atrioventricular node (AVN) in the ventricles allowing the heart to beat methodically. The electrical signals in AF are erratic and this disorganisation in activity leads to an irregular heartbeat<sup>3</sup>. This abnormality can lead to the formation of blood clots resulting in a display of cardiac problems, commonly a cerebral vascular accident (stroke) occurring when a blood clot becomes lodged in the arterial supply to the brain<sup>4</sup>. It is estimated that 15% of all strokes are due to underlying atrial fibrillation making it important to treat patients with anticoagulants to prevent these associated complications<sup>5</sup>. Common symptoms of atrial fibrillation include heart palpitations, chest pain, dizziness and breathlessness however some individuals are asymptomatic and diagnosis is often an incidental finding, this is known as silent AF<sup>2-3, 6</sup>.

### Method

As part of the Yorkshire and Humber Academic Health Science Network's national programme to facilitate the spread and adoption of best practice for AF detection and patient care, AliveCor (Kardia) devices were provided to the Stockwell Road Surgery. As second year medical students, we spent a total of two days at Stockwell Road Surgery and associated nursing homes in Knaresborough using the Kardia mobile application (app) to identify patients with undiscovered atrial fibrillation. The aim was to detect these patients and subsequently place them on an appropriate treatment plan after definitive diagnosis using a 12-lead electrocardiogram (ECG). The app allows a two-lead ECG to be traced in thirty seconds by asking the patient to place their index and middle finger from each hand on the electrodes. All patients who came into the surgery for routine appointments were offered the opportunity to be tested for the condition, however we showed a particular interest in the results from the over 75 age group as these patients have a significant increased risk of stroke<sup>7</sup>. When visiting the nursing homes, we tested all patients who were registered at Stockwell Road Surgery, were not already diagnosed with atrial fibrillation and did not have dementia. The results from the patient's ECG's were added to their notes. There were four possible results from the app: normal, possible atrial fibrillation, unclassified and undetermined. Results that did not come back as 'normal' were investigated further, those with a result of possible atrial fibrillation were invited for a 12-lead ECG to confirm the diagnosis and the treatment of Rivaroxaban was initiated.

### Results

In total 66 people were tested, of these 5 were excluded from the study due to an inability to produce an accurate reading (unreadable) due to Parkinson's disease, hand and finger deformities and distress. The raw data for the 66 individuals tested is displayed in **Appendix 1**. A summarised version according to test result is shown in **Table 1**.

	Normal	Possible AF	Unclassified	Unreadable
Number of patients	49	6*	6	5

**Table 1: Two-lead ECG trace results.** The data was collected and categorised into 1 of 4 categories according to the outcome of the ECG trace.

\* On review of the generated results, 2 patients identified as 'possible AF' were found to have previously been diagnosed with the condition, this was not disclosed during the routine assessment.

The age range of the participants in the study was from 27 to 98 years old and the median age was 84 years old. The results from the 2-lead ECG found: 6 patients with possible AF, 6 registered unclassified, 5 registered unreadable and the remaining 49 registered a normal result. Of the 6 patients that obtained a result for possible AF, 2 were confirmed cases of previously diagnosed AF, 3 were new cases of AF and 1 was not AF.

On further clinical review of the 6 patients that were categorised as unclassified, using a 12-lead ECG, 2 patients were found to have AF and 4 were found to not have AF.

In total from the 61 patients tested that recorded a trace, after further investigation a total of 7 patients were found to have AF (11.4%), where 5 of these patients were new cases of AF (8.5%).

At the end of the study all the patients that had confirmed AF, pre-diagnosed or new cases, were age 75 or above (aged 75-94). The individual that recorded as possible AF and was found not to have AF after further investigation was 32 years old.

### Discussion

In total 11.4% of our study group was found to have AF. This is what was anticipated as studies show that the prevalence of AF increases with age and the median age for the individuals tested was 84 years<sup>8</sup>. The sample size that we used in this study was relatively small (66 people) and was mainly focused on the group of individuals at risk (over 75 years) so would not be representative of the entire population. To achieve our aim of detecting those at high risk, we should have used a larger sample size focussing on individuals over the age of 50 and the testing should have taken place at regular intervals throughout the year as oppose to two consecutive weeks.

Knaresborough is a town with a high population of elderly people, approximately 56% of the population in Knaresborough is over the age of 45<sup>9</sup>. This could explain why we found a considerable % of the study sample to have AF. If a similar study was carried out in an area with a different demography, an area with a lower proportion of elderly patients, the % of people diagnosed with AF in the study group would be expected to be much lower as other risk factors for AF including high blood pressure and heart failure are seen much less frequently in younger patients<sup>10</sup>.

We found the kardia app to be an effective screening tool for AF as it allowed us to detect and provide appropriate treatment for 8.5% of our study group. The app has a sensitivity of 90% making it very effective at correctly identifying those with AF and has a specificity (true negative value) of 85%<sup>11</sup>. As it detected the two individuals in the study group who had been previously diagnosed with AF, it leads us to believe that the device is an accurate screening tool, however a larger sample size would be needed to increase our certainty. The sensitivity of this app is 90% and this could explain why the 32 year old in the study received a result of possible atrial fibrillation but after further investigation the ECG trace was found to be normal.

The kardia device is cost-efficient and has a high level of user satisfaction making it a useful way of detecting AF. The fast nature of this screening technique suggests that the application could prove beneficial in detecting AF in routine general practice appointments. Integrating the screening programme into every-day practice would help manage the risk of strokes in the group of patients that are most at risk. Those that are classified as being high risk patients using the CHA<sub>2</sub>DS<sub>2</sub>-VAS<sub>c</sub> score should be treated with anticoagulants after screening with the app to prevent the risk of stroke<sup>7</sup>. The cost of treatment with anticoagulants would be much lower than the continuing care required after a resulting stroke. A limitation of introducing screening in consultations is the introduction of

discrimination amongst certain patient groups. Placing the index and middle fingers on the electrodes requires a certain level of manual dexterity, which some patients do not have. This was illustrated in our study when individuals had finger deformities and Parkinson's disease so could not record a trace.

### Conclusion

The aim of this study was to detect individuals with undiscovered atrial fibrillation and place them on an appropriate treatment plan, with the use of anticoagulants, to limit their risk of undergoing a cerebral vascular accident. We detected new cases of atrial fibrillation in 8.5% of the study group and placed these individuals on subsequent treatment, leading us to believe that the Kardia mobile app was a reliable source for detecting cardiac arrhythmias and opened debate as to whether it should become part of routine practice in primary care.

### References

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Appendix

<b>Age</b>	<b>Result</b>
27	Normal
32	Possible AF
34	Normal
35	Normal
43	Normal
45	Normal
49	Normal
49	Normal
50	Normal
55	Normal
55	Normal
56	Normal
58	Unclassified
62	Normal
62	Normal
63	Normal
72	Normal
73	Normal
74	Normal
75	Unclassified
78	Normal
82	Unclassified
83	Normal
84	Unclassified
84	Normal
84	Normal
85	Normal
85	Normal
85	Normal
86	Unclassified
87	Known AF
87	Normal
87	Normal
88	Normal
88	Normal
89	Possible AF
89	Normal
89	Normal
90	Unclassified
91	Known AF
91	Normal

92	Normal
92	Possible AF
94	Possible AF
94	Normal
96	Normal
96	Normal
98	Normal

**Appendix 1: Raw data of age and result generated from the kardia app.** Show the age (years) of all 61 participants and the result generated from the app in all those who produced a trace.