

## Screening of Atrial Fibrillation in Dental Practices: a qualitative feasibility study

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**Abstract (200 words)**

**Objectives:** To increase the detection of unknown atrial fibrillation (AF), general practitioners have started screening their patients using small hand-held devices. It is thought that dental settings could be utilised for screening as they have regular access to patients. The aim of this study was to explore the perceptions of dental staff of screening for AF using a hand-held electronic device in primary dental care.

**Methods:** The research took place in one large mixed NHS and private general dental practice. Views from staff including dentists, dental therapists, dental nurses, and managers were elicited via semi-structured interviews conducted face-to-face, audio recorded and transcribed verbatim. Interviews continued until there were no new themes or patterns emerging from the data and thematic saturation had been achieved.

**Results:** Eleven participants were interviewed. The main themes generated were methodology for screening, acceptability for screening within the practice, attitudes to screening, and implementation of screening. Overall, participants were positive about implementing AF screening in a dental practice but expressed concerns about time and remuneration. Staff also gave encouraging feedback regarding the simplicity of the portable screening device.

**Conclusions:** Participants felt that AF screening in primary care dental practices was a good concept but may be challenging to implement in NHS Dentistry, especially due to the pandemic.

**Keywords:** Atrial Fibrillation, Screening, General Dental Practice, Dentistry; Qualitative

## 1.0 Introduction

Atrial fibrillation (AF) is the most common heart rhythm abnormality, affecting about 33.5 million people worldwide [1,2]. AF is associated with a five-fold increased stroke risk, but appropriate anticoagulation in eligible patients can reduce this risk by around 65% [3]. Stroke is estimated to cost the NHS around £3billion per year and the National Institute for Health and Care Excellence (NICE) guidance states that around 7,000 strokes and 2,000 premature deaths could be avoided every year through effective diagnosis of AF [4]. AF is more common with increasing age; the prevalence is 1 in 10 among those aged 75 year and older [5]. The population is aging and data suggests that by 2050, a quarter of the population will be aged over 60; in the UK the estimated prevalence of AF by 2060 will be 1.6 million [6]. This makes older people a priority group for preventive efforts [7].

Growing attention is being given to the connection between poor oral health and the impact this can have on general health. Dental practices are increasingly seen as an appropriate place in which to undertake health prevention in the wider sense [8, 9]. Thus, since poor oral health has been linked to an increased risk of cardiovascular disease, it is also appropriate to start thinking about dental practices as a place where cardiovascular conditions are a focus of prevention strategies.

The main oral disease linked to poor cardiovascular health is periodontitis [10], which is an infection of the gingivae (gums) and alveolar bone surrounding the teeth. Periodontitis is extremely common; it affects almost half the population and one in ten people have a severe form of the disease which can result in mobile teeth [11, 12]. There is supporting literature suggesting an increased circulation of inflammatory markers with AF, including c-reactive protein and interleukin-six [13, 14]. These biomarkers are also associated with periodontitis and have been shown to reduce following professional dental cleaning and oral hygiene advice [15, 16]. In a recent article, a positive relationship between periodontitis and atrial fibrosis was reported following histological examination [17].

There are a limited number of studies showing an association with oral diseases and AF using hospital data, however, prospective or randomised controlled trials are still lacking [17-20]. A recent study that monitored patients for 17 years found an increased incidence of AF and stroke with periodontitis, and

another study in Hamburg assessed 5,634 participants with AF for severity of periodontitis and reported an increased association before adjusting for confounders [21, 22]. Current reviews have suggested the importance of prospective clinical studies to investigate a possible link further [23, 24]. Recently, there has been evidence that opportunistic screening for AF may prove beneficial [25]. Indeed, a systematic review concluded that although screening for AF is advantageous, with targeted screening more cost-effective than systematic screening [26]. Clinicians, such as general practitioners prefer to use hand-held devices for screening of AF over methods like palpating a patient's pulse, as the reading can be saved or stored [27]. A qualitative study interviewing pharmacists using focus groups concluded that AF screening should be incorporated into general practices and prioritised for high-risk patients [25]. Another qualitative study also highlighted the importance of screening high risk patients [28]. In one study, general practitioners (GP) were asked to screen all the patients aged 65 years or older over a 3-month period, using the portable ECG device; unknown AF was detected in 471 (6.2%) of the 7585 patients screened [29]. However, there is currently no literature in relation to dentists' views on screening for AF in routine dental practice.

This is an exploratory study which involves interviewing staff members about whether screening for AF in dental practices is feasible.

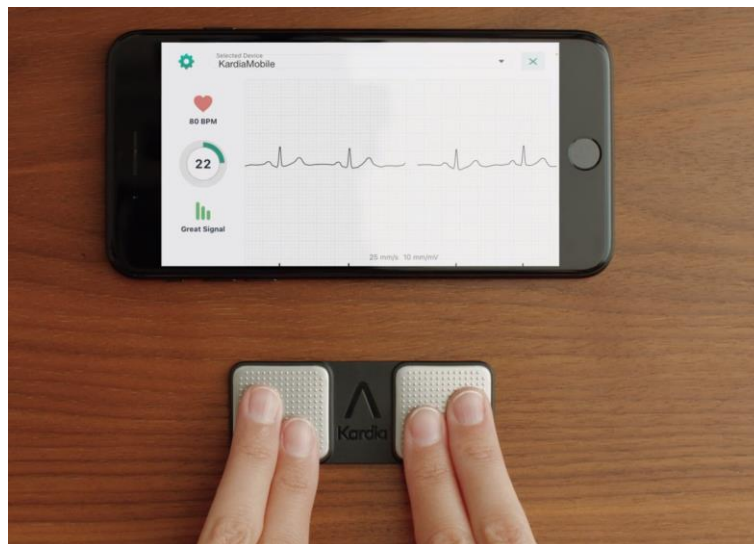
## 2.0 Methods

### 2.1 Study Design

This was a prospective qualitative research study at one large mixed NHS and private General Dental Practice in the North-West of England. The practice has more than 10 surgeries, a workforce of over 50 staff members, and >40,000 patients registered. Purposive sampling was used to ensure different types of staff were recruited for data collection. Participants were sent an email with an attachment to an information leaflet by the practice principle who was not involved in the research. A reminder was also sent a few weeks later. Participants that expressed an interest were given a consent form to sign. Prior to the interview, participants were given a questionnaire to collect demographics, and a briefing which included written information about the potential study design for screening of AF within the practice. No patients or participants have yet been screened for AF within the practice. It was

explained that to staff members that they would need to identify patients who were high risk for AF, which included age ( $\geq 65$  years) and medical comorbidities such as hypertension, heart failure, previous stroke or transient ischaemic attack, vascular disease, and diabetes mellitus [30]. A table was used in the briefing to identify risk factors for AF, the medical history characteristics are adapted from a risk score (CHA<sub>2</sub>DS<sub>2</sub>-VASc), which is normally used as a stroke risk predictor, but can also be used to detect incident AF [17, 31]. Participants also received information about a hand-held electrocardiogram (ECG) device commonly used to screen for AF, (Figure 1), which is clinically validated for recording, storing, and transferring single channel lead I ECGs [32].

**Figure 1. Image illustrating how to record an ECG with a portable device.** <sup>33</sup>



The interview schedule was sent to all participants a few days before their meeting in a flipped interview approach (Supplementary materials Table 1). This was to try and relax the participants, allow time to prepare answers, and stimulate discussion. Interviews were conducted face-to-face to ensure non-verbal cues were captured by the researcher (AH) in the research diary. Interviews were audio recorded and subsequently transcribed verbatim, assigning identification numbers to preserve anonymity. The meetings continued until there were no new recurring themes or patterns emerging from the data and thematic saturation had been achieved.

## 2.2 Ethical approval

The study was approved by the School Ethics Review Board at the [Anonymized] (SERB/2022/4/2339), and the University acted as sponsor. NHS ethics and trust approval was sought but were not required as the research was non-invasive and did not include vulnerable people or patients. A research passport was granted by the local Clinical Research Network primary care team to allow research to take place within the practice.

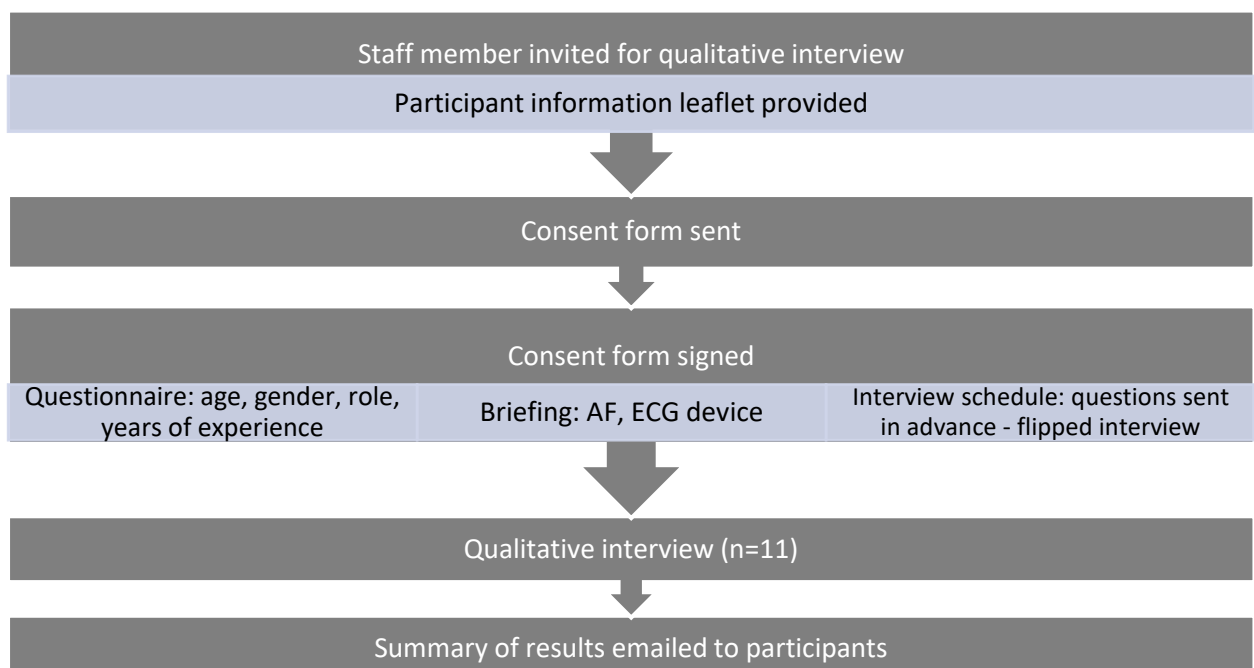
## 2.3 Data analysis

Final data analysis of outcomes took place with NVivo after data reached saturation. Main themes and sub-themes were developed iteratively alongside further data collection with a search for confirming and disconfirming cases. A second researcher reviewed the transcripts, coding, and emerging themes to ensure consistency. Thematic framework analysis was chosen as the research objectives were focused around gathering views or opinions about screening in a dental practice rather than a new phenomenon or theory. The participant journey is summarised in Figure 2.

## 2.4 Patient and public involvement

Representatives from a local hospital assisted with the study design and reviewed all documentation for participants, ensuring that they were easy to interpret.

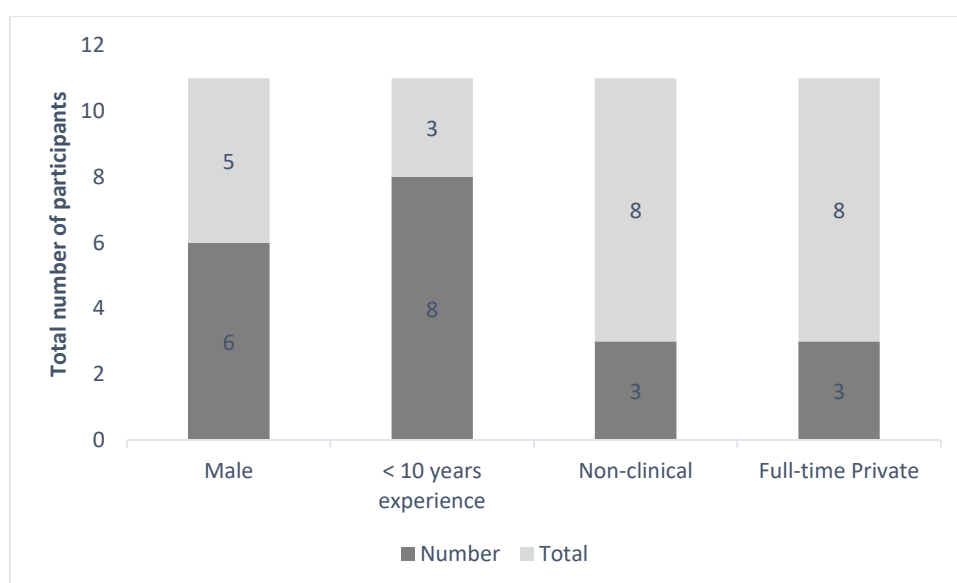
**Figure 2. Participant journey**



### 3.0 Results

In total, 52 individuals received information about the study, 14 participants expressed an interest and 13 were invited for interview. One participant that expressed an interest, did not respond despite several reminders and another asked not to take part due to time restraints and wellbeing. The final participant that expressed an interest was not invited as the last few interviews did not reveal any new information and it was felt that data saturation had been met. Eleven participants were interviewed, including NHS and private dentists, dental therapists, dental nurses, and managers. Four of the participants had five years or less experience, four participants had greater than five but less than ten years, and the remaining three participants had more than ten years' experience working as a dental professional. Three were non-clinical staff and a further three participants worked full-time as a private clinician. The participant demographics are summarised in a chart below (Figure 3.); individual participant characteristics are not discussed to preserve anonymity.

**Figure 3. Participant demographics**



Four main themes emerged and included: acceptability, attitudes to screening, screening methodology, and implementation.

### 3.1 Acceptability

Overall, non-clinicians were all mainly positive about screening for AF because it gave them an opportunity to develop extra skills and increased the skill set of the practice, although there were concerns about how the practice could overcome potential barriers.

*“I think majority of nurses enjoy having that little bit more responsibility with a patient, being able to help patients a little bit more in that more hands-on treatments, and able to help them rather than just all being the dentist that does everything.” (P7)*

Five of the eleven participants were female. Three males and two females were positive about the idea of screening for AF in dental practices.. Three females were positive about the idea, but had reservations, and three males were sceptical about the idea.

Clinicians’ views were mixed about whether the screening would work; all three full-time private clinicians and another clinician (4 out of 7 clinicians) said that the screening was a good idea, but it would not have a priority because of existing barriers within NHS Dentistry and that there would be resistance if it affected the time-constraints and workflow in the practice.

*“I think it's a good idea, but at the same time, I feel like we can be, especially now, really busy, overwhelmed. I feel like it's quite underfunded in general, the shortage of dentists, a long waiting list for dental treatment. A lot of demand, like, you know, terms of work and the workload, I feel like it's, it's not quite a priority in dental practice.” (P12)*

Most participants (7 out of 11 participants) were positive about screening and felt it will be rewarding to potentially prevent a stroke and save lives. Participants were keen however, to stress that their preference was not diagnose AF, but to refer patients to their GP for confirmation. A few participants expressed more concerns than others, and some also highlighted there will always be individuals within a practice that are more likely to accept the screening than others.



*“I think it's a brilliant idea. I think it's extremely straightforward and I don't think it's going to take a huge amount to implement it. I think especially knowing the information that I've been given in the briefing about the percentages and the number of people that potentially have atrial fibrillation that don't know that makes it much more important for me.” (P10)*

Participants felt that patients and the public would see the screening as positive, but they might feel sceptical about dentists screening for a non-dental related problem, and it may heighten anxiety.

### 3.2 Attitudes to screening

Participants discussed more about the barriers than the benefits for screening (76 references to barriers, compared to 56 benefits). The most common advantage was dental practices had more regular access to patients than a GP, as patients only attended when there was a problem. Other benefits for screening in a dental practice included being comfortable with screening (for oral cancer), breaking bad news, psychological reward (for staff) for helping patients and utilising prevention in a healthcare setting, with some participants also quoting “making every contact count” Most references to barriers were regarding the increased workload, which has worsened since COVID-19.

Remuneration (lack of) was also discussed by all participants as a barrier. There were concerns from clinicians about how the screening could be incorporated into the dental appointment and the amount of administrative time it would take to refer patients to their GP, whilst non-clinicians felt the responsibility of a referral was with the clinician.

*“If the check-up takes longer, that means fewer patients will be seen long-term. If fewer patients are seen, obviously there's a negative health care consequence of that, but also the remuneration to the individual will be negative, it will be a reduced rate. With the current feeling towards NHS dentistry, as that clinicians (we) are expected to constantly be doing more and receive less pay, that could be quite a barrier.” (P2)*

### 3.3 Screening Methodology

Participants received information from the briefing about the screening device and how to target high-risk patients, all responded positively about using the device to screen for AF. They felt the screening

was simple, quick and the device was portable and easy to clean. All participants thought that patients should have the screening incorporated into a dental appointment (opportunistic), rather than coming into the practice just for the screening, as the latter approach would attract patients that are healthier and more conscious about their health. When participants were asked about a possible method to target patients that were high-risk from their dental records, most felt that this was unnecessary, and that software should be able to create a “flag” in the software to notify staff of patients that are high-risk. Some staff thought that targeting patients could be simplified to age only, and everyone should be allowed to have screening if they wished.

*“I think the medical histories when we check on the patient's health, if it flags up, there's an indicator, isn't it, on the medical history that says if there's a heart problem, or you can set indicators for certain types of problems.” (P11)*

### 3.4 Implementation

This was the most discussed theme with 235 out of 540 references on how to implement screening within a dental practice. Participants felt training was essential, it should be led by experts, hands-on, and during working hours. Some suggested doing the screening during lunch hours because of financial loss.

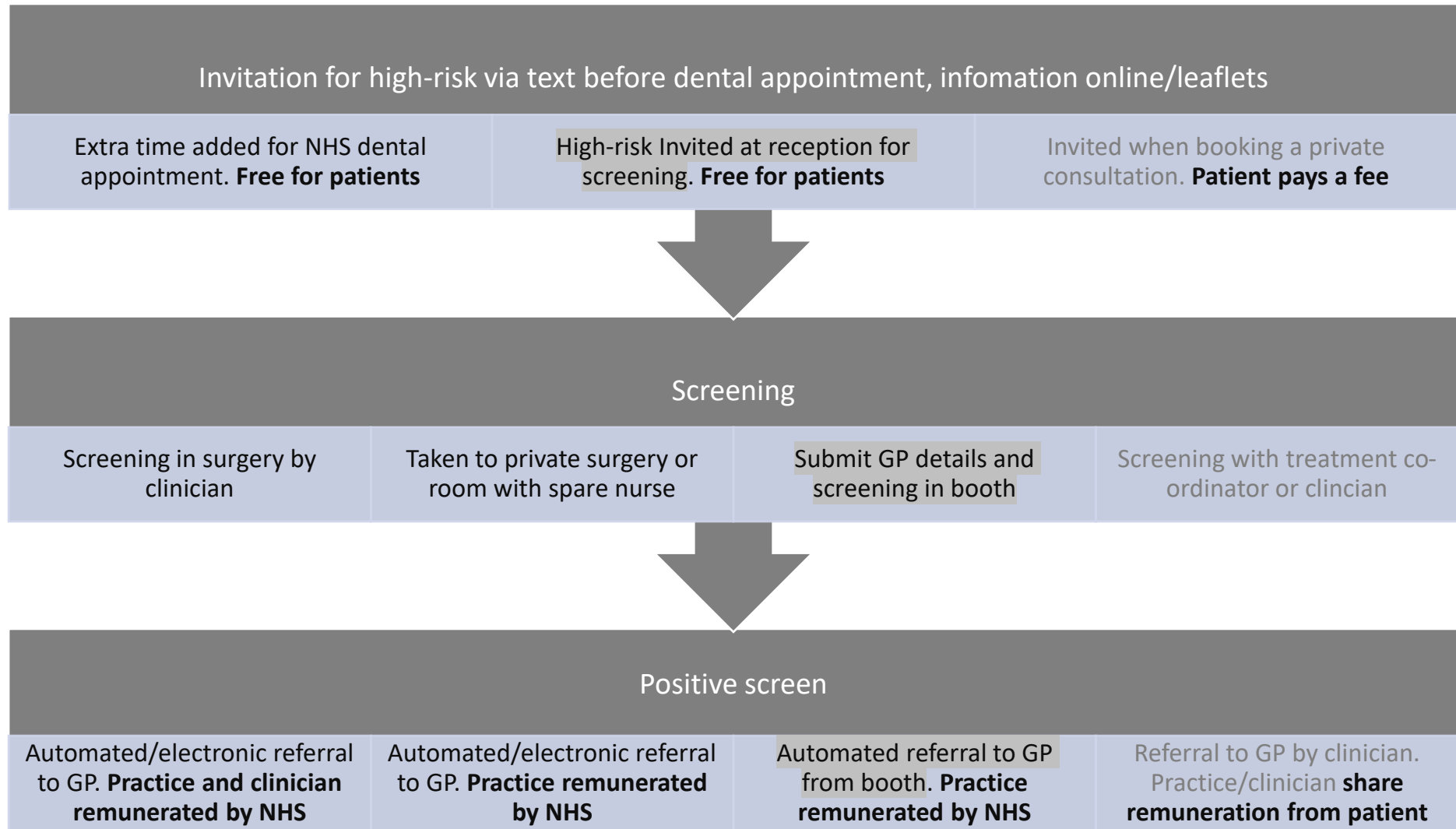
*“I think it'd have to be hands on. You'd need to run different simulations of what kinds of patients are coming in and then, maybe even acting sessions on how you're managing each situation.” (P8)*

When discussing possible models, many felt advertisement could be made online, with leaflets in the practice, with invitations sent via a text message before they attend an appointment or via a letter for those who do not have a mobile phone. If a patient agrees to screening, then time is incorporated into their dental appointment (participants varied between 5-30 minutes for additional screening time). Clinicians felt dental nurses or treatment co-ordinators (in private practices) could screen to save clinical time but felt having a spare surgery was unlikely, and screening by reception staff breached confidentiality. If the clinician was screening patients, then a cost would need to be calculated to cover the time lost as an associate.

*“So, they need to essentially calculate how long does this take per patient, and then remunerate the dentist based on, for example, how much on average they would make in 10 minutes of doing general dentistry. And if the screening takes 10 minutes, then they need to be paid that amount.” (P6)*

Patients that are screened positive would then be referred using an automated GP referral. Most participants felt that screening should be free to NHS patients and that private patients could be asked to pay a small fee to be screened as part of their consultation. It was felt that practices and clinicians should be paid but participants felt there needed to be a cost-benefit analysis to calculate this. An alternative model proposed by one participant involved screening patients in a private booth, like when purchasing passport photos in stores. Patients submit their details, including GP contact and then screen. If the patient is positive, the booth sends an automated electronic referral to their GP or local area team to contact the patient. The advantage for this model is only the practice is remunerated for having the booth and it is less likely to disrupt the workflow of dentistry within the practice. The possible models for screening are summarised in Figure 4.

**Figure 4. Possible models for screening of AF in dental practices**



White: workflow; black: incorporated NHS dental appointment; highlighted: screening model using a booth; light grey writing: private; bold: remuneration.

## 4.0 Discussion

To the best of our knowledge, this is the first study that has investigated whether screening for atrial fibrillation in dental practices using a portable ECG device is feasible. Clinicians' views were mixed; although they expressed that the concept was a good idea, there were concerns that it would disrupt workflow of NHS Dentistry which they claimed has worsened since COVID-19. Dental nurses were positive about the prospect of screening within the practice as they had an opportunity to become more hands-on and develop extra skills.

Participants were interviewed by a single researcher to ensure consistency in the types of questions being asked. A second senior researcher reviewed transcripts and emerging themes were discussed and refined. A representative sample of all the different staff roles within the practice was recruited which ensured that everyone's views were included. Interviewing all staff working in the practice, rather than specific roles (e.g., dentists only) was important as the research objectives were to evaluate whether the screening could work within a practice and who could potentially perform the screening, therefore it was important to include a variety of staff with different roles. A potential limitation of this study is that only 11 participants were recruited; previous studies have interviewed 15 participants for screening of AF in other healthcare settings [34, 27]. However, qualitative studies range in the number of participants from one upwards, and as data saturation was reached the sample size is sufficient to demonstrate acceptability of the feasibility of screening for AF in dental practices. Data saturation for thematic analysis is often described as the point in data collection and analysis when new incoming data produces little or no new information to address the research question [35].

Previous research has identified the number of qualitative interviews needed for research, and reports that the first six interviews produce most of the relevant data and that little new information was obtained following 20 interviews [36]. Another study has demonstrated across four datasets, that up to 92% of all concepts identified within the data analysis were mentioned in the first ten meetings [35].

More than two thirds of participants recruited had less than ten years' experience in a dental setting, however, most staff were young, and this was representative of the sample within the practice.

Participants were only recruited from one dental practice and therefore the data potentially lacks

generalisability. Another potential limitation is that participants that expressed an interest are likely to have favourable impression of the study which may bias the opinions expressed.

Based on the research, benefits of screening in healthcare settings, and growing evidence for links between dental disease and cardiovascular disease/AF, it is important to consider dental practices as a place where cardiovascular conditions are a focus of prevention strategies. Participants in this study suggested piloting the screening on patients in the dental practice and gathering feedback from patients to provide further insight into the potential uptake and acceptability of screening. Dental professionals have previously piloted screening for diabetes in dental practices because of the relationship of diabetes with oral diseases [37]. Furthermore, other authors also suggest that screening for newly diagnosed cardiovascular diseases and AF in dental settings has potential [8]. General dental practices have an advantage over other healthcare environments for screening, as they have regular access to patients that attend for appointments and can target higher risk patients for stroke related AF using their medical dental records, as co-morbidities are recorded.

It is clear from the feedback of staff members that certain barriers to screening of AF in dental practices would impact feasibility. Funding from stakeholders to practice owners (with financial incentives for screening patients with AF) would prompt dental practices to find ways to offer screening those from within the practice. Clinicians or nurses that were not interested would not have to screen, however those that will find it rewarding would be able to offer screening to patients that are already seen in the practice and identified as high risk. Another suggestion proposed by one of the participants is for healthcare stakeholders to install a private computer booth, like a passport photo booth near the reception. Participants would be identified by reception team or clinicians that are high risk and invited to screen following their dental appointment. Any other patients interested would also have the option to screen. They would enter their details on the computer in the private booth and have a private screen. If tested positive, then the booth would send direct communication to a healthcare provider such as local area team or general practitioner. This type of method would mean that there are little financial obligations and time constraints to the practice and if patients are identified with unknown AF, then stakeholders will benefit as it may prevent a stroke which is costly

to the NHS. Future research to evaluate the feasibility of screening for AF in other dental settings such as community, dental hospitals or private practices are indicated; dental nurses in the community often have extended skills in these settings, and there is also the possibility for increased capacity and time for screening in community or private practices.

## 5.0 Conclusion

This study suggests that screening for AF in dental practices with the current NHS requirements in England is a good concept and is acceptable in-principle to practice staff, but there are significant barriers including, time, capacity, remuneration, and referrals, which need to be overcome. These barriers have heightened since the COVID-19 pandemic. Further research and piloting of screening for AF in different dental settings that limit the impact of these barriers are indicated, whilst also exploring the patient acceptability and experience of screening.

## 6.0 References

1. Hindricks G, Potpara T, Dagres N, et al. 2020 ESC Guidelines for the diagnosis and management of atrial fibrillation developed in collaboration with the European Association for Cardio-Thoracic Surgery (EACTS): The Task Force for the diagnosis and management of atrial fibrillation of the European Society of Cardiology (ESC) Developed with the special contribution of the European Heart Rhythm Association (EHRA) of the ESC *Eur Heart J* 42(5), 373-498 (2021).
2. Chugh SS, Havmoeller R, Narayanan K, et al. Worldwide epidemiology of atrial fibrillation: a Global Burden of Disease 2010 Study *Circulation* 129(8), 837-47 (2014).
3. Jones NR, Taylor CJ, Hobbs FDR, et al. Screening for atrial fibrillation: a call for evidence *Eur Heart J* 41(10), 1075-85 (2020).
4. National Institute for Health and Care Excellence. Atrial fibrillation: diagnosis and management (2021) Taken from: <https://www.nice.org.uk/guidance/ng196>. Accessed on 04.08.23.
5. Wasmer K, Eckardt L, Breithardt G. Predisposing factors for atrial fibrillation in the elderly *J Geriatr Cardiol* 14(3), 179-84 (2017).
6. Lane DA, Skjøth F, Lip GYH, et al. Temporal Trends in Incidence, Prevalence, and Mortality of Atrial Fibrillation in Primary Care *J Am Heart Assoc* 6(5), e005155 (2017)
7. Müller F, Shimazaki Y, Kahabuka F, et al. Oral health for an ageing population: the importance of a natural dentition in older adults *Int Dent J* 67(2), 7-13 (2017).
8. Lamster IB, Myers-Wright N. Oral Health Care in the Future: Expansion of the Scope of Dental Practice to Improve Health. *J Dent Educ* 81(9), eS83-eS90 (2017).
9. Cullinan M. The role of the dentist in the management of systemic conditions. *Ann R Australas Coll Dent Surg* 21, 85-7 (2012).
10. Sanz M, Marco Del Castillo A, Jepsen S, et al. Periodontitis and cardiovascular diseases: Consensus report *J Clin Periodontol* 47(3), 268-88 (2020).
11. Jin LJ, Lamster IB, Greenspan JS, et al. Global burden of oral diseases: emerging concepts, management and interplay with systemic health *Oral Dis* 22(7), 609-19 (2016).



12. Kassebaum NJ, Bernabe E, Dahiya M, et al. Global burden of severe periodontitis in 1990-2010: a systematic review and meta-regression *J Dent Res* 93(11), 1045-53 (2014).
13. Chung MK, Martin DO, Sprecher D, et al. C-reactive protein elevation in patients with atrial arrhythmias: inflammatory mechanisms and persistence of atrial fibrillation *Circulation* 104(24), 2886-91 (2001).
14. Zhou P, Waresi M, Zhao Y, et al. Increased serum interleukin-6 level as a predictive biomarker for atrial fibrillation: A systematic review and meta-analysis *Rev Port Cardiol (Engl Ed)*, 39(12), 723-28 (2020).
15. Zhou QB, Xia WH, Ren J, et al. Effect of Intensive Periodontal Therapy on Blood Pressure and Endothelial Microparticles in Patients With Prehypertension and Periodontitis: A Randomized Controlled Trial *J Periodontol* 88(8), 711-22 (2017).
16. Demmer RT, Trinquart L, Zuk A, et al. The influence of anti-infective periodontal treatment on C-reactive protein: a systematic review and meta-analysis of randomized controlled trials *PLoS One* 8(10), e77441 (2013).
17. Hassan AO, Lip GYH, Bisson A, et al. Acute Dental Periapical Abscess and New-Onset Atrial Fibrillation: A Nationwide, Population-Based Cohort Study *J Clin Med* 10(13), 2927 (2021).
18. Chen DY, Lin CH, Chen YM, et al. Risk of Atrial Fibrillation or Flutter Associated with Periodontitis: A Nationwide, Population-Based, Cohort Study *PLoS One* 11(10), e0165601 (2016).
19. Chen SJ, Liu CJ, Chao TF, et al. Dental scaling and atrial fibrillation: a nationwide cohort study *Int J Cardiol* 168(3), 2300-3 (2013).
20. Chang Y, Woo HG, Park J, et al. Improved oral hygiene care is associated with decreased risk of occurrence for atrial fibrillation and heart failure: A nationwide population-based cohort study *Eur J Prev Cardiol* 27(17), 1835-1845 (2020).
21. Sen S, Redd K, Trivedi T, et al. Periodontal Disease, Atrial Fibrillation and Stroke *Am Heart J* 235, 36-43 (2021).
22. Struppek J, Schnabel RB, Walther C, et al. Periodontitis, dental plaque, and atrial fibrillation in the Hamburg City Health Study *PLoS One* 16(11), e0259652 (2021).

23. Hassan A, Lip GYH, Harris RV. Atrial fibrillation and cardiac arrhythmia associated with acute dental infection: A systematic literature review and case report. *Int J Clin Pract*;75(5):e13875 (2021).
24. Leelapatana P, Limpuangthip N. Association between oral health and atrial fibrillation: A systematic review *Heliyon* 8(3), e09161 (2022).
25. Savickas V, Stewart AJ, Rees-Roberts M, et al. Opportunistic screening for atrial fibrillation by clinical pharmacists in UK general practice during the influenza vaccination season: A cross-sectional feasibility study *PLoS Med* 17(7), e1003197 (2020).
26. Moran PS, Flattery MJ, Teljeur C, et al. Effectiveness of systematic screening for the detection of atrial fibrillation *Cochrane Database Syst Rev* (4), CD009586 (2013).
27. Uittenbogaart SB, Becker SJ, Hoogsteyns M, et al. Experiences with screening for atrial fibrillation: a qualitative study in general care *BJGP Open* 6(1), BJGPO.2021.0126 (2022).
28. Macniven R, Gwynn J, Fujimoto H, et al. Feasibility and acceptability of opportunistic screening to detect atrial fibrillation in Aboriginal adults *Aust N Z J Public Health* 43(4), 313-18 (2019).
29. Orchard J, Neubeck L, Freedman B, et al. eHealth Tools to Provide Structured Assistance for Atrial Fibrillation Screening, Management, and Guideline-Recommended Therapy in Metropolitan General Practice: The AF - SMART Study *J Am Heart Assoc* 8(1), e010959 (2019).
30. Schnabel RB, Yin X, Gona P, et al. 50 year trends in atrial fibrillation prevalence, incidence, risk factors, and mortality in the Framingham Heart Study: a cohort study *Lancet* 386(9989), 154-62 (2015).
31. Li YG, Bisson A, Bodin A, Herbert J, Grammatico-Guillon L, Joung B, Wang YT, Lip GYH, Fauchier L. C<sub>2</sub>HEST Score and Prediction of Incident Atrial Fibrillation in Poststroke Patients: A French Nationwide Study *J Am Heart Assoc* 8(13), e012546 (2019).
32. Zaprutko T, Zaprutko J, Baszko A, et al. Feasibility of Atrial Fibrillation Screening With Mobile Health Technologies at Pharmacies *J Cardiovasc Pharmacol Ther* 25(2), 142-51 (2020).
33. AliveCor Labs AliveCor (2022) . Available at: <https://store.alivecor.co.uk/products/kardiamobile>. Accessed on 04.08.23.

34. Lown M, Wilcox CR, Hughes S, et al. Patients' views about screening for atrial fibrillation (AF): a qualitative study in primary care *BMJ Open* 10(3), e033061 (2020).
35. Guest G BA, Johnson L. How many interviews are enough? an experiment with data saturation and variability *Field Methods* 18(1), 59-82 (2006).
36. Morgan M FB, Bostrom A, Atman C. *Risk Communication: A Mental Models Approach*. New York, NY: Cambridge University Press 19 - 33 (2002).
37. Genco RJ, Schifferle RE, Dunford RG, et al. Screening for diabetes mellitus in dental practices: a field trial *J Am Dent Assoc* 145(1), 57-64 (2014).

## 7.0 Supplementary materials 1

### 7.1 Interview guide sent to participants a few days before the meeting took place

#### INTERVIEW GUIDE FOR INTERVIEWING DENTAL STAFF ABOUT SCREENING FOR ATRIAL FIBRILLATION

##### **Introduction**

- Researcher introduces themselves and thank the participant for agreeing to be interviewed
- Explain that the study is looking to explore perceptions about screening of AF for staff
- Interview will last around 30-60 minutes
- Participant can is optional and can decline to answer or stop the interview at any time
- Ask if they have read the information leaflet about atrial fibrillation and if they have any questions
- Explain that the findings will be written up anonymously and may be published, direct quotations may be used but these will not be identifiable

##### **Briefing**

Participants are given information leaflet about how staff would identify patients that are high risk for stroke related AF and how the screening works, a short video of the screening will be shown on a tablet for how patients will be screened using the portable ECG device.

##### **Semi-structured interview topic guide for staff about screening for AF in dental practices**

###### Perceptions of screening programmes for atrial fibrillation from dental staff

What did you think about the information given to you about screening?

What are your views about using a handheld device to screen for atrial fibrillation in any healthcare setting?

###### Motivations for screening of atrial fibrillation in a dental practice

Tell me about your views in relation to screening for atrial fibrillation in a dental practice?

If a dental practice was to implement this screening programme, how do you anticipate this working?

###### Appropriateness of the dental setting for training of targeted screening

How would you feel if the practice mentioned to you, they were going to start screening patients for atrial fibrillation?

How could the practice invite screening for AF?

What are your views about targeting high risk patients?

###### Appropriateness of the staff members for screening patients using a handheld device and referring

When thinking about your role within the practice, in what way would you perceive yourself being involved in screening?

What are your views about using the handheld device to screen for atrial fibrillation in a dental practice?

What are the barriers, if any, for screening patients within your role?

How would you feel about telling someone they have screened positive and need to attend their GP for further tests?

Establishing new processes to deliver screening within dental practices

What pressures of working in a dental practice screening do you think there are that would impact screening patients?

**Summary**

In summary, can tell me your overall thoughts about the likelihood of a dental practice being able to screen for atrial fibrillation?

- Summarise findings/answers with participant - this can be done throughout the interview
- Thank the participant for taking part and explain findings will be communicated if consented

