

<b>Institution:</b> Edinburgh Napier University		
<b>Unit of Assessment:</b> Unit of Assessment 3 – Allied Health Professions, Dentistry, Nursing and Pharmacy		
<b>Title of case study:</b> Abnormal Heart Rhythms: Changing National and Global Detection and Management		
<b>Period when the underpinning research was undertaken:</b> 2016-2020		
<b>Details of staff conducting the underpinning research from the submitting unit:</b>		
<b>Name(s):</b>	<b>Role(s) (e.g. job title):</b>	<b>Period(s) employed by submitting HEI:</b>
Lis Neubeck Coral Hanson Janet Hanley	Professor and PI Research Fellow Associate Professor	Aug 2016-continuing Jan 2017-continuing March 2013-continuing
<b>Period when the claimed impact occurred:</b> 2016-2020		
<b>Is this case study continued from a case study submitted in 2014?</b> N		
<p><b>1. Summary of the impact</b> (indicative maximum 100 words) Internationally leading research at Edinburgh Napier University (ENU) on the early detection and appropriate management of the most common abnormal heart rhythm, atrial fibrillation, has had significant impact on the field of cardiovascular health at a national, European and global level.</p> <p>Our work has demonstrated the effect of new devices, which record heart rhythm and technology to detect atrial fibrillation, and increases uptake of medication to prevent strokes. The work has changed policy and clinical practice, been evidenced by parliamentary groups, led to new training and national initiatives and has been adopted within international guidelines, including the World Health Organisation (WHO).</p>		
<p><b>2. Underpinning research</b> (indicative maximum 500 words) Globally atrial fibrillation (AF) is the most common abnormal heart rhythm, affecting in excess of 33.5 million people. Risk rises exponentially over the age of 65 years. 20% of people over the age of 80 are known to have AF. 11% of people with AF will have an ischaemic stroke within 5 years of diagnosis, a five to seven-fold increase compared to stroke incidence in the general population. In 9% of all strokes, AF was not known prior to stroke. Strokes caused by AF are likely to be more severe, or fatal. If AF is detected, then taking an oral anticoagulant (OAC) drug can reduce the risk of stroke by two-thirds. In 20% of people with a stroke, AF was known but patients were either on no medication to prevent blood clots (8%) or on aspirin, which is largely ineffective to prevent AF-related strokes. Three key issues in AF are: 1) Almost half of all cases of AF are asymptomatic, and first presentation is frequently at time of hospitalisation for stroke; 2) appropriate prescription of OAC is low; and 3) medication adherence is low, with reported rates of only 30% adherence at 18-months. Up to 20% of strokes might be prevented if the evidence-practice gap of OAC prescription was eliminated.</p> <p><b>1) Detection of unidentified AF to prevent stroke in a population at risk</b> The ENU team have led a programme of research in partnership with the University of Sydney, to investigate how new technology aids community-based AF-diagnosis, and therefore could prevent stroke. We validated smartphone-based ECG technology against 'gold standard' 12-lead ECGs. Our preliminary work was vital in establishing the AliveCor KardiaMobile as a global leader in rhythm detection, and as a result of this, in 2018, 15 Academic Health Science Networks in England were provided these through the NHS Innovation Accelerator (NIA), a</p>		

national initiative to support the spread of high impact, evidence-based innovations across the NHS.

This work then informed work on AF-screening, firstly in community pharmacies and subsequently in general practice, and demonstrated that new AF could be readily identified and was cost-effective [O1]. This research has been replicated by many others globally. We have now completed a systematic review of primary data, including data from 19 primary AF screening studies (n=141,220) from 16 countries, which shows that AF screening is cost effective and that the number needed to screen to diagnose one case of treatable AF in those aged  $\geq 65$  years is 83 [O2]. We have worked with pharmacists from ten countries (Canada, New Zealand, Portugal, Spain, UK, Czech Republic, France, Hong Kong, Hungary and Switzerland) to show that community screening is feasible and acceptable in range of healthcare settings [O3]. We have also demonstrated the feasibility and acceptability of a community-based AF screening programme for people who have suffered a stroke [O4, P1].

## 2) Appropriate prescription of OAC

To improve appropriate prescription of OAC we developed and tested an electronic decision support (EDS) in general practice, which led the general practitioner through the AF-management guidelines to choose the best treatment strategy for the patient. We demonstrated that the EDS was acceptable and feasible [O5]. We then went on to demonstrate significantly enhanced adherence to guideline-based oral anticoagulant prescription in general practice using our EDS, with 83% of eligible new AF patients treated according to guidelines as opposed to 71% at baseline ( $p < 0.001$ ) [O6].

## 3) Medication adherence

The ENU team have worked with people living with AF to determine that a key area of need is timely, accurate, and tailored information about detection of AF and stroke prevention. We secured funding in January 2019 to develop and test an app using a participatory co-design approach to improve medication adherence in people living with AF [P2].

The ENU team is leading the implementation and service mapping element of a successful Horizon 2020 bid to improve AF management across Europe which involves researchers from 23 centres; Finland, Sweden, Belgium, UK, Germany, Ireland, Serbia, Australia, Canada, the USA, Italy and the Netherlands [P3]. Thus, our work focuses on demonstrating that strokes are prevented and that morbidity and mortality from AF is reduced.

## 3. References to the research (indicative maximum of six references)

**O1, O2, O3, O5, and O6** are all published following rigorous peer-review.

- [O1] Orchard J, Lowres N, Freedman SB, Ladak L, Lee W, Zwar N, Peiris D, Kamaladasa Y, Li J, Neubeck L. *Screening for atrial fibrillation during influenza vaccinations by primary care nurses using a smartphone electrocardiograph (IECG): A feasibility study*. (2016). *European Journal of Preventive Cardiology*. Oct;23(2\_suppl):13-20.

<https://doi.org/10.1177/2047487316670255>

- [O2] Lowres, N., Olivier, J., Chao, T.F., Chen, S.A., Chen, Y., Diederichsen, A., Fitzmaurice, D.A., Gomez-Doblas, J.J., Harbison, J., Healey, J.S. and Hobbs, F.R., Neubeck L., et al. *Estimated stroke risk, yield, and number needed to screen for atrial fibrillation detected through single time screening: a multicountry patient-level meta-analysis of 141,220 screened individuals*. (2019). *PLoS medicine*, 16(9). <https://doi.org/10.1371/journal.pmed.1002903>

**Submitted to REF2.**

- [O3] da Costa, F. A., Mala-Ladova, K., Lee, V., Tous, S., Papastergiou, J., Griffiths, D., Lobban, T [...] & Neubeck, L. (2019). *Awareness campaigns of atrial fibrillation as an opportunity for early detection by pharmacists: an international cross-sectional study*. *Journal of Thrombosis and Thrombolysis*. 1-12.

<https://doi.org/10.1007/s11239-019-02000-x>

- [O4] Lennon, M., McCann, L., Horan, S., Kyfonidis, C., Munford, R., Mooney, P., Bruce, A., Neubeck, L., Barber, M., Brennan, K. *Process Evaluation for Technology Enabled Atrial Fibrillation Screening after a Stroke in Scotland*. (2020). University of Strathclyde (with Digital Health & Care Institute), Glasgow, UK. <https://doi.org/10.17868/72214>

- **[O5]** Orchard, J., Li, J., Gallagher, R., Freedman, B., Lowres, N., & **Neubeck, L.** *Uptake of a Primary Care Atrial Fibrillation Screening Program (AF-SMART): A Realist Evaluation of Implementation in Metropolitan and Rural General Practice.* (2019). BMC Family Practice 28, S377-S378. <https://doi.org/10.1186/s12875-019-1058-9>
- **[O6]** Orchard, J., **Neubeck, L.**, Freedman, B., Li, J., Webster, R., Zwar, N., [...] & Lowres, N. *eHealth Tools to Provide Structured Assistance for Atrial Fibrillation Screening, Management, and Guideline-Recommended Therapy in Metropolitan General Practice: The AF-SMART Study.* (2019). Journal of the American Heart Association, 8(1), e010959. DOI: 10.1161/jaha.118.010959 <https://europepmc.org/article/MED/30590964>
- **[P1]** **Neubeck L.** 2018-2019. Secondary detection of atrial fibrillation. £36,779.67. Digital Health Institute.
- **[P2]** **Neubeck L.** 2019-2022. £353,989.79. Chief Scientists Office. Increasing medication adherence among adults with atrial fibrillation: A Medical Research Council complex intervention framework development and feasibility study.
- **[P3]** **Neubeck L.** 2020-2022. £118,374.14. European Commission. Digital, risk-based screening for atrial fibrillation in the European community.

#### 4. Details of the impact (indicative maximum 750 words)

The work carried out at Edinburgh Napier University on the clinical management and care of atrial fibrillation (AF) has:

- had global impact on guidelines, policy and practice.
- been adopted by the World Health Organization (WHO), who included oral anticoagulants (OAC) recommended by the researchers in their Essential Medicines List, influencing drug policy in more than 150 countries.
- influenced national and international policy.
- driven education on management of AF (involving 38 countries).
- resulted in engaging with international charities and associations to improve AF Management.

#### **Global impact on guidelines, policy and practice**

The European Society of Cardiology (ESC), the leading professional association of cardiovascular professionals globally, guidelines (2016) on management of AF include recommendations on AF Screening and cited our work as Class 1 Level B evidence for the detection of AF **[C1]**. These guidelines are the most commonly used in clinical practice, and have been cited 6,599 times since publication. Registry data evidences substantial improvement in uptake of OAC over the last five years (an increase from 50% to 80%), which have been linked to dissemination of ESC guidelines. Another factor in the successful improvement in AF management has been the release of new OAC drugs, recommended in the guidelines.

#### **World Health Organization Essential Medicines List**

The release of a new class of OAC presented a global challenge, as the new drugs were more widely available in high-income countries, creating further inequalities in stroke prevention. In 2018, Neubeck was one of only 25 people globally selected to participate in the World Heart Federation Emerging Leaders Programme on Stroke Prevention **[C2]**. Prof Neubeck was one of nine participants of this programme to focus on the challenge of access to OAC. Together, the team reviewed all the available evidence for use of the drugs and summarised this in an application to the World Health Organisation Essential Medicines Committee. The Essential Medicines List forms the basis for drug policy in 155 countries. The application was successful and the new class of OAC was added to the Essential Medicines Lists in April 2019 **[C3]**.

#### **Influencing national and international policy**

To continue driving improvements in AF-related stroke prevention, the ENU team have forged strong relationships with key stakeholders in AF management, and are invited members of the Cross-Party Group on Heart Disease and Stroke in Scottish Parliament. The team also provided academic and clinical advice to the 'Focus on Atrial Fibrillation in Scotland: a report of the Cross-Party Group on Heart Disease and Stroke' national inquiry into current AF management in Scotland **[C4]** and met with the Scottish Government Health and Sport Minister, Aileen Campbell

(now cabinet secretary), to discuss the strategy for implementing these recommendations on 23rd January 2018. As a result, a parliamentary debate was conducted on this topic on the 6th of March 2018 [C5], and the ENU team are invited members on a national task force convened by the Scottish Government to deliver the recommendations for management of AF in Scotland. In February 2020, Prof Neubeck was asked to chair this group. The report of AF-Screen was featured in the January issue of Holyrood Magazine [C6], received national media attention [C7], and has been shared globally via the AF-SCREEN international e-blast. AF-Screen is an international collaborative organisation dedicated to stroke prevention, with 35 member countries. They describe the action in Scotland as an exemplar of what can be achieved by advocacy [C8]

#### ***Driving education on management of AF***

Members of AF-SCREEN have demonstrated that uptake of recommendations in screening and appropriate management reduce stroke-related deaths in AF from 14.5 to 9.1 per 1000 persons per year ( $P = 0.003$ ). Indeed, it has been estimated that effective detection and management of AF could save 9,000 lives per year in England alone. To ensure uptake of this evidence occurs it is essential to equip health professionals with appropriate knowledge and skills to deliver effective care. Our team is working to support educational programmes in AF that will enable health professionals to deliver the 10 recommendations of the AF inquiry [C9]. In October 2019 we ran a successful webinar of AF medication adherence, watched live by over 250 people from 38 different countries, and now available on the global platform ESC365 [C10]. A second webinar was held February 2020, watched live by 346 people from 40 countries.

#### ***Engaging with international charities and associations to improve AF management***

As a result of these broad reaching activities to improve management of AF and prevent stroke, Prof Neubeck was invited to serve as a medical advisor for the Atrial Fibrillation Association, a UK-based charity, with partners in 26 countries (2017-present), and is a founding member of the AF-Screen international collaborative. Together with AF-Screen, Prof Neubeck developed and co-authored recommendations on AF-screening in 2017 [C11]. More recently, the ENU team collaborated with members of the AF-Screen on a second report on AF-screening and stroke [I12]

#### **5. Sources to corroborate the impact** (indicative maximum of 10 references)

- [C1] European Society of Cardiology guidelines on AF  
Kirchhof, P., S. Benussi, D. Kotecha, A. Ahlsson, D. Atar, B. Casadei, M. Castella, H.-C. Diener, H. Heidbuchel, J. Hendriks, G. Hindricks, A. S. Manolis, J. Oldgren, B. A. Popescu, U. Schotten, B. Van Putte and P. Vardas (2016). "2016 ESC Guidelines for the management of atrial fibrillation developed in collaboration with EACTS." *European Heart Journal* 37(38): 2893-2962.  
<https://doi.org/10.1093/ejcts/ezw313>
- [C2] Announcing the 2018 Emerging Leaders Cohort  
<https://www.world-heart-federation.org/emerging-leaders/news/announcing-2018-emerging-leaders-cohort/>
- [C3] NOACs and fixed-dose combination antihypertensive medications added to WHO Essential Medicines List  
<https://www.world-heart-federation.org/news/noacs-and-simpler-treatments-for-high-blood-pressure-added-to-who-essential-medicines-list/>
- [C4] A Focus on atrial fibrillation in Scotland  
<https://www.bhf.org.uk/how-you-can-help/heart-voices-wip/cross-party-group-inquiry-into-atrial-fibrillation-in-scotland>
- [C5] Parliamentary debate  
<https://www.scottishparliament.tv/meeting/members-business-atrial-fibrillation-in-scotland-march-6-2018>
- [C6] Freeman, T. (2018) Atrial Fibrillation: Maintaining momentum. *Holyrood Magazine*  
[https://www.holyrood.com/news/view,atrial-fibrillation-maintaining-momentum\\_8315.htm](https://www.holyrood.com/news/view,atrial-fibrillation-maintaining-momentum_8315.htm)  
accessed 06/03/2021
- [C7] Strachan, K. (2018) Kylie Strachan: Working together is at the heart of efforts to reduce stroke risk for thousands.

<https://www.scotsman.com/news/opinion/kylie-strachan-working-together-is-at-the-heart-of-efforts-to-reduce-stroke-risk-for-thousands-1-4701053> accessed 09/03/2018

- **[C8]** Update from AF-SCREEN Int'l Collaboration

- **[C9]** Delivering the ten recommendations of the atrial fibrillation inquiry

[https://www.napier.ac.uk/about-us/events/atrial-](https://www.napier.ac.uk/about-us/events/atrial-fibrillation?utm_source=napier.ac.uk&utm_medium=redirect&utm_campaign=afevent)

[fibrillation?utm\\_source=napier.ac.uk&utm\\_medium=redirect&utm\\_campaign=afevent](https://www.napier.ac.uk/about-us/events/atrial-fibrillation?utm_source=napier.ac.uk&utm_medium=redirect&utm_campaign=afevent) accessed 09/03/2018

- **[C10]** Increasing understanding of atrial fibrillation (AF) and medication adherence for people living with AF (15/10/2019)

<https://www.escardio.org/Education/E-Learning/Webinars/Increasing-understanding-atrial-fibrillation>

- **[C11]** Freedman, B., Camm, J., Calkins, H., Healey, J. S., Rosenqvist, M., Wang, J., ... Neubeck L... & Boriani, G. (2017). Screening for atrial fibrillation: a report of the AF-SCREEN international collaboration. *Circulation*, 135(19), 1851-1867.

<https://doi.org/10.1161/CIRCULATIONAHA.116.026693>

- **[C12]** Schnabel, R. B., Haeusler, K. G., Healey, J. S., Freedman, B., Boriani, G., Brachmann, J., ... Neubeck L ... & Doehner, W. (2019). Searching for Atrial Fibrillation Poststroke: A White Paper of the AF-SCREEN International Collaboration. *Circulation*, 140(22), 1834-1850.

<https://doi.org/10.1161/CIRCULATIONAHA.119.040267>

- **[C13]** Letter from Consultant Cardiologist and Clinical Lead at the South West Acute Hospital