European Journal of Arrhythmia & Electrophysiology

VOLUME 7 • SUPPLEMENT 1

Heart Rhythm Congress
www.heartrhythmcongress.org

STARS Syncope Trust And Reflex anoxic Seizures
Arrhythmia Alliance
AFA AFAssociation
www.heartrhythmalliance.org

Official Journal of A–A

ABSTRACTS

Heart Rhythm Congress 2021

3–6 October

Arrhythmia Alliance Virtual Conference Centre

www.touchCARDIO.com

European Journal of Arrhythmia & Electrophysiology

Volume 7 • Supplement 1 •

Cover image: Medicine heart beat illustration
By alex_aldo | © stock.adobe.com

Editorial Board

Official Journal of A–A

www.touchmedicalmedia.com

e-ISSN: 2058-3877

Contents – Session

Contents – Abstracts

CONTINUED

Contents – Abstracts

CONTINUED

Contents – Abstracts

Young Investigators Competition

1/Cardiac resynchronisation by His bundle and left bundle area pacing compared to biventricular pacing; an acute electrical and haemodynamic study

European Journal of Arrhythmia & Electrophysiology. 2021;7(Suppl. 1):abstr1

N Ali (Presenting Author) - National Heart and Lung Institute, Imperial College London, London; AA Miyazawa - National Heart and Lung Institute, Imperial College London, London; AD Arnold - National Heart and Lung Institute, Imperial College London, London; P Kanagratnam - National Heart and Lung Institute, Imperial College London, London; NS Peters - National Heart and Lung Institute, Imperial College London, London; N Qureshi - National Heart and Lung Institute, Imperial College London, London; B Lim - National Heart and Lung Institute, Imperial College London, London; F Ng - National Heart and Lung Institute, Imperial College London, London; N Linton - National Heart and Lung Institute, Imperial College London, London; D Lefroy - National Heart and Lung Institute, Imperial College London, London; A Muthumala - St Bartholomews Hospital and North Middlesex University Hospital, London; MA Tanner - St Richards Hospital, University Hospitals Sussex NHS Foundation Trust, London; D Keene - National Heart and Lung Institute, Imperial College London, London; GD Cole - National Heart and Lung Institute, Imperial College London, London; D Francis - National Heart and Lung Institute, Imperial College London, London; ZA Whinnett - Imperial College London, London

Introduction: Conduction system pacing in the form of His bundle pacing (HBP) can deliver more effective ventricular resynchronization compared to biventricular pacing, which translates to greater acute haemodynamic benefit. Left bundle branch pacing (LBBP) has potential advantages over HBP; capture thresholds are typically lower and it can correct left bundle branch block occurring as a result of more distal conduction system disease. A potential disadvantage of LBBP compared to His-CRT is that is does not typically capture the right bundle branch and therefore results in delayed right ventricular activation. It is not known whether this delayed activation produces important reductions in the improvements of cardiac function compared to HBP.

We conducted a within-patient comparison of acute electrical and haemodynamic response to HBP, LBBP and biventricular pacing (BVP) in patients with a CRT indication.

Methods: Patients with severely impaired left ventricular systolic function and QRS duration >120 ms were recruited into the study. HBP and LBBP was delivered to all patients and BVP was also delivered to a subgroup of these patients. Conduction system capture was confirmed using standard criteria. We defined successful delivery of resynchronization as a reduction of at least 15 ms in left ventricular activation time. We assessed the acute electrical response by measuring the change in QRS duration (12-lead ECG) and ventricular activation times (ECGi, Medtronic). Acute haemodynamic response was assessed using a high precision haemodynamic protocol.

Results: 15 patients were recruited (12 male, 3 female), mean age 66.5 years (IQR 55–76), LVEF 32% (IQR 30–35) and QRS duration 172 ms (IQR 166–178). HBP and LBBP both achieved better ventricular resynchronization compared with biventricular pacing. Reduction in left ventricular activation times were significantly greater with both HBP and LBBP compared to BVP (22 ms; 95% CI, 9.8–34.2; p<0.01 for HBP, and 26.7 ms; 95% CI, 16.0–37.5; p<0.01 for LBP). The reduction in left ventricular activation times with HBP was 46 ms ± 8.6 (95% CI, 37.5–54.5). LBBP also resulted in a reduction in left ventricular activation time of 45 ± 8.5 (95% CI, 36.5–53.3). There was no significant difference between the two modalities (-2.1; 95% CI, -11.4–7.1; p=0.6). All three modalities improved acute systolic blood pressure (median increase; HBP 11.3 mmHg, LBBP 9.1 mmHg and BVP 6.7 mmHg) (*Figure 1*). When we compared HBP and LBBP there was a trend towards greater improvement with HBP compared to LBBP, but this did not reach statistical significance (1.05; 95% CI, -6.1–4.0; p=0.66).

Conclusion: Conduction system pacing with HBP and LBBP both have the potential to deliver more effective ventricular resynchronization compared to biventricular pacing. The delayed right ventricular activation with LBBP does not appear to significantly impact acute cardiac function. LBBP is therefore a very promising method for delivering cardiac resynchronization therapy. ❑

Young Investigators Competition

2/Recurrence matrix mapping: a novel approach to characterising atrial fibrillation phenotype

European Journal of Arrhythmia & Electrophysiology. 2021;7(Suppl. 1):abstr2

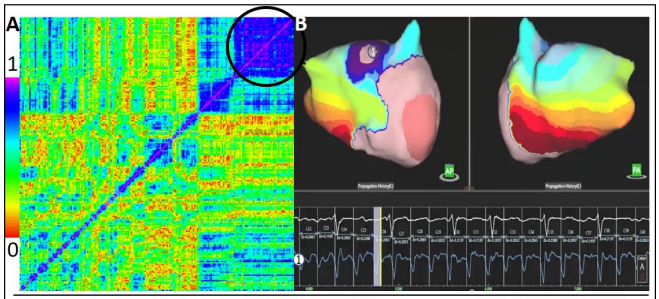
MTB Pope (Presenting Author) - Oxford University Hospitals NHS Foundation Trust, Oxford; P Kuklik - Asklepios Clinic St. Georg, Hamburg; A Banerjee - University of Oxford, Oxford; A Briosa e Gala - Oxford University Hospitals NHS Foundation Trust, Oxford; M Leo - Oxford University Hospitals NHS Foundation Trust, Oxford; M Mahmoudi - University of Southampton, Southampton; J Paisey - Southampton University Hospitals NHS Foundation Trust, Southampton; TR Betts- Oxford University Hospitals NHS Foundation Trust, Oxford

Introduction: Characterising patient-specific atrial fibrillation (AF) phenotype may lead to individualised approaches and improve ablation outcomes. Our novel mapping approach based on signal recurrence plots has not previously been applied to whole chamber, bi-atrial recording of AF.

Methods: Simultaneous bi-atrial 30s AF recordings were obtained using non-contact charge density mapping prior to ablation. Mean phase coherence was calculated for each whole chamber and anatomical segments for all combinations of two different time points resulting in a chamber recurrence matrix where a value of 1 (purple, see *Figure 1 panel A*) represents uniform repetitive conduction, and 0 (red), irregular, non-repetitive activity. The mean value of the matrix (whole chamber/ global and region) was calculated to give the recurrence index (RI). Activation patterns identified using charge density mapping (localised rotational and irregular activation [LIA and LRA] and focal firing [FF]) were quantified with binomial logistic regression used to identify predictors of acute AF termination with ablation.

Results: Recordings were obtained in 21 patients (5 pAF, 16 persAF) undergoing de-novo ablation procedures. Recurrence matrices revealed regions with organised activation corresponding to emergence of a dominant focal activation (*Figure 1A-B*). Global RI was higher in patients with paroxysmal vs persistent AF (0.40 ± 0.08 vs 0.35 ± 0.05; p<0.0005) and when AF was induced (p<0.0005). Regional RI had strong inverse correlation with complexity measured by the frequency of LIA (r=-0.66; p<0.0005). Global RI was the strongest univariate predictor of acute outcome (p=0.0007) and remained significant in multivariate analysis (*Figure 1C*).

Figure 1



C

VARIABLE	UNIVARIATE ANALYSIS			MULTIVARIATE ANALYSIS	
	log odds	AIC	p value	log odds	p value
RECURRENCE INDEX	20.4	97.0	0.0007	20.53	0.0056
LIA FREQUENCY	0.0009	117.0	0.6028	0.013	0.0012
LRA FREQUENCY	-0.0284	102.4	0.0006	-0.0271	0.1718
FF FREQUENCY	0.0133	105.9	0.0048	0.0153	0.079
AFCL	0.0303	111.4	0.0211	0.0254	0.4042

Figure (A) shows a recurrence matrix plot from one patient with a period of organisation (circled) which corresponded to a focal activation from the roof (B) with clear QS signal, ablation of which terminated AF. Univariate and multivariate predictors of acute outcome are shown in (C). (In A, purple (1) represent maximum RI, red (0), minimum). AIC, Akaike Information Criteria

Conclusion: Recurrence matrix mapping characterises whole chamber and regional AF complexity and predicts acute procedural outcome. Identifying periods with high organisation may reveal "drivers" that can be targeted with focal ablation. ❑

Young Investigators Competition

3/Obstructive sleep apnoea, obesity and atrial fibrillation: a Mendelian randomisation study

European Journal of Arrhythmia & Electrophysiology. 2021;7(Suppl. 1):abstr3

M Ardissino (Presenting Author) - Imperial College London, London; RK Reddy - Imperial College London, London; KHK Patel - Imperial College London, London; DK Ryan - St George's University Hospitals NHS Foundation Trust, London; D Gill - Imperial College London, London; FS Ng - Imperial College London, London

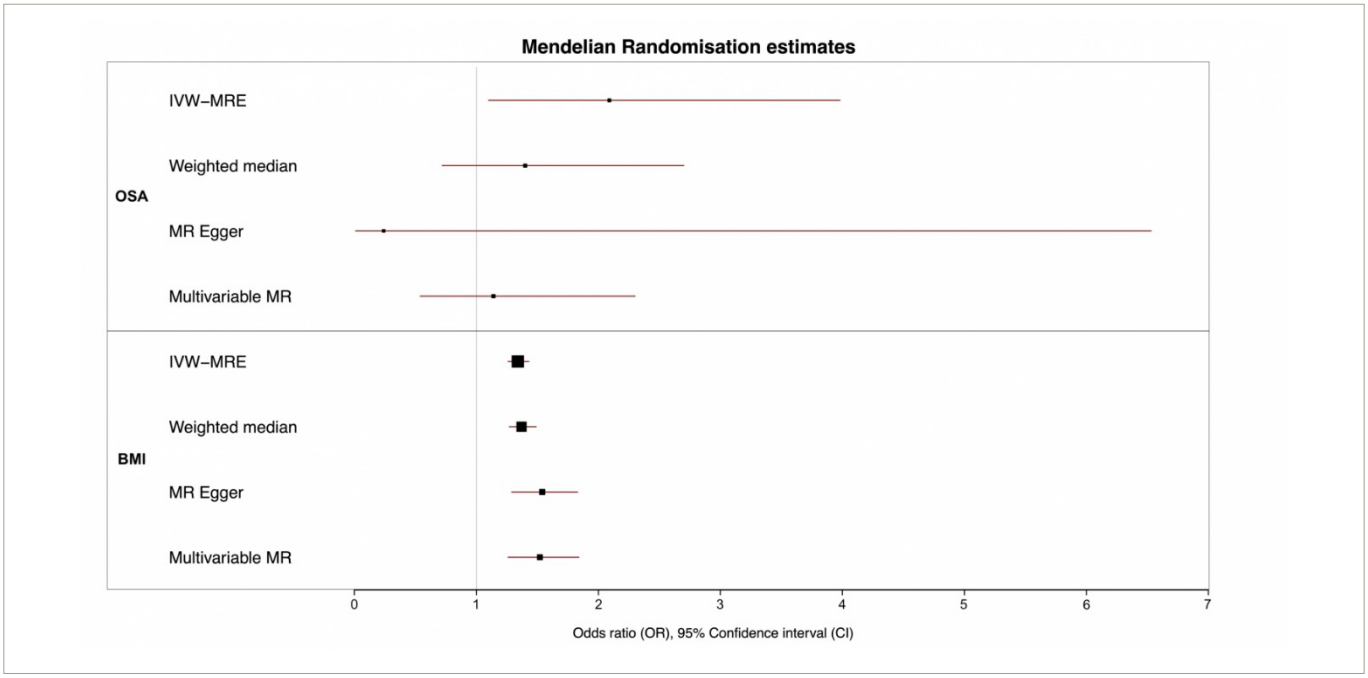
Aims: The association between obstructive sleep apnoea (OSA) and atrial fibrillation (AF) is yet to be fully delineated. Although several observational studies have suggested an independent association between OSA and AF, subsequent randomised controlled trials have failed to demonstrate any benefit of OSA treatment on reducing AF incidence. Complicating the interpretation of the data on OSA and AF is the strong association of both these conditions with obesity, which may act as a confounder, and it is therefore unclear whether this association is mediated by shared co-morbidities such as obesity. We performed Mendelian randomisation (MR) to investigate the causal relationship between OSA, body mass index (BMI) and AF.

Methods: Mendelian randomisation utilises genetic variants in instrumental variable analysis to investigate relationships between modifiable risk factors and outcomes in observational data. Using genetic variants that are independently and randomly inherited as proxies for modifiable exposures enables causal inference concerning outcomes, overcoming limitations of classical observational epidemiology; namely, confounding and reverse causality. Single-nucleotide polymorphisms associated with OSA and BMI were selected as instrumental variables to estimate associations of BMI and OSA with AF among 55,114 cases with AF and 482,295 controls.

Results: Primary analysis was conducted using inverse-variance weighted MR. Genetically-predicted OSA and BMI were both significantly associated with increased odds of AF (per odds ratio unit increase in OSA: OR 2.09; 95% CI, 1.10–3.98; p=0.03; per kg/m^2 increase BMI: OR 1.34; 95% CI, 1.26–1.43; p<0.001). However, the association between genetically-predicted OSA and AF was no longer observed in sensitivity analyses that are more robust to the presence of pleiotropy, whilst associations between genetically-predicted BMI and AF remained consistent. Similarly, in multivariable MR, genetically-predicted OSA was not associated with AF when adjusting for genetically-predicted BMI (OR unit increase for OSA 1.14; [95%CI, 0.54–2.30], p=0.86). Genetically-predicted BMI remained associated with AF after adjusting for genetically-predicted OSA (OR 1.52; [95% CI, 1.26–1.84] per kg/m^2 increase; p=0.049) *(Figure 1)*.

Conclusion: Our data suggest that OSA is not independently causal of AF and their association is attributable to mediation or confounding from obesity, while we confirm that obesity is causally associated with AF. Our results highlight a hierarchy of importance for the putative modifiable risk factors for AF, with evidence for obesity being stronger than that for OSA, suggesting that weight reduction treatments may be potentially more effective than OSA treatments in reducing AF burden. ❑

Figure 1



Young Investigators Competition

4/Overcoming delayed right ventricular activation associated with left bundle area pacing by additional right septal capture does not offer any haemodynamic advantage

European Journal of Arrhythmia & Electrophysiology. 2021;7(Suppl. 1):abstr4

KA Saqi (Presenting Author) - Imperial College School of Medicine, London; N Ali - National Heart and Lung Institute, Imperial College London, London; AD Arnold- National Heart and Lung Institute, Imperial College London, London; AA Miyazawa - National Heart and Lung Institute, Imperial College London, London; D Keene - National Heart and Lung Institute, Imperial College London, London; NS Peters - National Heart and Lung Institute, Imperial College London, London; P Kanagratnam- National Heart and Lung Institute, Imperial College London, London; N Qureshi - National Heart and Lung Institute, Imperial College London, London; FS Ng - National Heart and Lung Institute, Imperial College London, London; N Linton - National Heart and Lung Institute, Imperial College London, London; D Lefroy - National Heart and Lung Institute, Imperial College London, London; D Francis - National Heart and Lung Institute, Imperial College London, London; PB Lim - National Heart and Lung Institute, Imperial College London, London; GD Cole - National Heart and Lung Institute, Imperial College London, London; MA Tanner - St Richard's Hospital, University Hospitals Sussex NHS Foundation Trust, London; A Muthumala - St Bartholomew's Hospital and North Middlesex University Hospital, London; ZI Whinnett - National Heart and Lung Institute, Imperial College London, London

Introduction: Left bundle area pacing is a novel conduction system technique that is rapidly expanding. When the left bundle branch (LBB) alone is captured the 12-lead ECG shows an R prime in lead V1 indicative of delayed right ventricular activation. This is usually seen in unipolar pacing. Right septal myocardial capture can be achieved by anodal stimulation. This overcomes the delay in right ventricular activation. Whether overcoming this delay in right ventricular activation has positive effects on cardiac function is unknown and has never been investigated. We sought to address whether overcoming delayed right ventricular activation is associated with any haemodynamic benefit.

Methods: Patients were recruited from our pacing clinic and before attempting left bundle branch pacing (LBBP). We reviewed the 12-lead electrocardiograms of all patients to distinguish LBB-only capture from LBB plus right septal myocardial capture. With LBB-only capture there is an R prime in lead V1, this is eliminated when right septal capture is achieved by anodal stimulation. We selected patients who demonstrated both types of capture. High precision haemodynamic protocol was used to measure systolic blood pressure change with each capture type compared to a reference baseline. We undertook a within-patient comparison of QRS duration, pacing threshold and systolic blood pressure between the two types of capture.

Results: 15 patients with permanent LBBP demonstrated both LBB-only capture and LBB plus anodal capture and were included in the study. The average age was 68 ± 11 years and 11 (73%) were male. Bradycardia was the pacing indication in 3 (20%) patients, heart failure in 11 (73%) and pre-TAVI in 1 (7%). LBB plus right septal capture was associated with significantly narrower QRS duration compared to LBB-only capture (-11.7 ms; 95% CI, -15.7 to -7.6 ms; p<0.0001). However, LBB plus right septal capture required higher pacing outputs, typically seen in bipolar pacing configuration. The mean threshold with LBB-only capture was 0.69 V ± 0.25 at 0.4 ms, and LBB plus right septal capture was 3.28 V ± 2.16 at 0.4 ms; the difference was statistically significant (2.6V; 95% CI, 1.4–3.8 V; p=0.0004). Despite the narrower QRS, there was no significant difference observed in systolic blood pressure between the two capture types (-0.96 mmHg; 95% CI, -3.3–1.4 mmHg; p>0.05) (*Figure 1*).

Conclusion: Left bundle pacing achieves left bundle branch capture at a low output, but this is associated with delayed right ventricular activation. Anodal stimulation can be used to achieve right septal capture, and lead to earlier activation of the right ventricle. However, this requires significantly higher outputs and does not offer any haemodynamic advantage. This has important implications for device programming. ❑

Oral Abstracts 1 – Allied & Service Development

5/Diagnostic yield of injectable implantable loop recorders: a single UK centre experience

European Journal of Arrhythmia & Electrophysiology. 2021;7(Suppl. 1):abstr5

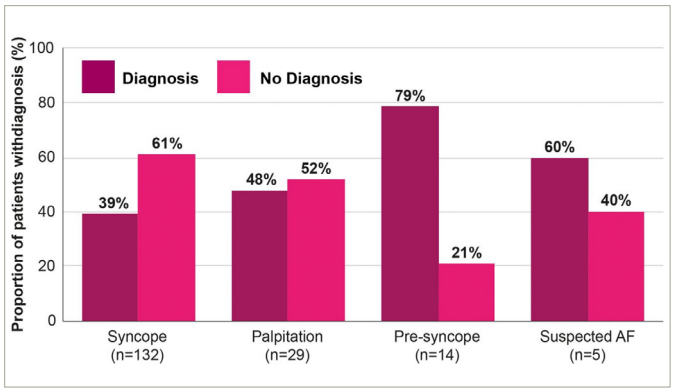
L Yates (Presenting Author) - Royal Stoke University Hospital, Stoke-on-Trent; S Siddiqui - Royal Stoke University Hospital, Stoke-on-Trent; R Goodwin - Royal Stoke University Hospital, Stoke-on-Trent; V Walker - Royal Stoke University Hospital, Stoke-on-Trent; S Kwok- Royal Stoke University Hospital, Stoke-on-Trent; A Patwala- Royal Stoke University Hospital, Stoke-on-Trent

Introduction: Implantable loop recorders (ILRs) are increasingly used for detection of arrhythmias for prolonged rhythm monitoring. They have become a preferred strategy for investigation and diagnosis of arrhythmia following clinical events such as syncope and stroke. ILR implantation has been shown to have a superior diagnostic yield to conventional, external methods of cardiac monitoring and has also been shown to be more cost-effective. The current generation of ILRs are smaller compared to previous models and can be injected into subcutaneous tissue rapidly and safely by non-physicians as primary operators, with high procedural success and low complications rates. They can also utilise remote monitoring via automated or manual data transmission in order to minimise delays between detection and clinical intervention. Here, we evaluate the diagnostic utility of injectable ILRs at a major UK cardiac centre.

Methods: Data from 200 consecutive patients who received a Medtronic Reveal Linq™ ILR between January and October 2015 were gathered retrospectively and included baseline demographics, indication for ILR, diagnostic information and time taken to reach diagnosis following implant.

Results: 20 patients were excluded due to incomplete data. For the 180 remaining patients who underwent ILR implant, indications for implant were syncope (132/180 [73%]), pre-syncope (14/180 [8%]), palpitation (29/180 [16%]) and suspected AF (5/180 [3%]). During a mean (± SD) follow-up period of 327 (± 355) days the overall diagnostic yield, defined as an arrhythmia that was recorded by the ILR and led to a diagnosis which directly resulted in a change in clinical management, was 80/180 (44%). Patients in whom a diagnosis was made had a higher mean age than those in whom a diagnosis was not made (68 ± 17 vs 62 ± 18; p=0.03). Of those in whom a diagnosis was made from ILR recordings, 41/80 (51%) went on to receive either a permanent pacemaker or implantable cardioverter-defibrillator, 32/80 (40%) received a change to pharmacological management and 7/80 (9%) underwent catheter ablation for an arrythmia. Of those in whom a diagnosis was not made from ILR recordings, only 1/100 (1%) received a permanent pacemaker.

Figure 1: Proportion of patients reaching diagnosis according to initial indication for implant



Between the diagnostic and non-diagnostic group, the proportion of patients receiving a change in clinical management following ILR implant was significantly different (p<0.001). When categorising patients according to the initial indication for implant, the diagnostic yield was 39% (syncope), 48% (palpitation), 79% (pre-syncope) and 60% (suspected AF) (*Figure 1*). The mean time (± SD) to reach diagnosis was shortest for sinus node disease (222 ± 187 days) and longest for sustained VT (518 ± 377 days).

Conclusion: The injectable ILR is a useful diagnostic tool which directly informs clinical management, including the decision to implant therapeutic devices and institute essential medication such as anti-arrhythmic drugs and anticoagulation. The detection rate at our centre of 44% for an arrhythmia, which informed clinical management, compares favourably to other studies evaluating ILRs and re-enforces the diagnostic superiority of ILRs over conventional forms of evaluation such as Holter monitoring. Further work is warranted in order to determine the long-term prognostic value of this tool. ❑

Oral Abstracts 1 – Allied & Service Development

6/A hub-and-spoke model implementing HeartLogic in cardiac device patients across east London and beyond

European Journal of Arrhythmia & Electrophysiology. 2021;7(Suppl. 1):abstr6

P Lloyd (Presenting Author) - Barts Health NHS Trust, London; Z Carter - Barts Health NHS Trust, London; S Cowap - Barts Health NHS Trust, London; J Ramplin - Barts Health NHS Trust, London; B Jones - Barts Health NHS Trust, London; N Mark - Barts Health NHS Trust, London; B Patel - Barts Health NHS Trust, London; M Thomas - Barts Health NHS Trust, London

Introduction: The HeartLogic (HL) index (Boston Scientific) is a novel multisensory approach in the monitoring of heart failure (HF) patients with ResonateTM cardiac defibrillator devices. Without a dedicated HF nurse team onsite at St Bartholomew's Hospital, and the subsequent COVID-19 pandemic, it has been vital to liaise with patients' local community care teams to reduce hospital attendances. Therefore, a hub-and-spoke model has evolved to initiate clinical reviews and medication changes for patients at risk of HF decompensation.

Methods: The local criteria for HL activation included a HF diagnosis and NYHA class II+; patients were activated in batches to stagger initial alerts. From December 2019 to February 2021, HL was activated for 179 patients (*Table 1* shows the baseline clinical characteristics). The median follow-up duration (from activation to last follow up or death) was 16 months (25th–75th percentile: 8–17), a total of 161 patient years. A total of 9 patients died during follow up (5 due to COVID-19) and 5 were in alert state at the time. All active alerts were reviewed twice a week by a cardiac scientist, and the alert trend and contributing factors examined. If the alert had a sudden onset, the patient's symptoms were assessed via a phone call using a locally developed questionnaire. If the alert had a gradual onset, a 'watch and wait' approach was adopted as patient symptoms may not have manifested yet and the call was undertaken a week later. Depending on the patient's condition and alert duration, further monitoring or escalation to the local HF team for medication review was arranged.

Results: The HL index crossed the threshold value (16) 198 times (1.2 alerts/patient year) in 89 patients (up to 7 times per patient). The median alert duration was 48 days (25th–75th percentile: 14–99). Overall, the total time in alert state for the entire patient population was 26 years (16% of the total observation period). The maximum HL index value was 31 ± 12. The HL sensors detected changes in heart sound amplitude in 155 (78%) alerts; decreased thoracic impedance for 116 (59%) alerts; increased respiratory rate for 110 (56%) alerts; and increased night heart rate for 95 (48%) alerts. Kaplan–Meier plots of the time to the first HL alert, stratified by baseline characteristics, showed no significant differences between subgroups. However, Cox regression analysis showed that lower LVEF at time of implant was a predictor of HL alerts (p=0.002; hazard ratio 0.95; 95% CI, 0.92–0.98). Although, a sub-analysis of the MultiSENSE study (Gardner et al. 2018) demonstrated HL maintains its predictive value for HF events after correction for baseline variables, including LVEF.

Table 1: Results

Patient demographic	N=179
Age, years	65 ± 11
Male gender, n (%)	143 (80)
Ischaemic aetiology, n (%)	117 (65)
LV ejection fraction (LVEF), %	31 ± 6
QRS duration, ms	125 ± 31
LBBB	60 (34)
Primary prevention, n (%)	165 (92)
CRT-D, n (%)	89 (50)
NYHA class (II, III, IV)	131 (73), 46 (26), 2(1)

Conclusions: The present analysis includes one of the largest patient populations managed with HL described to date and demonstrates that the clinic's alert burden is comparable to that seen in the MultiSENSE trial (2 alerts per patient per year). Cardiac scientists leading this service have adapted the alert reporting and escalation process to ensure it is sustainable long term. This has brought together multidisciplinary professionals to coordinate care in line with the NHS Long-Term Plan for these high-risk heart failure patients. ❑

Oral Abstracts 1 – Allied & Service Development

7/Handheld echocardiographic assessment of the LV, aiding generator selection at box change in device clinics

European Journal of Arrhythmia & Electrophysiology. 2021;7(Suppl. 1):abstr7

MA Swift (Presenting Author) - Great Western Hospital, Swindon; KJ Sullivan - Great Western Hospital, Swindon; P Foley - Great Western Hospital, Swindon; B Chandrasekaran- Great Western Hospital, Swindon

Background: In patients with pre-existing devices, elective generator change is an opportunity to revisit whether a revision of their existing leads or addition of extra leads is required. This is especially the case in individuals who have a high burden of right ventricular pacing (RVP) which can lead to a deterioration in left ventricular systolic function (LVSF). Assessment of LVSF is predominantly carried out by transthoracic echocardiography (TTE) and there is already an increasing demand on TTE making this challenging.

Aim: To evaluate the feasibility and cost-effectiveness of focused handheld echo (HHE) in screening individuals requiring generator change.

Methods: A retrospective review of 136 elective generator changes between 2017 and 2019 for patients with pacemakers (PPM) and internal cardiac defibrillators (ICD) but not cardiac resynchronisation therapy (CRT). The pacing clinic notes were reviewed and the type and results of any echo undertaken was collected. The number of individuals that required any upgrade of their device was recorded. The ability of HHE to screen individuals and obviate the need for further imaging was evaluated. The potential cost savings of HHE as a first-line investigation was also investigated.

Results: A total of 136 patients required generator change (93 males) with a median age 81 (range 37–101 years). Of this total, 16 required upgrade to CRT or ICD (1 x ICD, 10 x CRT and 5 x CRT-D). In 22 patients no echo was performed. The demographics of the 114 patients in whom echo was performed prior to generator change are shown in *Table 1*. Screening identified 66 patients with moderate–severe LVSD prior to generator change of which 16 went on to have an upgrade to CRT (10), CRT-D (5) and ICD (1). In the hand-held group 16 had severe LVSD, and in the TTE group 28 had severe LVSD.

Table 1

	Handheld echo (60)	Transthoracic echo (54)
Patient age (years)	42–101 years	38–100 year
Male (%)	52%	48%
PPM (%)	68%	32%
ICD (%)	45%	55%
Single chamber (%)	70%	30%
Dual chamber (%)	68%	32%
Device age years (median, range)	Median 12 years (range 8–20 years old)	Median 10 yrs (range 2–24 years old)
AF (%)	52%	48%

Discussion: The results demonstrate that HHE can be used in device clinic routinely to assess patients prior to device box change. Improvements in technology, with the ability to save images and compute accurate ejection fractions offline have made service adaptations similar to this one even more efficient. Challenges remain regarding physiology workforce planning, with dual-accredited or a skill mix of TTE and devices-accredited staff required for such a service often at a premium. ❑

Oral Abstracts 1 – Allied & Service Development

8/Single center experience of Reveal LINQ™ Insertable Cardiac Monitor (RL-ICM) in cryptogenic stroke

European Journal of Arrhythmia & Electrophysiology. 2021;7(Suppl. 1):abstr8

S Elshafie (Presenting Author) - Nottingham University Hospital NHS Trust, Nottingham; MA Naeem - Nottingham University Hospital NHS Trust, Nottingham; MJ Ng Kam Chuen - Nottingham University Hospital NHS Trust, Nottingham

Introduction: Cryptogenic stroke accounts for 30–40% of ischaemic strokes, and may be due to undetected atrial fibrillation (AF). Conventionally, 24-hour ECG monitoring is used to detect AF after a cryptogenic stroke; however, the CRYSTAL AF trial concluded that insertable cardiac monitoring (ICM) was superior to conventional -hour ECG monitoring in AF detection with 19.0% and 2.3% detection rate, respectively, at 3 years. NICE has now recommended the use of Reveal LINQ™ ICM (RL-ICM) as an option for detection of AF after cryptogenic stroke if initial Holter monitoring has failed to detect AF.

Methods: At Nottingham University Hospital NHS Trust, we established a service with the Stroke Team for RL-ICM insertion in patients with cryptogenic stroke for AF detection. The inclusion criteria were confirmation of stroke/transient ischaemic attack, sinus rhythm on 12-lead ECG, no embolic source on transthoracic echocardiogram, negative prolonged Holter monitoring, modified Rankin score 0–3, normal CT or MR angiogram of brain, normal carotid ultrasound, and normal hyper-coagulable screening if <55 years old. The exclusion criteria were known AF or atrial flutter, indication for pacemaker or implantable cardiac defibrillator, anticoagulation deemed inappropriate, or already on anticoagulation.

Results: Between 29th January 2018 and 6th May 2021, 55 patients were referred for RL-ICM insertion from the Stroke Team (age 63.4 ± 14.7 years; range 24–94); male 34 (61.8%); stroke 49 (89); transient ischaemic attack 6 (10.9%); hypertension 23 (41.8%); diabetes 7 (12.7%); hypercholesterolaemia 22 (40%); current smoker 2 (3.6%); and coronary artery disease 7 (12.7%). Twenty-five (45.5%) patients have been implanted to date, with implants dates ranging between 27th March 2018 and 27th May 2021. The average time between referral and RL-ICM implantation was 82 days (median 74 days; range 29–321). Atrial fibrillation has been detected in 7 (28%) patients. The mean time for detection was 153 days (median 20 days; range 1–579). The shortest episode of AF was 10 seconds and the longest was 16 hours with a mean of 3 hours. Once detection was established, out of the 7 patients, the Stroke Team started anticoagulation in 6 (85.7%) patients; 1 patient was not anti-coagulated due to his AF lasting <30 seconds. Two of these patients died; one due to COVID-19 pneumonia and the other of an unclear cause. No patient had further stroke while awaiting RL-ICM implantation.

Table 1: Patients who had implanted RL-ICM with AF detection

Patient	Time to AF detection	Longest duration of AF	Anticoagulation
68 M	8 days	1 hour and 42 minutes	Yes
66 F	8 days	16 hours	Yes
75 M	1 year	10 seconds	No
86 F	1.6 years	6 hours and 14 minutes	Yes
58 M	1 day	5 hours	Yes
73 F	3 months	5 hours	Yes
84 M	20 days	10 minutes	Yes

Conclusion: The current detection rate of AF at our centre is 28% at a median time of 20 days. Although the number of patients in our cohort is very small, this appears to be much higher than the findings of CRYSTAL AF where detection rate of AF was 19% at 3 years. Our RL-ICM implant waiting times have significantly increased due to the COVID-19 pandemic, with currently 30 cryptogenic stroke patients still awaiting implantation. The initial high detection rate of AF in our patient population with RL-ICM highlights the importance of this service, and the need for finding solutions to our long waiting times for RL-ICM insertion. ❑

Oral Abstracts 1 – Allied & Service Development

9/Pre-implant animation improves implantable loop recorder consent: a single center quality improvement project

European Journal of Arrhythmia & Electrophysiology. 2021;7(Suppl. 1):abstr9

C Monkhouse (Presenting Author) - Barts Heart Centre, London; H Harvie - Barts Heart Centre, London;R Mravljak - Barts Heart Centre, London; J Binoy - Barts Heart Centre, London; K Belleca - Barts Heart Centre, London; H Caldeira - Barts Heart Centre, London; R Ang - Barts Heart Centre, London; A Muthumala - Barts Heart Centre, London; P Moore - Barts Heart Centre, London; M Earley - Barts Heart Centre, London; DS Wald - Barts Heart Centre, London

Background: Implantable loop recorders (ILRs) are small cardiac rhythm monitoring devices that require a minor invasive procedure to implant. ILR implants are increasing following recommendations for their use in the NICE guidance for secondary stroke prevention. Implants are often performed by nurse and cardiac scientist specialists with variable levels of patient information provided before consent. A multi-language animation to support patient information before ILR implant was developed (www.explainmyprocedure.com) and we assessed patient understanding and engagement before and after introducing the animation into the consent pathway.

Methods: Patents having ILR implant in the out-patient clinic were prospectively surveyed on the day of their procedure, before (no animation group) and after (animation group) introducing the animation into the consent pathway. Standard care in the no animation group involved a consultant clinic consultation, a referral letter for procedure, phoned by admin to arrange appointment and sent a uni-lingual appointment letter via post or email (if email available). In the animation group, in addition to standard care, patients' emails were emailed a link to the multilingual animation, which they could view often as needed. In the survey, patients were asked to respond to 3 questions relating to (i) the quality of information provided, (ii) their understanding of the information, and (iii) their involvement in the decision to proceed, each using a 5-point Likert scale. Results were examined by visual inspection and analyzed using Wilcoxon Rank Sum test. An additional 4 questions were asked of the animation group to assess the extent to which the animation supported patient understanding of the procedure, its benefits, risks and alternatives. Patients were asked to choose from one of 3 responses (complete understanding, partial understanding, no understanding).

Results: Surveys were completed from February 2020- May 2021, with a break in activity due cessation of elective work during the pandemic. A total of 103 consecutive patients were surveyed, 72 in the no animation group and 31 in the animation group. *Table 1* shows the patient characteristics. *Figure 1* displays the results of the comparative analysis, which showed a highly statistically significant improvement in the quality of information and patient understanding (p<0.001 and p=0.004) in the animation group compared with the no animation group, but not for patient involvement in decision-making (p=0.324). Among the animation group, complete understanding of the procedure, its benefits, risks and alternatives was reported in 84%, 87%, 81% and 52%, respectively.

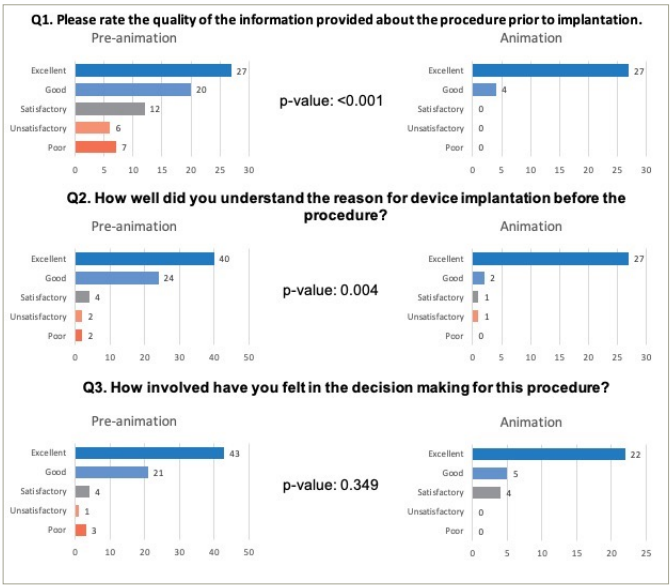
Conclusion: Introduction of a multi-language pre-implant animation into the consent pathway was feasible, supported out-patient implant by non-medical staff and substantially improved patient-reported quality of information and understanding. Patients who watched the animation reported high levels of understanding of the procedure, its benefits, risks and alternatives. Consideration should be given to routinely offering the animation along with all referrals for ILR implant. ❑

Table 1

	No animation group	Animation group
Total Number	72	31
Number of men	35 (49%)	16 (52%)
Age (years)	55 ± 19	59 ± 21
Implant indication:		
Syncope/Dizziness	42 (58%)	16 (51%)
Stroke- AF detection	16 (22%)	6 (19%)
Palpitations	10 (14%)	7 (23%)
Rhythm monitoring	4 (6%)	2 (6%)

p>0.05 for all comparisons

Figure 1: Graphs showing results from questionnaires



Oral Abstracts 1 – Allied & Service Development

10/Pharmacist-led approach to improve prescribing and monitoring of direct oral anticoagulants (DOACs) in a primary care network

European Journal of Arrhythmia & Electrophysiology. 2021;7(Suppl. 1):abstr10

NP Emumwen (Presenting Author) - Federated4Health, London; A Ahmed (Presenting Author) - Federated4Health, London; C Gaffar - Federated4Health, London

Introduction: Clinical pharmacists are a new workforce in Primary Care Networks (PCNs) who play a vital role in medication optimisation and high-risk drug monitoring. With the popularity of DOACs growing and increasing treatment options becoming available to patients and clinicians, there is also an increased risk of prescribing errors. Thus, it is important to ensure that oral anticoagulants are prescribed safely and optimised for individual patients, to reduce the risk of stroke and minimise risk of bleeding. The aim of this project was to implement the PERFECT pathway to ensure safe and effective prescribing of DOACs. In particular, the focus was to review if patients were prescribed the correct DOAC dose and were monitored appropriately in accordance with national and local guidelines.[1,2]

Method: A search was conducted on EMIS clinical system in all three practices in the Crouch End PCN, to identify all patients currently prescribed a DOAC. In-house training was provided to clinical pharmacists by the anticoagulation specialist to support upskilling. The pharmacists conducted clinical virtual reviews for patients prescribed DOACs and reviewed indication, dose, renal function, weight, blood monitoring (FBC, LFTs, U&Es) and potential drug interactions. For cases where a pharmacist intervention was required, this was discussed with the patient's named GP and/or their anticoagulation clinician. Respective changes were made to patient's treatment plans, following appropriate discussions with the patient.

Results: *Table 1*

Discussion: In total, 189 patients were reviewed across 3 practices. The creatinine clearance was calculated for all patients to review dose. Of these reviews, 2 patients required an increased dose, 11 required dose reductions (either due to age or impaired renal function), and 4 patients whose DOAC treatment duration had elapsed had their prescriptions stopped. Interacting anti-epileptics were co-prescribed for 4 patients requiring further specialist input and secondary care referral. The emergence of the COVID-19 pandemic may also have been a possible reason for outstanding blood tests due to restricted pathology services and patient's refusal to attend blood test appointments.

Table 1: Outcomes of virtual DOACs review

	Number	Percentage %
Virtual DOACs reviews	189	-
DOAC dose		
Appropriate dose prescribed	172	91.0 %
Monitoring		
FBC outstanding	44	23.3%
LFTs outstanding	24	12.6%
U&Es outstanding	22	11.6%
Pharmacist intervention		
Dose increased	2	1.1 %
Dose reduced	11	5.8%
DOACs stopped	4	2.1%
Blood tests requested	45	23.8%
Drug interactions identified and appropriately managed	5	2.6%
Creatinine clearance calculated	189	100%

Conclusion: The addition of clinical pharmacists in the PCN has led to an improvement in the quality and safety of anticoagulant prescribing and monitoring. Pharmacists can play a crucial role in reducing prescribing errors through routine high-risk drug monitoring, implementation of improvement strategies and share learning with the multidisciplinary team to ensure sustainability of outcomes. The pharmacy workforce will continue to support the delivery of the NHS Long-Term Plan ambition, principally through secondary prevention. ❑

References:

1. NCL JFC DOAC prescribing support for NCL AF and VTE, December 2018.
2. EHRA Practical Guide on the Use of Non-Vitamin K Antagonist Oral Anticoagulants in Patients with Atrial Fibrillation, April 2021.

Oral Abstracts 1 – Allied & Service Development

11/Quality assessment of ILR implanting service, procedural characteristics with different ILR devices

European Journal of Arrhythmia & Electrophysiology. 2021;7(Suppl. 1):abstr11

R Mravljak (Presenting Author) - Barts Heart Centre, London; H Page - Barts Heart Centre, London; S Martin - Barts Heart Centre, London H Harvie - Barts Heart Centre, London; H Caldeira - Barts Heart Centre, London; K Belleca - Barts Heart Centre, London; J Binoy - Barts Heart Centre, London; MJ Earley - Barts Heart Centre, London; Christopher Monkhouse- Barts Heart Centre, London

Introduction: Implantable cardiac monitor (ICM) is a small device implanted to detect and record arrhythmias and symptomatic events. The procedure has a low complication rate, with procedures being performed in an outpatient setting. Due to greater accessibility to ICMs there has been an increasing amount of ICM devices on the market with new innovations in hardware and software. We sought to conduct a quality assessment of each device to evaluate each ICM with regard to procedural complications and remote monitor (RM) connectivity to provide a guide for NHS services.

Methods: Patients referred for ICMs for any indication were prospectively enrolled in a tertiary, adult cardiac centre. We aimed to implant 30 of each ICM: Medtronic (Reveal Linq, L1 & Linq II, L2), Abbott (Confirm Rx, CRx) and Biotronik (Biomonitor III, BMIII). Implants for each device were performed in series; 1st BMIII, 2nd L1, 3rd CRx, 4th L2, in an outpatient clinic area by experienced (50-250 procedures each) Specialist Nurses or Cardiac Scientists. Closure technique using wound closure strips, which were removed 7–10 days post procedure. Outcomes were assessed using electronic records, remote monitoring data and patient wound images. Remote monitoring was assessed at the 1-month check with patients being seen face to face (pre COVID-19) and virtually (post March 2020). The study was registered with the hospital clinical effectiveness unit.

Results: 94 patients were enrolled between January 2020 and April 2021: 32 CRx, 25 L1, 25 L2 and 12 BMIII. Outcomes can be seen in *Table 1.* Biomonitors implants were reduced due to a high protrusion rate (33%), resulting in them being withdrawn from QA assessment. Procedural complications showed 0 infections, with the only complication being device protrusion.

Discussion: Our data shows that there is a disparity in the type of device with the model of care we provide. The BMII has significantly more wound complications that other devices when the wound is closed with wound closure strips (WCS) (e.g. steri-strips). This is likely to be because the incision blade is wider than that of its counterparts, relying more on the WCS to support the wound. Compounding this, the device antenna design acts as a spring if any counter pressure is applied to it, such as a female patient wearing a bra, effectively pushing the device back towards the scar. There was also 1 complication in the CRx arm due to protrusion, which could be attributed due to its wider blade compared to L1/L2. However, 1 complication does not prove any systemic issues and should be assessed in a comparison with larger implant numbers. Remote monitoring connectivity has shown to be excellent across all manufacturers. There are external factors at play to produce these high results. Specifically, the L1 patients were enrolled on FocusOn with troubleshooting for connectivity utilising the BeConnected (Medtronic telephone support) service. Therefore, this does not attribute just the technology but also the service. Unfortunately, the L1 device does not download full disclosure of recordings in contrast to the L2, CRx and BMIII, which send all recordings and were connected prior to departure. RM should be assessed on a wider cohort from multiple centres over longer periods.

Table 1

ICM	Crx (n=32)	L1 (n=25)	L2 (n=25)	BMIII (n=12)
Age (years, mean ± SD)	56 ± 22	54 ± 17	52 ± 17	58 ±1 6
Male (%)	13/19	14/11	15/10	4/8
RM connectivity @ 1 month (%)	100	100	100	100
Procedural complications (protrusion requiring device removal)	1 (3%)	0	0	4 (33%)

Conclusion: Our findings show there is a good compliance with RM connectivity at 1 month with all devices. The BMII having significant wound complications if used with WCS. We would recommend BMIII is utilised with stitches to secure the deep layers of the wound. ❑

Oral Abstracts 1 – AF Clinical

12/Assessment of outcomes of atrial fibrillation ablation using the Acutus mapping system

European Journal of Arrhythmia & Electrophysiology. 2021;7(Suppl. 1):abstr12

RT Rashid (Presenting Author) - Papworth Hospital, University of Cambridge, Cambridge; S Fynn - Papworth Hospital, Cambridge; A Grace - Papworth Hospital, Cambridge; P Heck - Papworth Hospital, Cambridge; G Mellor- Papworth Hospital, Cambridge; M Virdee - Papworth Hospital, Cambridge; J Mesquita- Papworth Hospital, Cambridge; S Agarwal - Papworth Hospital, Cambridge; D Begley - Papworth Hospital, Cambridge; C Martin - Papworth Hospital, Cambridge

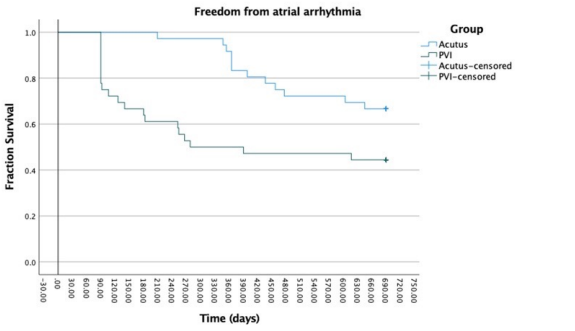
Introduction: Outcomes of ablation for atrial fibrillation (AF) remain suboptimal, and strategies outside pulmonary vein isolation (PVI) vary. The AcQMap 3D imaging and mapping system (Acutus Medical, CA, USA) uses ultrasound to reconstruct the atrial chamber anatomy, whilst an inverse solution uses the non-contact unipolar voltage electrodes to derive charge density propagation maps in order to visualize complex arrhythmias. This study aimed to assess outcomes of ablation procedures using this system.

Methods: Demographic, procedural and outcome data was prospectively collected from 42 patients with persistent AF who underwent an ablation procedure guided by the AcQMap system. PVI was first undertaken (or checked if previously undertaken), followed by an individualized approach targeting the conduction pattern core with an extension to the nearest non-conducting boundary. Endpoint was freedom from atrial arrhythmia recurrence, defined as at least 30 s of documented arrhythmia, with or without the use of antiarrhythmics, and evaluated at 3, 6 and 12 months, and if symptomatic, from ECGs and Holter monitoring. A blanking period of 3 months was employed. Outcomes were compared with a control group undergoing PVI only, matched for age and sex. Statistical analysis was performed using Cox proportional hazards models with covariates of age and gender using SPSS.

Results: 42 patients (61.0 ± 11.0 years old, 79% male) underwent index procedure (35%) or repeat procedure (65%). At the onset of the procedure, 33% of patients were in sinus rhythm, 60% were in AF and 7% were in atrial flutter. Mean BMI was 27.8 and risk factors included: 10% heart failure, 26% hypertension, 12% previous cerebrovascular accident, 2% diabetes. All procedures were undertaken under general anaesthesia. Mean procedure duration was 225 ± 51.3 minutes and mean fluoroscopy time was 34.4 ± 12.3 minutes. Adverse events included one pericardial effusion. In all index procedures, the PV were isolated. In redo procedures, re-isolation was required in 30.1%. Further AcQMap-guided lesion sets were as follows: adjacent to left PV (21%), adjacent to right PV (21%), LA anterior wall (62%), LA posterior wall (52%), base of LA appendage and/or ridge (31%), roof line (14%), mitral isthmus line (14%), right atrium (35%). A cavo-tricuspid isthmus line was also completed in 7%. At 12 months, freedom from AF was present in 64% of patients. In a matched control group (n=42, 62 ± 9.6 years old, 79% male) undergoing PVI alone by point-by-point radiofrequency ablation either using the Carto (61%) or Ensite (39%) mapping systems, freedom from atrial arrhythmia at 12 months was present in 48% of patients.

Conclusion: The AcQMap system is a safe method in guiding ablation of conduction pattern cores in AF patients. In a small single-centre cohort, 64% freedom from AF at 12 months was found. The most common location for conduction pattern cores was the LA anterior wall. Larger randomised control studies are required to investigate whether the AcQMap system can demonstrate improvements in long-term outcomes over conventional strategies. ❑

Figure 1



Number at risk

Time(days)	0	180	360	540	720
Acutus	36	36	33	26	24
PVI	36	23	18	17	16

Fig 1 – Kaplan Meier survival curve of freedom from atrial arrhythmia recurrence after ablation in AcQMap vs PVI control groups.

Oral Abstracts 1 – AF Clinical

13/Rate or rhythm control for atrial fibrillation? The evolving approach in England 1998–2019

European Journal of Arrhythmia & Electrophysiology. 2021;7(Suppl. 1):abstr13

KA Mbonye (Presenting Author) - Barts Health NHS Trust, London; A Yazdi - Barts Health NHS Trust, London; S Naulls - Barts Health NHS Trust, London; R Brignall - Barts Health NHS Trust, London; F Al-Amodi - Barts Health NHS Trust, London; K Patel - Barts Health NHS Trust, London; C Hayward - Barts Health NHS Trust, London.

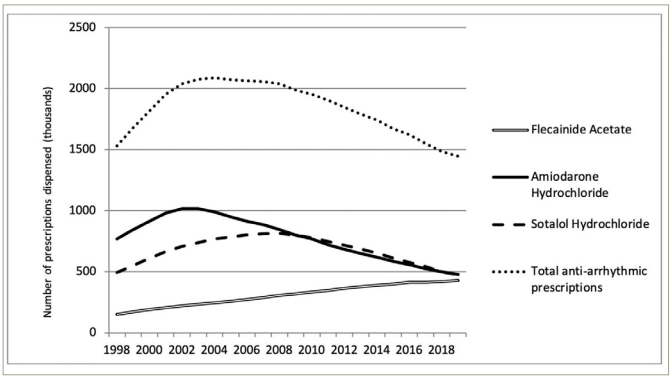
Introduction: A fundamental treatment decision in the management of patients with atrial fibrillation (AF) is whether to adopt a rate or rhythm control strategy. Randomised, controlled trials broadly suggest that mortality is unaffected by this decision. However, there are groups of patients who may benefit from rhythm control for symptom relief, heart failure management or to reduce hospitalisations. We sought to describe the use of anti-arrhythmic drugs (AADs) and atrial ablation over the past 20 years in England as a surrogate for the rhythm control approach.

Methods: We conducted a retrospective study using data from the Prescription Cost Analysis system, which holds information on every prescription dispensed in the community in England. We obtained data from 1998 to 2019 for all Class Ia, Ic and III AADs. In addition, we used data from the Quality and Outcomes Framework and The National Institute for Cardiovascular Outcomes Research to describe annually the number of patients with AF and total number of ablations, respectively.

Results: The number of prescriptions for AADs is displayed in *Figure 1* and demonstrates an initial increase in prescriptions for all AADs from 1998 to 2002 but an overall decline from 2002 to 2019. The exception to this is that flecainide prescriptions increased linearly throughout this period. There has been a linear increase in the number of patients with atrial fibrillation from 692,054 in 2007 to 1,174,959 in 2019. The total number of atrial ablations has increased from 2,726 in 2008, to 9,450 in 2019.

Conclusions: There has been an overall reduction in AAD prescriptions since 2002 despite an increase in the number of patients with AF. This suggests a shift in practice from rhythm to rate control. The increased use of flecainde and atrial ablation suggests that these are the strategies employed for those patients selected for rhythm control. The total number of ablations is still very low and around half that performed in other European countries. ❑

Figure 1: The number of annual prescriptions in the community in England, in thousands, for different AADs from 1998 to 2019 (data is only presented for the three most common AADs because the numbers for the other AADs were extremely small).



Oral Abstracts 1 – AF Clinical

14/Population-based screening for atrial fibrillation in subjects with sleep apnea

European Journal of Arrhythmia & Electrophysiology. 2021;7(Suppl. 1):abstr14

Y Guo (Presenting Author) - Chinese PLA General Hospital, Beijing

Background: Sleep apnea is highly associated with atrial fibrillation (AF), resulting in increased risk of mortality. However, early identification and intervention of AF is limit among subjects with sleep apnea asoften asymptomatic.

Objective: The present study aimed to investigate the occurrence of AF in subjects at high risk for sleep apnea with smart technology.

Methods: The photoplethysmographic (PPG)-based smart devices (wristband: Huawei Band B6, Honor Band 6); wristwatch: Huawei Watch GT2, Huawei Watch FIT, Honor Watch GS Pro, Honor Watch ES, Honor MagicWatch2, Huawei Technologies Co., Ltd., Shenzhen, China) were used for screening AF across China, which has been validated in Pre-mAFA (Huawei Heart Study). The PPG-based detecting sleep apnea has been developed. High-risk sleep apnoea was defined as more than 80% monitoring measures with Apnoea–Hypopnoea Index (AHI) ≥30 during the sleep, monitored by PPG-based smart devices. The identified AF and high-risk sleep apnea were further confirmed by health providers with clinical evaluation, electrocardiogram, 24-hour Holter, or polysomnograph, respectively.

Results: There were 187,933 subjects (38.18 ± 10.77 years, 90.88% male) who recruited for screening sleep apnea between December 2019 and December 2020. Among these, 9,088 (4.84%,42.62 ± 9.27 years, 98.13% male) were identified as high-risk sleep apnea, with average AHI of 27.99 (interquartile range [IQR]: 19.27–36.40). Among those, 184,970 (of 187,933, 98.42%) subjects monitored sleep apnea and pulse rhythm with PPG-smart devices, with 8,837 subjects of high-risk sleep apnea. Ninety-three (93/8837; 1.05%) AF were identified among those at high-risk sleep apnea, which was higher compared to those without sleep apnea (203/54,916; 0.37%; p<0.001). With the increased risk for sleep apnea, identified AF raised (normal-, low-, moderate-, high-risk: 0.37%, 0.72%, 0.95% and 1.05%, p<0.001, *Figure 1*). Compared with non-AF subjects, subjects with identified AF were at much high - risk of sleep apnea (8,744/183,736; 4.76% 93/1234; 7.54%; p<0.001). In multivariate analysis, high-risk sleep apnoea increased 5.36 (95% CI: 3.43-8.37) fold risk of AF, after adjustment of age, sex, body mass index, hypertension, diabetes mellitus, coronary artery disease, heart failure and hyperthyroidism. The sensitivity analysis of the high-risk sleep apnea subjects (n=460; 42.41 ± 8.04 years; 98.70% male), which further confirmed with the diagnosis of sleep apnea by doctors and polysomnography, demonstrated the similar proportion identified AF (5/460; 1.09%).

Conclusions: In this population-based screening study, high-risk sleep apnea increased more than fivefold risk for AF, highlighting the compelling need for effective intervention of AF. ❑

Oral Abstracts 1 – AF Clinical

15/Should we be screening people with diabetes for AF? A cross sectional screening study

European Journal of Arrhythmia & Electrophysiology. 2021;7(Suppl. 1):abstr15

A Hall (Presenting Author) - Jersey General Hospital, St Helier; A Mitchell - Jersey General Hospital, St Helier; Carol Holland - Lancaster University, Lancaster; L Ashmore - Jersey General Hospital, St Helier

Introduction: There is an increasing prevalence of atrial fibrillation (AF) and diabetes worldwide, and diabetes is recognised as a risk factor for developing AF. Both diabetes and AF increase stroke risk. Previous AF screening studies have recruited high-risk patient groups but not with diabetes as the lone target group. The aim of this study is to determine whether people with diabetes have a higher prevalence of AF than the general population and investigate whether further determinants, such as duration of diabetes or level of diabetes control, add to the risk of AF. This study screens people with diabetes for AF using a single-lead ECG device (Kardia®, Mountainview, California, USA) and then examines the role of age, gender and other risk factor variables in relation to the likelihood of AF diagnosis.

Methods: This cross-sectional screening study was conducted in two community settings in Jersey – the diabetes centre (an out-patient hospital setting) and a central clinical locality – where patients recruited from participating GP surgeries attended. Patients were invited to participate on arrival to the diabetes centre or via letter sent out from participating GP surgeries. A 30-second ECG was recorded using the Kardia® device along with physiological measurements and details relating to risk-factor variables.

Results: A total of 300 participants with a diagnosis of diabetes were recruited (156 from the diabetes centre and 144 from GP surgeries). Single-lead ECG screenings were recorded on all participants and 16 patients were identified with AF, providing a 5.3% prevalence in this sample. The population in this study do not show a significantly greater likelihood of AF than the background population, although there is a non-significant trend in this direction t(298)=1.803; p=0.072. One-way ANOVA determined a statistically significant difference in age between groups (p=0.003). The Chi-square test of independence identified a statistically significant difference in diabetes type (p=0.030). Logistic regression was used to examine prediction of AF diagnosis with age, sex, diabetes type, diabetes duration and level of control as predictors. The only significant predictor was age (X2=4.696; p=0.030).

Conclusion: The diabetes population in this study does not show a significantly greater likelihood of AF than the background population. Age was identified as the only significant predictor of AF. These findings can add to existing data around the association of the two chronic conditions and assist in guiding further the importance of screening for AF in this high-risk group, but particularly in those of older age. This can then inform and contribute to appropriate management of both conditions when in combination, not least with regards to stroke prevention. ❑

Oral Abstracts 1 – AF Clinical

16/Success and outcomes of the convergent procedure for treating persistent atrial fibrillation: a real-world experience

European Journal of Arrhythmia & Electrophysiology. 2021;7(Suppl. 1):abstr16

NN Mannakkara (Presenting Author) - King's College London, London; B Porter - King's College London, London; N Child - King's College London, London; S Ahmed - Guy's and St. Thomas' Hospital, London; CA Rinaldi - King's College London, London; C Blauth - Guy's and St. Thomas' Hospital, London; JS Gill - Guy's and St. Thomas' Hospital, London

Background: Atrial fibrillation (AF) is common and its prevalence continues to increase. It can cause significant morbidity, healthcare economic burden and detriment to quality of life for its sufferers. Success rates for conventional catheter ablation are suboptimal in persistent AF, especially when longstanding. Long-term anti-arrhythmic use is undesirable and often ineffective. Patients with persistent AF therefore have few genuine options for rhythm control and may be left with debilitating symptoms. Convergent hybrid ablation combines endoscopic surgical epicardial and endocardial catheter ablation to improve the success and durability of ablation. It offers promise in treating persistent AF.

Objective: To evaluate the efficacy and safety outcomes of the Convergent procedure for the treatment of Persistent AF.

Methods: We performed a retrospective, observational study of patients undergoing ablation from 2012 to 2019 at a single London cardiac centre. Epicardial ablation was performed via mostly subxiphoid access to create posterior wall lesions and partial pulmonary vein isolation (PVI), followed by endocardial ablation to complete PVI and perform additional ablation lesions at the operator's discretion. Baseline and follow-up data were obtained from procedure reports and clinical notes.

Results: 67 patients underwent Convergent ablation. (See *Table 1* for baseline and outcome data). A majority had AF longer than 1 year (80.6%) and 49.3% were obese. 19.4% had an ejection fraction of 40% or less. Mean follow up was 2.8 (± 2.0) years. Freedom from AF recurrence was 81.5% at 1 year and 61.5% longer-term. 75.0% of patients had mEHRA symptom class 1 (asymptomatic) at 1 year. On multivariate analysis, only increased LA diameter was mildly predictive of longer-term recurrence (p=0.04; OR 1.086; 95% CI, 1.003–1.177). On Kaplain–Meier analysis, patients with AF duration greater than 5 years had a shorter time to AF recurrence (p=0.01) than those with duration under 5 years. 11 patients (16.4%) required redo AF ablation. Complications were: stroke/TIA (n=2) and pseudoaneurysm (n=1).

Conclusion: Convergent ablation had good 1-year and longer-term success rates for treating persistent AF. These encouraging results were seen in a challenging cohort with adverse features, who would not traditionally be considered ideal candidates for successful conventional catheter ablation. Our results in a real-world population are in keeping with recent positive results from the CONVERGE study. ❑

Table 1: Baseline demographics and outcomes

Baseline demographics		Outcomes	
Age (mean)	61.7 years (± 11.3)	1-year freedom from AF recurrence	81.5%
Male (n)	59 (88.1%)	1-year freedom from AF off AADs	69.2%
Previous failed AF ablation (n)	26 (38.8%)	Long-term freedom from AF recurrence	61.5%
AF duration (mean)	3.2 years (± 2.7)	1-year mEHRA symptom class 1 (asymptomatic)	75.0%
AF duration >1 year (n)	54 (80.6%)	1-year freedom from AF/AT/AFL	69.2%
LA diameter (mean)	45.6 mm (± 8.0)	DCCV in blanking period (n)	15 (22.4%)
LA diameter >50 mm (n)	20 (29.9%)	Repeat ablation for AF (n)	11 (16.4%)
Body mass index (mean)	32.1 kg/m2 (± 5.8)	Repeat ablation for AT/AFL only (n)	8 (11.9%)
Hypertension (n)	26 (38.8%)	DCCV post-blanking period (n)	20 (29.9%)

Oral Abstracts 1 – AF Clinical

17/The ProGlide venous closure device leads to early mobilisation after cryoablation for atrial fibrillation

European Journal of Arrhythmia & Electrophysiology. 2021;7(Suppl. 1):abstr17

D Ahmed (Presenting Author) - St Bartholomew's Hospital, London; RJ Schilling - St Bartholomew's Hospital, London; S Honarbaksh - St Bartholomew's Hospital, London; V Kanthasamy - St Bartholomew's Hospital, London; MJ Earley - St Bartholomew's Hospital, London; R Hunter - St Bartholomew's Hospital, London; M Finlay - St Bartholomew's Hospital, London; G Wong - St Bartholomew's Hospital, London; E Maclean - St Bartholomew's Hospital, London; A Creta - St Bartholomew's Hospital, London; M Finlay - St Bartholomew's Hospital, London

Introduction: It is now quite common for patients to be able go home on the same day after their AF ablation. A contributing factor of this is the Proglide Suture-Mediated Closure System which allows quick recovery after large bore venous access (>12F). This study is one of the first to see whether the Proglide device enables early mobilisation after AF ablation.
Objective: We compared outcomes in patients whose vascular access site was closed with the Proglide device with those whose site was closed with the standard Z suture. We looked for any significant differences in ambulation time as well as bleeding outcomes.
Methods: Patients undergoing cryoablation at a tertiary centre for paroxysmal or persistent AF were included in this study. There were 104 participants in total. Pulmonary vein isolation (PVI) was performed using US guidance for access with 14F cryosheath and second 7F sheath. 5 minutes pressure was used at the 7F site. Transeptal puncture was performed and a 28 mm cryoballoon was used. Patients were subsequently transferred to the ward for recovery post sedation and nurse led discharge. Operator preference determined whether a Proglide Closure device was used (PD; Abbott Ltd) or a Z suture (ZS). All patients received protamine for heparin reversal and their usual anticoagulant agent remained uninterrupted. Time to ambulation (TTA) and time to discharge (TTD) was measured. Complications such as bleeding, haematoma and minor ooze were recorded.
Results: The group demographics were largely similar and the mean age was 64 ± 11. 52 (50%) patients had paroxysmal AF. 65 patients were male (64%). 73 (70%) patients received the Z suture whilst 31 (30%) patients were in the PD group. There were 2 haematomas (2.8%) in the ZS group compared with none in the PD group. There was no significant difference between the incidence of minor bleeding between the two groups (PD 3 [9.7%]; ZS 2 [2.7 %]; p=0.155). No major bleeding occurred in either group. The PD group had a significantly shorter mean TTA (3.3 ± 1.1 vs 4.1 ± 1.7 hrs; p=0.025). But there was no significant difference in same-day discharge (PD: 25 [81%] vs ZS: 53 [73%]; p=0.386) and TTD (5.0 ± 3.6 vs 6.1 ± 4.2 hrs; p=0.275) between the two groups. There was 1 patient in the ZS group which complained of groin pain that delayed discharge. This did not occur in the PD group. There were no differences in any incidence of complications after a mean follow up of 2.2 ± 1.4 months.
Conclusion: Relative to the conventional Z suture technique for haemostasis, this study has shown an association between the use of the Proglide closure device and quicker mobilisation times after cryoablation for AF. Groin access complications were infrequent in both groups. This study shows that the Proglide device may contribute to improving patient flow in AF cryoablation. ❑

Oral Abstracts 2 – Highest Scoring Abstracts

18/Potential proarrhythmic effect of automatic threshold testing in pacemakers

European Journal of Arrhythmia & Electrophysiology. 2021;7(Suppl. 1):abstr18

KA Mather (Presenting Author) - Northumbria Healthcare, North Tyneside; IG Matthews - Northumbria Healthcare, North Tyneside; C Runnett - Northumbria Healthcare, North Tyneside; HE Thomas - Northumbria Healthcare, North Tyneside

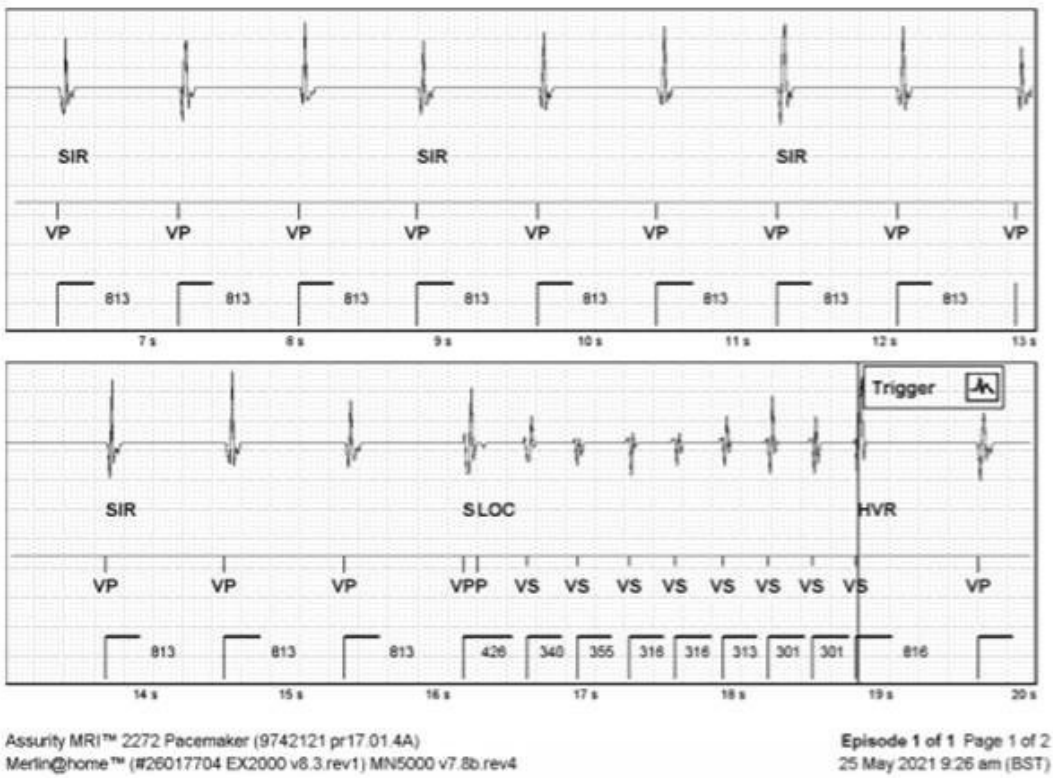
Background: Manufacturers of cardiac implantable electronic devices have incorporated automatic features to improve safety, allow remote monitoring and improve longevity. The Abbott Autocapture algorithm measures capture threshold by verifying impulse capture using an evoked response and adjusts the output. If the device identifies loss of capture (LOC), it delivers a back-up pulse (VPP). However, an intrinsic QRS complex may coincide with the initial impulse, and the device may interpret this as LOC and deliver a VPP. A small number of case reports describe ventricular tachyarrhythmia potentially associated with the delivery of a VPP in Abbott/SJM devices. We recognised this phenomenon in several of our patients prompting a systematic local case review.

Methods: We reviewed the local follow-up data for all Abbott pacemakers. We reviewed all ventricular high-rate episodes which had accompanying EGMs. If confirming a ventricular tachyarrhythmia (VT), we recorded any evidence of a LOC-VPP response on the EGM and classified if this immediately preceded the event or was present elsewhere on the EGM.

Results: 282 patients with Abbott pacemakers were identified. 147 patients (52%) had Autocapture actively programmed with 135 inactive. 53/147 patients with Autocapture active had episodes of VT during device follow up with only 15/135 VT episodes in those with Autocapture inactive. In the Autocapture active group, 13/53 patients were found to have LOC-VPP directly preceding a period of VT (VPP-VT group). See *Figure 1* for an example EGM. An additional 12 had a VPP-LOC within the recorded EGM but not immediately preceding the VT. Of the 13 patients with VPP-VT, left ventricular function was reduced in 5 (1 mild, 4 moderate), normal in 5 and unknown in 1. 4/13 of the VPP-VT group had episodes of VT prior to the index VPP-VT event; one died (during the VPP-VT event), 1 had no further episodes following Autocapture deactivation, 1 had further VT following Autocapture deactivation and 1 awaits Autocapture deactivation. In patients with no prior VT and a single episode of VPP-VT, there has been no further VT since Autocapture deactivation.

Discussion: The use of the Ventricular Autocapture algorithm in Abbott pacemakers could be associated with the apparent initiation of VT in over 8.8% of patients. We have yet to carry out systematic review of patients with other manufacturers' devices, but anecdotally we have not identified this in these groups. The Abbott algorithm differs from other manufacturers in that the backup pulse is at 80 ms – the shortest interval of the large device manufacturers. The vast majority of our pacemakers are now remote monitored and it may be that this better allowed us to identify and investigate this issue. It may also be that our strategy of remote follow up increases Autocapture activation subsequently revealing the scale of this potential problem. We are in the process of deactivating the Autocapture in any patient with evidence of VHR in association with a LOC-VPP event and will gather data prospectively to assess the impact of this. During this investigation process, our findings have been shared with our regional cardiac network, Abbott and the MHRA. ❑

Figure 1: This figure illustrates a typical EGM of a VPP-VT episode in an Abbott pacemaker



LOC, loss of capture, VPP, back-up ventricular pulse. HVR, High Ventricular rate.

Oral Abstracts 2 – Highest Scoring Abstracts

19/The impact of generic ICD programming on clinical outcomes

European Journal of Arrhythmia & Electrophysiology. 2021;7(Suppl. 1):abstr19

P Khan (Presenting Author) - King's College Hospital NHS Trust, London; N Jahagirdar - King's College Hospital NHS Trust, London; M Laybourn - King's College Hospital NHS Trust, London; I Harding - King's College Hospital, London; A Cannata - King's College Hospital NHS Trust, London; D Bromage - King's College Hospital, London; F Murgatroyd - King's College Hospital, London; PA Scott - King's College Hospital, London

Background: Inappropriate implantable cardioverter defibrillator (ICD) therapy can significantly reduce quality of life and is associated with adverse outcomes. Introduction of generic programming strategies, combing high detection rates and long detection times have shown to significantly reduce inappropriate therapy. Each of the 3 large randomised controlled trials that have informed programming strategies included only a single device manufacturer, with tightly controlled programming parameters in both the active and control groups. Both detection time and lower treatment zone rate varied and no study evaluated combining the most aggressive programming of each parameter. A standardised programming protocol was introduced at our centre in October 2013 with shock reduction programming extrapolated from trials of one manufacturer and applied to across manufacturers.

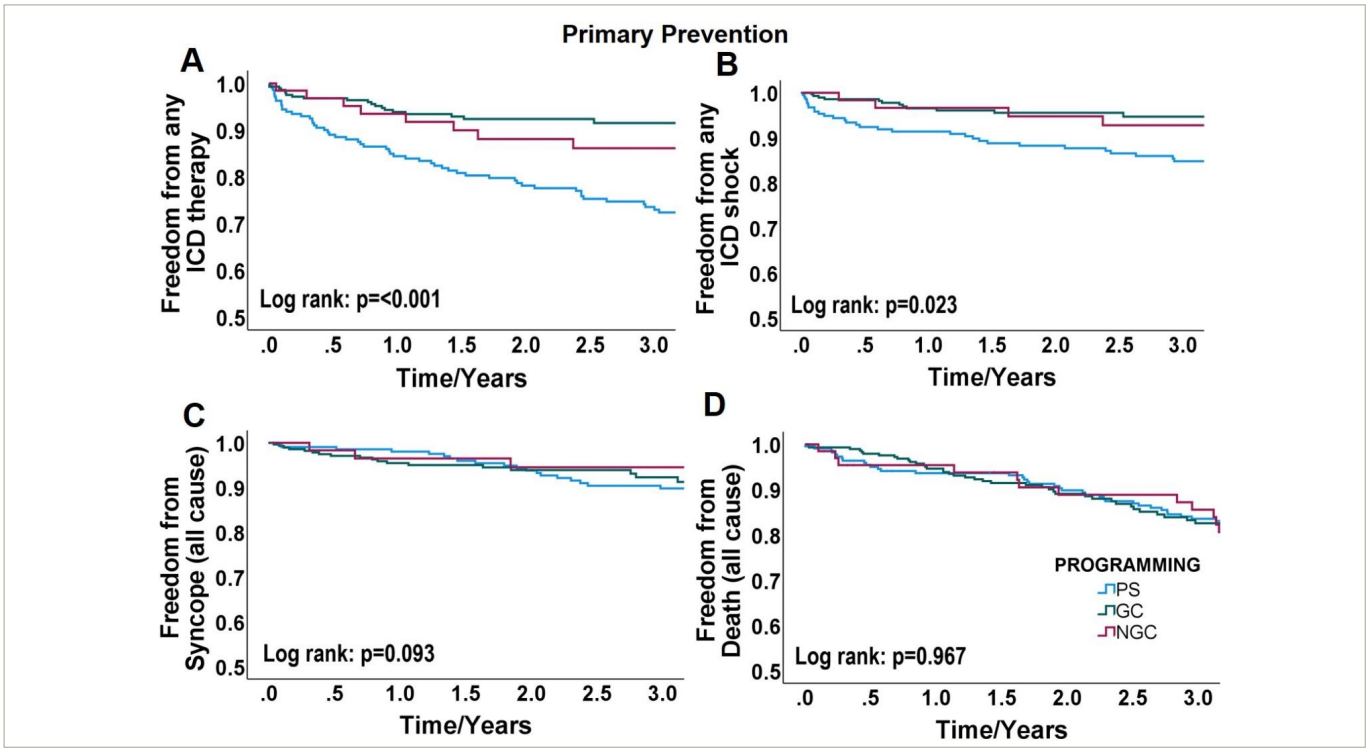
Objective: In 2017 a series from 4 institutions reported 10 cases where normally functioning ICDs failed to deliver timely therapy for ventricular fibrillation (VF). The authors suggested that complex and unanticipated interactions between manufacturer-specific features and generic programming prevented therapy for VF. The purpose of this retrospective cohort study was to evaluate the evaluate the benefits and safety of generic programming and explore the effect of different detection programming combinations on outcomes.

Methods: We included all new ICDs in a single centre (2009–2019). In 2013 a standardised programming protocol based on generic programming was introduced, incorporating high detection rates (200 bpm for primary prevention) and long detection (30/40 or equivalent in VF zone) for all patients. Patients were classified into three groups based on implant programming: pre-guideline (PS), post-guideline and guideline complaint (GC), and post-guideline but not guideline complaint (NGC). The endpoints were the first occurrence of any device therapy (ATP or shocks) or shock alone, syncope and all-cause mortality. Survival analysis was used to evaluate outcomes. To evaluate the potential impact of combining long detection time and a high lower rate detection zone, we constructed a composite 'programming' score, which combined measures of both parameters. The relationship between this composite programming score and study endpoints were evaluated in separate multivariable Cox proportional hazards models, with separate analyses for primary and secondary prevention patients.

Results: 1,003 patients were included (mean follow-up 1,519 ± 1,005 days). In primary prevention patients (n=583) freedom from ICD therapy (91.5% vs. 73.6%; p<0.001) or shock (94.7% vs 84.8%; p=0.004) were significantly higher in GC compared to PS patients, without significant increase in syncope or mortality. In secondary prevention patients (n=420) freedom from any ICD therapy or any shock were non-significantly higher in GC compared to PS patients, without an increase in syncope or mortality. Multivariant analysis of composiste programming scores found a lower rate of 200 bpm with long detection provided the greatest reduction in risk of ICD therapy without any demonstrable increase in syncope or mortality.

Conclusion: In a real-world population, introduction of a standardised programming protocol significantly reduced the burden of ICD therapy without an increase in adverse outcomes. Furthermore, the use of generic programming appeared effective across manufacturers. ❑

Figure 1: Primary prevention



Oral Abstracts 2 – Highest Scoring Abstracts

20/Role of artificial intelligence and utilisation of deep learning methods in screening for S-ICD eligibility

European Journal of Arrhythmia & Electrophysiology. 2021;7(Suppl. 1):abstr20

M El Refai (Presenting Author) - University Hospital of Southampton NHS Foundation, Southampton; M Abouel Asaad- University Hospital of Southampton NHS Foundation, Southampton; PR Roberts - University Hospital of Southampton NHS Foundation, Southampton

Introduction: The subcutaneous implantable cardioverter-defibrillator (S-ICD) has comparable efficacy and avoids many of the complications associated with transvenous ICDs. There is a Class I recommendation for S-ICD implantation in patients at a high risk for infection or are without appropriate venous access and no indication for pacing. Many heart failure (HF) patients fall into these categories. The eligibility for S-ICD is identified during a mandatory pre-implant screening. Surface ECG recordings of 10 seconds duration taken in multiple body postures are used as a surrogate marker of future S-ICD vectors to be able to assess vector morphology and determine S-ICD eligibility. Temporal variations in R and T waves amplitudes are frequently observed on ECG recordings, particularly in HF patients undergoing diuresis where changes in electrolytes, body weight and fluid shifts can cause detectable dynamic changes on the ECG. Subsequently, the T:R ratio – a major predictor of S-ICD eligibility – is dynamic.

Hypothesis: We hypothesize that prolonged screening for S-ICD eligibility particularly in HF patients helps identify patients with high probability of T wave oversensing (TWO) and inappropriate shocks that otherwise can be missed using the current screening methodology.

Methods: We ran a prospective study on a total of 21 participants at our centre. 7 volunteers with structurally normal hearts and 14 patients with a known history of HF admitted for diuresis on clinical grounds. Participants were asked to wear Holter® monitors for 24 hours. The leads for the Holters® were positioned to mimic and correspond to the three vectors (primary, alternate and secondary) of an S-ICD. We monitored the T:R ratio throughout being the main determinant of S-ICD eligibility. We chose a T:R ratio eligibility cut-off of 1:3 based on the manual S-ICD screening tool following the manufacturer guidelines. We used a convolutional neural network-based model utilising phase space reconstruction matrix as a state-of-the-art tool to efficiently and accurately determine and record the T:R ratio for the leads over the 24-hour period.

Results: The mean age was 58.43 ± 18.92 with 8 female and 13 male participants. We found a statistically significant difference in the mean and the SD of the T/R ratios between both groups. In HF patients and volunteers with normal hearts, the mean T/R ratio averaged at 0.1808 ± 0.0841 and 0.1037 ± 0.0538, and the SD of the T/R ratio averaged at 0.0929 ± 0.0478 and 0.067 ± 0.0362, respectively. We found no significant difference in the mean or SD of the T/R ratio between different leads within the same group. T/R ratio was found to be above the eligibility screening threshold (0.33) with a median of 4.68% (0% - 64.599%) in the HF group compared to a median of 0.03% (0% - 30.348%; p=00413) in the healthy volunteers. There was no difference in the median between different leads within the same group.

Figure 1

			Subgroup HF	Subgroup Normal	P value	
Mean T/R ratio	Mean		0.1808	0.1037	< 0.001	
	95% Confidence Interval for Mean	Lower Bound	0.1523	0.0792		
		Upper Bound	0.2093	0.1282		(Welch Two Sample t-test)
	Median		0.1834	0.0919		
	Std. Deviation		0.0841	0.0538		
	Minimum		0.0353	0.0298		
	Maximum		0.3551	0.2742		
SD T/R ratio	Mean		0.0929	0.0670	= 0.024	
	95% Confidence Interval for Mean	Lower Bound	0.0767	0.0505		
		Upper Bound	0.1091	0.0835		(Welch Two Sample t-test)
	Median		0.0987	0.0519		
	Std. Deviation		0.0478	0.0362		
	Minimum		0.0187	0.0267		
	Maximum		0.2058	0.1700		
Percentage of T/R ratio above 0.3	Mean		13.2126	2.5270	= 0.004	
	95% Confidence Interval for Mean	Lower Bound	6.8309	0.6612		
		Upper Bound	19.5944	5.7152		(Wilcox test)
	Median		4.6806	0.0352		
	Std. Deviation		18.8614	7.0041		
	Minimum		0	0		
	Maximum		64.5993	30.3484		

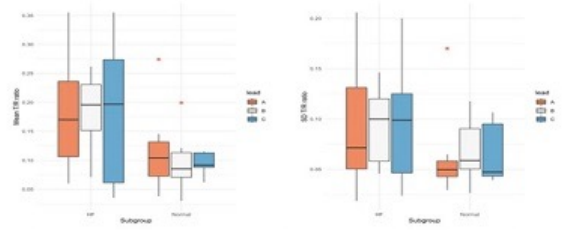


Figure: Mean, standard deviation and percentage of T:R ratio above pre-determined eligibility threshold (0.33) over 24 hours screening period in the studied subgroups (Heart failure patients undergoing diuresis vs healthy volunteers with structurally normal hearts). Leads A, B and C correspond to primary, alternate, and secondary vectors of an S-ICD respectively.

Conclusions: T:R ratio, one of the main determinants for S-ICD eligibility is significantly higher, and with more tendency to fluctuate overtime in patients with HF. We report an accurate, and reproducible method that utilises prolonged screening to find the cohort of HF patients deemed eligible for S-ICD with low probability of T Wave oversensing (TWOs) and inappropriate shocks. ❑

Oral Abstracts 2 – Highest Scoring Abstracts

21/Epicardial adipose tissue causes greater conduction slowing than subcutaneous adipose tissue in neonatal rat ventricular myocytes

European Journal of Arrhythmia & Electrophysiology. 2021;7(Suppl. 1):abstr21

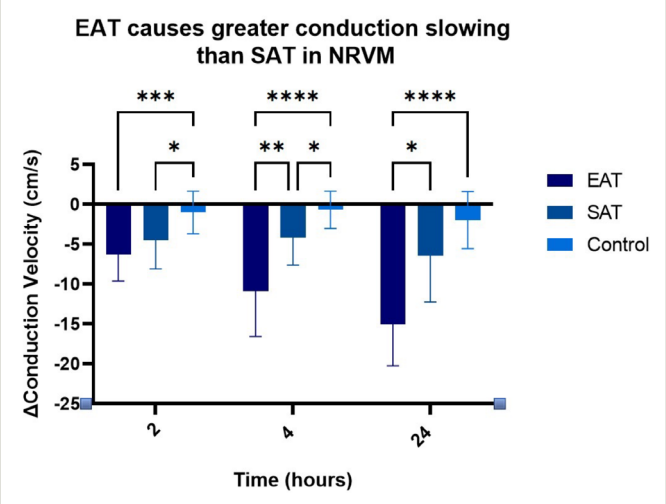
T Hwang (Presenting Author) - Imperial College London, London; KHK Patel - Imperial College London, London; CS Liebers - Imperial College London, London; I Diakonov - Imperial College London, London; P Punjabi - Imperial College London, London; D Agha-Jaffar - Imperial College London, London; R Chowdhury - Imperial College London, London; NS Peters - Imperial College London, London; J Gorelik - Imperial College London, London; FS Ng - Imperial College London, London

Background: Obesity has been strongly associated with atrial and ventricular arrhythmias. This effect is, in part, mediated by epicardial adipose tissue (EAT), which has previously shown to have a pro-arrhythmic secretome. Therefore, we sought to confirm any paracrine effects of adipose tissue on myocardial conduction and tested the differential effects of human EAT and subcutaneous adipose tissue (SAT) on ventricular myocyte electrophysiology.

Methods: EAT and SAT harvested from 11 patients during cardiothoracic surgery were cultured to generate adipose tissue-conditioned media (Cme), and their secretomes characterised using adipokine arrays and ELISA. Conduction velocities in monolayers of neonatal rat ventricular myocytes (NRVM) were measured at baseline and at 2, 4 and 24 hours post-incubation with EAT-, SAT- and control-CMe.

Results: Referenced to baseline at 2 hours, NRVM exposed to EAT- and SAT-Cme recorded slower conduction velocities than control, though they were comparable decrements (-6.3 ± 3.4 cm/s and -4.5 ± 3.6 cm/s vs -1.0 ± 2.7 cm/s; p=0.0001 and p=0.014, respectively). At 4 hours, NRVM incubated with EAT-Cme demonstrated greater conduction slowing than with SAT-Cme (-10.9 ± 5.7 cm/s vs -4.2 ± 3.4 cm/s; p=0.0024). At 24 hours, further reduction in conduction velocity was observed, with EAT again inducing a greater effect than SAT (-15.1 ± 5.2 cm/s vs -6.4 ± 5.8 cm/s; p=0.011). Electrogram amplitude, duration and fractionation exhibited no significant difference between all groups. There were no significant differences in the adipokine secretomes of EAT and SAT. Moreover, stratification of the study cohort by mean age and BMI, and the presence of cardiometabolic disease, demonstrated comparable adipokine profiles of EAT and SAT, respectively.

Figure 1:



Conclusion: Acute exposure to adipose-Cme causes conduction slowing *in vitro*, which is more marked with EAT- vs SAT-Cme. These results confirm the arrhythmogenic effect of EAT, which is mediated, in part, by a paracrine mechanism. Future studies are required to determine the mediators of the paracrine effect and investigate potential therapeutic targets. ❑

Oral Abstracts 2 – Highest Scoring Abstracts

22/In silico electrogram-based estimation of myocardial conduction using deep neural networks

European Journal of Arrhythmia & Electrophysiology. 2021;7(Suppl. 1):abstr22

K Ntagiantas (Presenting Author) - Imperial College London, London; CD Cantwell - Imperial College London, London; RA Chowdhury - Imperial College London, London; AA Bharath - Imperial College London, London

Introduction: Current methods of identifying scar from the contact electrogram (EGM) are limited. Scar leads to a reduction in myocardial conductivity, which can be represented computationally by the conductivity diffusion tensor. We present a novel deep learning-based method of using EGMs to estimate the conductivity diffusion tensor in simulated myocardial substrate.

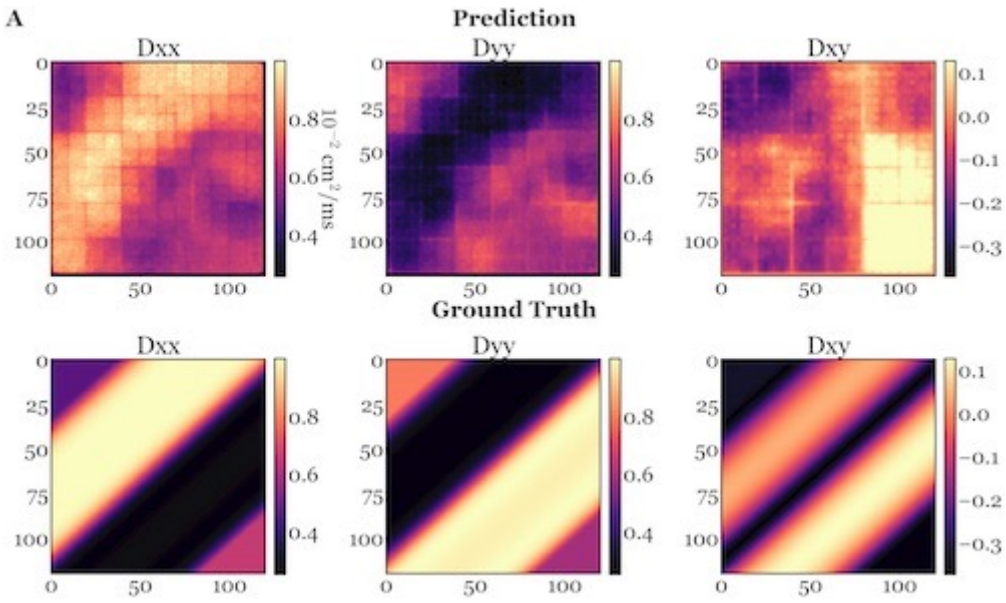
Methods: We use the simplified Fenton-Karma in silico cardiac cell model with a variety of different stimuli, model parameters and conductivity diffusion tensor maps to produce simulations in a two-dimensional field. Both isotropic and anisotropic cases are considered for the diffusion tensor fields. Unipolar EGM signals are generated, with a sampling rate of 1 ms, and the same spatial density that can be achieved with a high-density mapping catheter (HD grid). The signals are used as the input to a Fully Convolutional Encoder-Decoder network, which is trained to output the three values *Dxx*, *Dyy*, *Dxy* of the diffusion tensor at each point on the field. The statistical significance of the predicted fields is quantified using wavelet-based surrogate data testing.

Results: Our deep neural network achieves a small generalisation error, with a Root Mean Square Error of 1.18 and 1.38 in the training and testing set, respectively, both containing isotropic heterogeneous, as well as isotropic diffusion, tensor fields. When low conductivity regions (areas of fibrosis) are present, the network is able to successfully identify their position, and surrogate data testing shows that the true and predicted diffusion tensor fields are positively correlated as expected, while the predictions on the testing set are statistically significant from the average generated scar distribution (p-value = $6\acute{}10^{-8}$). Regarding pixelwise scar prediction, a Jaccard similarity coefficient of 0.91 is achieved, showing a high accuracy in the detection of the scar position.

Conclusions: This work is a proof of concept that deep neural networks can be used to solve the inverse problem of estimating substrate properties of myocardial tissue from unipolar electrogram data, specifically the heterogeneous isotropic, and anisotropic, conductivity tensor fields, representing scar and fibre orientation. Going forward and following appropriate adjustments, this technique could be applied and optimised in a biological setting.

Acknowledgements: This work was supported by the Wellcome Trust (Grant reference number: 222845/Z/21/Z), and the Rosetrees Trust Grant (M577). ❑

Figure 1



Oral Abstracts 2 – Highest Scoring Abstracts

23/An active fixation quadripolar left ventricular lead for cardiac resynchronization therapy with a lower displacement and reintervention rate compared to passive fixation quadripolar leads

European Journal of Arrhythmia & Electrophysiology. 2021;7(Suppl. 1):abstr23

C Robertson (Presenting Author) - Oxford Heart Centre, John Radcliffe Hospital, Oxford University Hospitals NHS Foundation Trust, Oxford; O Duffey - Oxford Heart Centre, John Radcliffe Hospital, Oxford University Hospitals NHS Foundation Trust, Oxford; P-T Tang - Oxford Heart Centre, John Radcliffe Hospital, Oxford University Hospitals NHS Foundation Trust, Oxford; N Fairhurst - Oxford Heart Centre, John Radcliffe Hospital, Oxford University Hospitals NHS Foundation Trust, Oxford; C Monteiro - Oxford Heart Centre, John Radcliffe Hospital, Oxford University Hospitals NHS Foundation Trust, Oxford; P Green - Oxford Heart Centre, John Radcliffe Hospital, Oxford University Hospitals NHS Foundation Trust, Oxford; J Grogono - Oxford Heart Centre, John Radcliffe Hospital, Oxford University Hospitals NHS Foundation Trust, Oxford; M Davies - Oxford Heart Centre, John Radcliffe Hospital, Oxford University Hospitals NHS Foundation Trust, Oxford; A Lewis - Oxford Heart Centre, John Radcliffe Hospital, Oxford University Hospitals NHS Foundation Trust, Oxford; R Wijesurendra - Oxford Heart Centre, John Radcliffe Hospital, Oxford University Hospitals NHS Foundation Trust, Oxford; J Ormerod - Oxford Heart Centre, John Radcliffe Hospital, Oxford University Hospitals NHS Foundation Trust, Oxford; J Gamble - Oxford Heart Centre, John Radcliffe Hospital, Oxford University Hospitals NHS Foundation Trust, Oxford; M Ginks - Oxford Heart Centre, John Radcliffe Hospital, Oxford University Hospitals NHS Foundation Trust, Oxford; K Rajappan - Oxford Heart Centre, John Radcliffe Hospital, Oxford University Hospitals NHS Foundation Trust, Oxford; Y Bashir - Oxford Heart Centre, John Radcliffe Hospital, Oxford University Hospitals NHS Foundation Trust, Oxford; TR Betts - Oxford Heart Centre, John Radcliffe Hospital, Oxford University Hospitals NHS Foundation Trust, Oxford; N Herring - Oxford Heart Centre, John Radcliffe Hospital, Oxford University Hospitals NHS Foundation Trust, Oxford

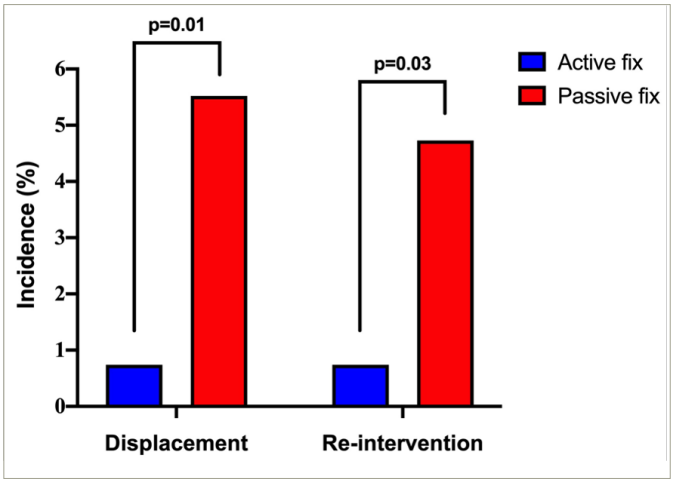
Aims: The rate of left ventricular (LV) lead displacement after cardiac resynchronization therapy (CRT) remains high (2–10%) despite recent improvements in lead technology. This post-operative complication often results in an increase in pacing threshold and subsequent loss of ventricular capture, thus negating the benefits of resynchronisation therapy. Under the circumstances where there is loss of ventricular capture from all the available pacing vectors, a repeat procedure is nearly always required to replace the lead. In August 2017, Medtronic introduced a new quadripolar lead with active fixation technology, the Attain Stability Quad 4798. The novel design feature of this lead is the inclusion of an electrically inactive side helix that actively fixes the lead body to the target vessel. The goal of our study was to assess whether this active fixation lead had a lower incidence of displacement and re-intervention compared to conventional passive fixation quadripolar LV leads.

Methods: This was a retrospective, observational study analysing device complications in 1,023 consecutive patients undergoing successful first-time implantation of a CRT device at a UK tertiary centre (John Radcliffe Hospital, Oxford). All patients inserted with a quadripolar LV lead between November 2010 and July 2020 were included in the study. This time period reflects the start of routine use of quadripolar LV leads in our hospital. All CRT devices were implanted according to guidelines published by the European Society of Cardiology.

Results: Whilst there was a trend in patients implanted with an active fixation lead towards older age, longer QRS duration and greater ejection fraction, the two groups were well matched with respect to sex, heart failure aetiology and their underlying rhythm. Patients implanted with an Attain Stability lead (n=135) had a reduced incidence of lead displacement at 6 months (0.74% vs 5.52%; p=0.01) compared to those implanted with conventional passive fixation quadripolar leads (n=888; *Figure 1*). There was no significant difference in the rate of right atrial (RA) and right ventricular (RV) lead displacement between the two groups (RA: 1.48% vs 1.80%, p=1.00; RV 2.22% vs 1.58%, p=0.48). Despite reprogramming, the rate of surgical re-intervention within 6 months was also lower with the Attain Stability lead (0.74% vs 4.73%; p=0.03; [*Figure 1*]). Furthermore, the radiation dose used to insert an active fixation LV lead was significantly lower compared to that for conventional passive fixation leads (538 vs 665 cGy.cm^2; p=0.02).

Conclusion: The Medtronic Attain Stability Quad 4798 lead deploys an active-fixation mechanism which is associated with a lower incidence of lead displacement and re-intervention compared to conventional quadripolar leads. ❑

Figure 1



Oral Abstracts 2 – Arrhythmia Mechanisms

24/Obesity is associated with repolarisation abnormalities which are unmasked with exercise: a non-invasive electrocardiographic imaging study

European Journal of Arrhythmia & Electrophysiology. 2021;7(Suppl. 1):abstr24

K Nyamakope (Presenting Author) - NHLI Imperial College London, London; KHK Patel - NHLI Imperial College London, London; X Li - NHLI Imperial College London, London; J Stoks - Maastricht University, Maastricht; R Davidson - NHLI Imperial College London, London; B Statton - MRC London Institute of Medical Sciences, London; M Brezitski - MRC London Institute of Medical Sciences, London; A Berry - MRC London Institute of Medical Sciences, London; H Bergman - MRC London Institute of Medical Sciences, London; M Orini - University College London, London; S Purkayastha - NHLI Imperial College London, London; P Lambiase - University College London, London; NS Peters - NHLI Imperial College London, London; D O'Regan - MRC London Institute of Medical Sciences, London; M Cluitmans - Maastricht University, Maastricht; FS Ng - NHLI Imperial College London, London

Background: Obesity is associated with an increased risk of ventricular arrhythmias and sudden cardiac death. Although the 12-lead electrocardiogram (ECG) may detect repolarisation abnormalities, it lacks the spatial resolution for detailed characterisation of the proarrhythmic substrate associated with obesity. We therefore used electrocardiographic imaging (ECGi) to non-invasively map epicardial potentials to investigate differences in activation and repolarisation in obese vs non-obese individuals.

Methods: 13 obese (mean body max index [BMI] 45.0 ± 4.2kg/m^2) and 9 non-obese (BMI 24.9 ± 2.9kg/m^2) participants underwent ECGi, in which 256-lead ECG was recorded at rest, during exercise and in the recovery phase, followed by a non-contrast thoracic MR scan to generate individualised heart–torso geometry. Unipolar epicardial electrograms were reconstructed to calculate total activation (TAT) and repolarisation times (TRT), corrected activation–repolartion intervals (ARIc) and their respective dispersions in both groups.

Results: ARIc was longer in obese vs non-obese group (p=0.02), with the greatest difference at 4 minutes post-exercise (264.3 ± 17.8 ms vs 242.5 ± 13.0 ms; p=0.02). Obesity was associated with a greater ARIc dispersion interventricular gradient (p=0.02). TRT, RT dispersion and ARIc dispersion were not significantly different between groups (p=0.21, p=0.59, p=0.35, respectively). TRT, RT dispersion, ARIc and ARIc dispersion decreased with exercise (p=0.02, p=0.03, p<0.0001 and p=0.0004, respectively). TAT and AT dispersion were comparable between groups and were unaffected by exercise.

Conclusion: Obesity is associated with prolonged repolarisation and interventricular repolarisation heterogeneity, which manifests with exercise and in the post-exercise recovery phase. These results provide an insight into the proarrhythmic substrate. ❑

Oral Abstracts 2 – Arrhythmia Mechanisms

25/Impact of electrical storm and ablation strategy on 5-year outcome of catheter ablation for ventricular tachycardia in patients with ischaemic and non-ischaemic cardiomyopathies

European Journal of Arrhythmia & Electrophysiology. 2021;7(Suppl. 1):abstr25

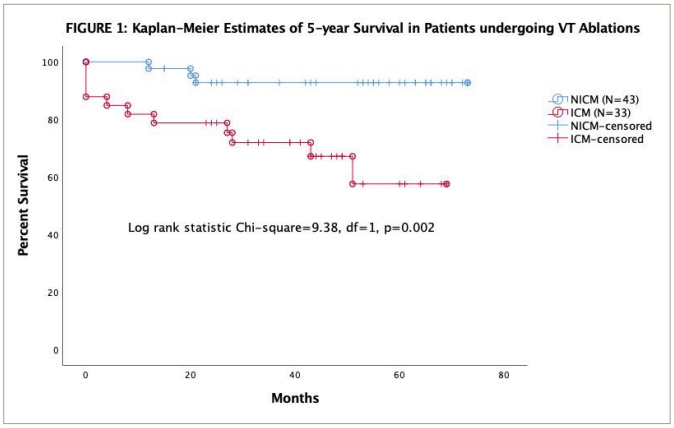
SH Man (Presenting Author) - University Hospitals of Leicester NHS Trust, Leicester; JO Ajagu - University Hospitals of Leicester NHS Trust, Leicester; N Chan - University Hospitals of Leicester NHS Trust, Leicester; R Somani - University Hospitals of Leicester NHS Trust, Leicester; PJ Stafford - University Hospitals of Leicester NHS Trust, Leicester; AJ Sandilands - University Hospitals of Leicester NHS Trust, Leicester; M Ibrahim - University Hospitals of Leicester NHS Trust, Leicester; M Lazdam - University Hospitals of Leicester NHS Trust, Leicester; GA Ng - University Hospitals of Leicester NHS Trust, Leicester; SH Chin - University Hospitals of Leicester NHS Trust, Leicester

Introduction: Patients with structural heart disease (SHD) are susceptible to ventricular tachycardia (VT) and arrhythmic death. Use of anti-arrhythmic drugs is often confounded by unacceptable side effects or suboptimal effectiveness. Catheter ablation (CA) is a viable option in these patients. This study aims to: 1) determine long-term outcome of patients with SHD undergoing CA for VT; and 2) identify potential predictors of favourable ablation outcome and improved survival.

Method: This single-centre longitudinal study enrolled patients with ischaemic (ICM) and non-ischaemic cardiomyopathies (NICM) undergoing CA for VT. Follow-up data on 5-year survival and ICD shocks for VT were collected. Potential demographic, clinical and procedural predictors of VT-free survival were assessed. Cox regression and Kaplan–Meier analyses were performed.

Results: Seventy-six patients (ICM 43%, NICM 57%; male 79%) were included. Electrical storm is more prevalent in the ICM group (ICM 50% vs. NICM 14%). At ablation, unstable clinical VT were more prevalent in ICM group (52% vs. 32%, p<0.05) despite similar VT inducibility. In these patients, only substrate-based ablation was performed. Ablation endpoint was determined by VT non-inducibility (ICM 70% vs. NICM 76%, p=ns). Acute complication rate was 18.4% including vascular complications (5.3%), cardiac tamponade (1.3%), stroke (1.3%), MI (1.3%), cardiogenic shock (2.6%) and death (1.3%). In both groups, there were significant reduction in ICD shocks after CA. However, NICM group demonstrated superior long-term VT-free survival (*Figure 1*). Independent predictors of mortality include age >60 years, LVEF <35%, electrical storm, declined eGFR and substrate-based ablation strategy. VT non-inducibility as ablation endpoint independently predicts freedom from ICD shocks.

Figure 1



Conclusion: VT ablation significantly reduces ICD shocks for VT but mortality remains high in some patients. VT non-inducibility as ablation endpoint partially prognosticates VT recurrence. Future studies are warranted to refine patient profiling, thereby further optimising long-term VT ablation outcomes. ❑

Oral Abstracts 2 – Arrhythmia Mechanisms

26/Frequency and time-frequency domain features from unipolar and omnipolar electrograms identify K_{ATP} channel opening in the *ex vivo* porcine heart

European Journal of Arrhythmia & Electrophysiology. 2021;7(Suppl. 1):abstr26

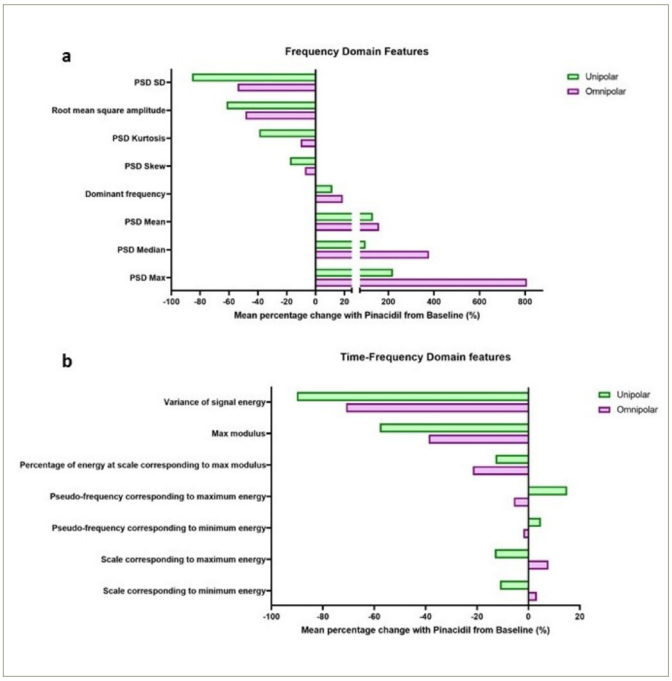
JKC Toh (Presenting Author) - National Heart and Lung Institute, Faculty of Medicine, Imperial College London, London; J Brook - National Heart and Lung Institute, Faculty of Medicine, Imperial College London, London; D Agha-Jaffar - National Heart and Lung Institute, Faculty of Medicine, Imperial College London, London; S Savvidou - National Heart and Lung Institute, Faculty of Medicine, Imperial College London, London; K Ntagiantas - National Heart and Lung Institute, Faculty of Medicine, Imperial College London, London; C Houston - Faculty of Engineering, Imperial College London, London; D Panagopoulos - National Heart and Lung Institute, Faculty of Medicine, Imperial College London, London; N Qureshi - National Heart and Lung Institute, Faculty of Medicine, Imperial College London, London; J Perkins - Royal Veterinary College, University of London, London; FS Ng - National Heart and Lung Institute, Faculty of Medicine, Imperial College London, London; S Harding - National Heart and Lung Institute, Faculty of Medicine, Imperial College London, London; AA Bharath - Faculty of Engineering, Imperial College London, London; NS Peters - National Heart and Lung Institute, Faculty of Medicine, Imperial College London, London; CD Cantwell - Faculty of Engineering, Imperial College London, London; RA Chowdhury - National Heart and Lung Institute, Faculty of Medicine, Imperial College London, London

Clinically, bipolar electrograms (EGMs) are interpreted based on time and voltage characteristics such as amplitude and fractionation index. However, this discards much of the information within the signal. EGMs can also be analysed in the frequency and time-frequency domain. Omnipolar EGMs are a direction-independent form of bipolar EGMs and can be calculated from unipolar EGMs. Using an *ex-vivo* porcine preparation in combination with unipolar and omnipolar EGMs, we sought to determine whether frequency and time-frequency features can be used to differentiate between substrate at baseline and with repolarisation abnormalities.

Unipolar EGMs were recorded from hearts paced at varying cycle lengths between 300 and 1,500 ms at positions across the left ventricle and left atrium. EGMs were measured at baseline (n=7) and post-modulation with $K_{AT}P$ channel agonist, pinacidil (n=2). Omnipolar EGMs were calculated from the unipolar EGMs using a custom-written algorithm. A total of 8 frequency domain features (dominant frequency [DF], power spectral density [PSD] max, PSD mean, PSD median, PSD standard deviation [SD], PSD kurtosis, PSD skew and root mean square [RMS] amplitude) and 8 time-frequency domain features (max modulus, variance of signal energy, scale corresponding to minimum and maximum energy, pseudo frequency corresponding to minimum and maximum energy, and percentage of energy corresponding to max modulus) were extracted using a fast Fourier transform and continuous wavelet analysis of the EGM signals, respectively.

In the ventricle, both unipolar and omnipolar EGMs showed significant difference between baseline vs pinacidil values for all frequency and time-frequency domain features. For frequency domain features (*Figure 1a*), unipolar EGMs recorded a greater mean negative percentage change from baseline with pinacidil for four4 features (PSD SD, RMS amplitude, PSD kurtosis and PSD skew) while omnipolar EGMs recorded a greater mean positive percentage change from baseline with pinacidil for the remaining 4 features (DF, PSD mean, PSD median, PSD max). For time-frequency domain features (*Figure 1b*), unipolar EGMs recorded a greater negative for 2 features (variance of signal energy and max modulus) while omnipolar EGMs recorded the same for percentage of energy corresponding to max modulus.

Figure 1: Mean percentage change post-modulation with pinacidil from baseline of (a) frequency and (b) time-frequency domain features in unipolar and omnipolar electrograms from the left ventricle.



Frequency and time-frequency domain features can identify K_{ATP} channel opening in both unipolar and omnipolar EGMs. With further study on different pro-arrhythmic modulators, such as gap junction or sodium channel blockers, this approach may provide mechanistic links between the EGM and properties of the myocardium and may help guide future ablation procedures. Omnipolar EGMs are not found to be superior to unipolar EGMs in this context. ❑

Oral Abstracts 2 – Arrhythmia Mechanisms

27/Identification of multiple pro-arrhythmic substrates from the contact electrogram using machine learning in *ex-vivo* porcine hearts

European Journal of Arrhythmia & Electrophysiology. 2021;7(Suppl. 1):abstr27

J Brook (Presenting Author) - Imperial College London, London; A Sufi - Imperial College London, London; D Agha-Jaffar- Imperial College London, London; J Toh - Imperial College London, London; S Savvidou- Imperial College London, London; K Ntagiantas - Imperial College London, London; DS Pitcher - Imperial College London, London; B Handa - Imperial College London, London; D Panagopoulos - Imperial College London, London; N Qureshi - Imperial College London, London; J Perkins - Royal Veterinary College, University of London, Hertfordshire; FS Ng - Imperial College London, London; S Hardin - Imperial College London, London; AA Bharath - Imperial College London, London; NS Peters - Imperial College London, London; RA Chowdhury - Imperial College London, London; CD Cantwell - Imperial College London, London

Electrograms (EGMs) contain information in the frequency domain (FD) and time-frequency domain (TFD) that is not currently assessed clinically. Greater utilisation of this information could lead to improved understanding of the local electroarchitecture. The Langendorff perfusion system allows EGMs from porcine hearts to be recorded *ex-vivo*, where cellular components of the pro-arrhythmic substrate ablation targets can be pharmacologically induced in a controlled manner. Carbenoxolone (CBX) induces gap-junction uncoupling, while Lidocaine (Lido) blocks the Na channel and Pinacidil (Pin) opens the K_{ATP} channel. We aimed to predict the presence of multiple pro-arrhythmic substrates in the intact porcine myocardium using FD and TFD EGM features and machine learning (ML).

Following explantation using a clinical donor retrieval protocol, *ex-vivo* porcine hearts were perfused on a custom-built Langendorff apparatus. Unipolar electrograms were recorded on the epicardial surface across 16 positions in the left atrium and ventricle at pacing cycle lengths between 300-1,500 ms at baseline (BL) (n=7), then modulated with Pin (n=2), CBX (n=2) or Lido (n=4). A total of 8FD features were extracted: dominant frequency (DF), power spectral density (PSD) mean, PSD median, PSD max, PSD skew, PSD Kurtosis, PSD standard deviation (SD) and root mean square (RMS) amplitude. Seven 7 TFD features were extracted: maximum modulus (MM), variance of signal energy, scale corresponding to minimum energy, scale corresponding to maximum energy, pseudo-frequency corresponding to minimum energy, pseudo-frequency corresponding to maximum energy and percentage of energy corresponding to MM. The dataset was split using 5-fold cross validation and a random forest ML algorithm was trained to classify each EGM as either BL or modulated (Mod). Classification of each EGM as BL against the specific modulation (Pin, CBX, Lido) was also trained. The accuracy of each model was tested on unseen EGMs.

Prediction accuracy on unseen EGMs was 94% with 12,733 (92%) BL EGMs correctly predicted and 13,259 (95%) Mod EGMs correctly predicted. The top features selected in order of importance were PSD mean, PSD SD, MM, PSD max, DF.

The overall prediction accuracy between BL, CBX, Lido and Pin of unseen EGMs was 88% with 3,890 (88%) BL EGMs, 4,374 (83%) CBX EGMs, 3,288 (80%) Lido EGMs and 4,673 (99%) Pin EGMs correctly predicted. The features selected in order of importance were percentage of the energy at the scale corresponding to the MM, pseudo frequency (PF) corresponding to minimum energy, PSD mean, PF corresponding to minimum energy and RMS amplitude.

ML can accurately and automatically differentiate pro-arrhythmic substrates when used with FD and TFD features of EGMs. ❑

Oral Abstracts 3 – Devices

28/Predictors of pacemaker dependency in patients receiving devices following cardiac surgery

European Journal of Arrhythmia & Electrophysiology. 2021;7(Suppl. 1):abstr28

J Cranley (Presenting Author) - Royal Papworth Hospital, Cambridge; T Nye - Royal Papworth Hospital, Cambridge; O Omoniyi - Royal Papworth Hospital, Cambridge; J Cheung - Royal Papworth Hospital, Cambridge; E Hopley - Royal Papworth Hospital, Cambridge; M Bethell - Royal Papworth Hospital, Cambridge; D Kotecha - Royal Papworth Hospital, Cambridge; S Sarbjit-Singh - Royal Papworth Hospital, Cambridge; S Agarwal - Royal Papworth Hospital, Cambridge

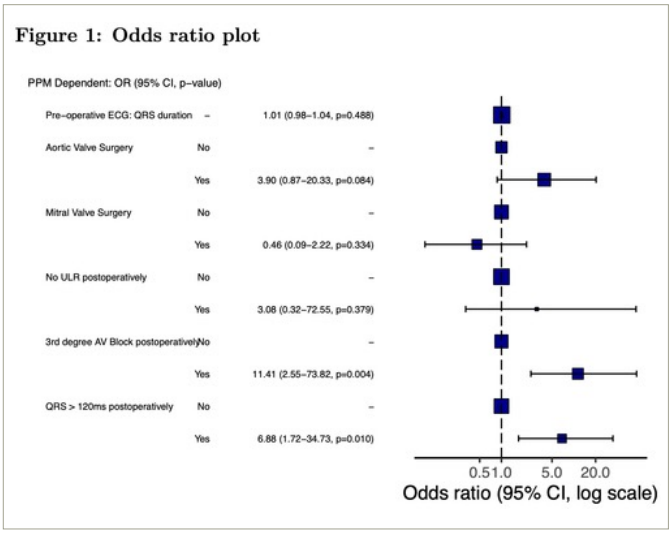
Introduction: Permanent pacemaker (PPM) implantation is a well-recognised short-term complication after cardiac surgery; however, in some cases, conduction system function may recover, leaving the patient with an unnecessary device and its associated morbidity.

Aims: In order to aid in decision-making process for PPM implantation post cardiac surgery, we sought to determine predictors of pacemaker dependency.

Methods: We identified patients who had undergone PPM implant within 30 days of cardiac surgery (bypass grafting and/or valvular surgery) at our institution between May 2016 and December 2019. Parameters including pre-operative ECG, surgical details and device follow-up data were collected. Pacemaker dependency (PPM-D) was defined as any of the following at the initial post-discharge device check: no underlying rhythm at VVI 40, underlying junctional rhythm, RV pace percentage >80% or underlying rhythm rate of 40 bpm or less. Using a stepwise approach, we constructed a series of logistic regression models to predict PPM-D, minimising the Akaike Information Criterion (AIC) and maximising the AUROC/C-statistic to optimise discriminative performance.

Results: We identified 143 patients who had undergone PPM implantation for whom device follow-up information was available. Only seventy eight (54.5%) patients were PPM-D as defined. After multivariate logistic regression analysis two factors predicted PPM-D. The presence of post-operative complete AV block (OR 11.41; CI, 2.55–73.82; p=0.004) and QRS duration >120 ms on the post-operative ECG (OR 6.88; CI, 1.72–34.73; p=0.010) (*Figure 1*). Interestingly, neither surgery type (valve, bypass, etc.) nor any pre-operative ECG parameters were significantly associated in this cohort. A model incorporating just these factors had high discriminative capability with AUROC=0.749.

Figure 1.



Conclusions: In post cardiac surgical patients, pacemaker dependency was only present in approximately half of patients at the post-discharge device check. Although this data requires external validation, assessing for complete AV block or a broad QRS may be helpful in deciding whether to implant PPMs in this patient group. ❑

Oral Abstracts 3 – Devices

29/Lead performance of His bundle pacing in a tertiary centre

European Journal of Arrhythmia & Electrophysiology. 2021;7(Suppl. 1):abstr29

N Mark (Presenting Author) - Barts Health NHS Trust, London; N Papageorgiou - Barts Health NHS Trust, London; J Ramplin - Barts Health NHS Trust, London; C Monkhouse - Barts Health NHS Trust, London; P Moore - Barts Health NHS Trust, London; A Chow - Barts Health NHS Trust, London; R Hunter - Barts Health NHS Trust, London; S Sporton - Barts Health NHS Trust, London; R Providencia - Barts Health NHS Trust, London; M Earley - Barts Health NHS Trust, London; J Elliott - Barts Health NHS Trust, London; A Muthumala - Barts Health NHS Trust, London

Introduction: His bundle pacing (HBP) may have a role as an alternative approach to conventional right ventricular pacing in bradycardia and AV node ablation, and for patients with heart failure who require cardiac resynchronisation therapy. There are concerns from the literature with changes in HBP threshold over time.

Methods: Patients implanted between 2017 and 2020 with a Medtronic Select Secure model 3830 lead were included in this retrospective study. Data collected included HBP thresholds documented at implant and at latest on-site device check.

Results: A total of forty-one patients were included for data analysis (58% male and mean age 69 ± 9.4 years). Device indications were 24% for bradycardia, 24% for AV node ablation and 52% for heart failure. Nine were PPMs, sixteen were CRTPs and sixteen were CRTDs. Mean follow up was 12.5 ± 8.5 months. There were no implant complications. Mean HBP threshold (analysed at a pulse width of 1 ms) at implant was 1.45 ± 0.95 V and at last follow up 1.49 ± 1.2 V. Mean change in HBP threshold from implant to follow up was 0.04 ± 1.24 V (p=0.832). An increase in HBP threshold of greater than 1V over follow up was seen in ten patients (24%). Loss of His-bundle capture at follow-up was seen in four patients (10%) and in one further patient there was lead failure due to rise in impedance.

Conclusion: In the majority of patients, HBP capture thresholds were stable over follow up. Lead failure rate is similar to that described in the literature.[1] Further multicentre studies are needed to evaluate threshold changes over time. ❑

Reference:

1. Teigeler et al., (2021) Intermediate-term performance and safety of His-bundle pacing leads: A single-center experience.

Oral Abstracts 3 – Devices

30/Cardiac pacemaker implantation in Australia: temporal trends 2000–2019

European Journal of Arrhythmia & Electrophysiology. 2021;7(Suppl. 1):abstr30

AA Dina (Presenting Author) - Gold Coast University Teaching Hospital, Southport Gold Coast

Background: With the increasing ageing population, especially in developed countries, the rate of permanent pacemaker (PPM) implantation has increased. The increase in life expectancy associated with the increase in cardiovascular co-morbidities is likely the major contributor to the rising rate of PPM implantation. Over 70% of PPM implantations occur in patients over 65 years of age.1 While many studies around the world have reported the rising rate of PPM implantation, there is no study evaluating the rate of PPM implantation Australia-wide over the last 2 decades.

Aim: This study aims to evaluate the trends in PPM implantation in Australia by year, patient age and sex over the last 19 years.

Method: This was a population-based observational study using the National Hospital Morbidity Database (NHMD) to identify all PPM implantation procedures between July 2000 to June 2019. The NHMD record diagnosis and procedures for all hospitalizations in Australia and these data are aggregated and freely available. The number of PPM implantation procedures by year, patient age (<55, 55–64, 65–74, 75–84, and 85 years or more) and sex were analyzed.

Results: From July 2000 to June 2019, there were 278,355 PPM implantation procedures in Australia. Over 58% of PPM implantation was in men and more than 95% of PPM implantations were in patients over 55 years. Between 2000-2001 and 2018-2019, the annual number of PPM implantation increased from 10,326 to 18,964. The population-adjusted rate increased from 53.7 to 74.8 procedures per 100,000 persons. The number of PPM implantation has increased by 83% over the last 2 decades. The PPM implantation rate was highest for patients aged 85 years and older. In 2018–2019, compared to the population rate of PPM implantation of 74.8 procedures per 100,000 persons; the rate for patients aged 85 years and older was 939.9 procedures per 100,000 persons (*Figure 1*). Only a small proportion of PPM implantation (4.9%) was performed in people under the age of 55 years. The rate in this age group however decreased between 2000-2001 and 2018-2019 from 4.6 to 3.7 per 100,000 persons.

Conclusion: There has been a steady growth in the use of PPM in Australia over the last 19 years. This is likely because patients are getting older with more medical comorbidities. The rate of PPM implantation in patients younger than 55 years has however decreased over time, likely as a result of improved quality of healthcare. The findings in this study have important implications for future healthcare policy decisions. ❑

References

1. Aronow WS, Gregoratos G. Management of atrial fibrillation, ventricular arrhythmias and pacemakers in older persons: permanent pacemakers in older persons. *Journal of the American Geriatrics Society*. 1999;47(9):1125-35.

Oral Abstracts 3 – Devices

31/Application of the PADIT score for cardiac implantable electronic devices: could it reduce infections at our district general hospital?

European Journal of Arrhythmia & Electrophysiology. 2021;7(Suppl. 1):abstr31

F Bell - Frimley Health NHS Foundation Trust, Camberley; C Bruce - Frimley Health NHS Foundation Trust, Camberley; L Eveson - Frimley Health NHS Foundation Trust, Camberley; A Lake - Frimley Health NHS Foundation Trust, Camberley; A Cox - Frimley Health NHS Foundation Trust, Camberley

Introduction: Cardiac implantable electronic device (CIED) infection is a major complication resulting in significant morbidity. The Prevention of Arrythmia Device Infection Trial (PADIT) identified 5 independent risk predictors of device infection: prior procedures, age, depressed renal function, immunocompromise and procedure type, and developed a novel infection risk score ranging from 0 to 15 classifying patients into low (0 to 4), intermediate (5 to 6) and high (7 or greater). The aim of our study was to apply the PADIT score to our patient cohort and compare PADIT score with outcomes at our DGH and determine if implementation could have highlighted risk.

Methods: This was a retrospective study of medical records for patients treated at our DGH who underwent cardiac implantable electronic device insertion between 1 Jun 2020 and 31 Dec 2020. Demographics, patient characteristics, device details, device infection risk factors, complications and outcomes were analysed. The PADIT score was calculated for all patients.

Results: Over the six-month period 248 patients underwent device implantation for either urgent or elective procedure (97 vs 151). The average age was 77 years with a male predominance. The percentage who underwent each type of device implantation or generator change was: 71% pacemaker, 10% ICD, 10% CRT, and 8% device revision or upgrade. The average PADIT score of the patients was 2.1; 205 patients (83%) had a low PADIT score, 26 patients (10%) an intermediate score and 17 patients (7%) a high score. Of the 248 patients, 5 developed symptoms of possible device infection. 3 were patients who had wound site inflammation, without any system symptoms, which was treated as possible superficial infection and resolved with a course of oral antibiotics. 2 had deep infection that required device explantation and prolonged hospital admission. The average PADIT score of these patients was 5.0, although the scores ranged from 0 to 9. Three of these patients were identified as high risk, which included both of those who developed deep infection.

Conclusion: Our results demonstrate that use of the PADIT score in our DGH would have identified the 2 patients who developed deep device infection. Identification of these patients as high risk would enable consideration of further preventative measures and may help reduce the morbidity associated with device infection and enable joint decision-making with our patients. The cost of additional interventions, antibiotics or specialist device pouches in these high-risk patients' needs to be weighed against the reduction in hospitalization, re-admission and health-related quality of life. In our cohort, only a small number of patients were identified as high risk and so suggests the economic benefit of additional measure may prevail. ❑

Oral Abstracts 3 – Devices

32/Real-world evaluation of follow-up strategies after implantable cardiac defibrillator therapies in patients with ventricular tachycardia (REFINE-VT)

European Journal of Arrhythmia & Electrophysiology. 2021;7(Suppl. 1):abstr32

LM Marshall (Presenting Author) - University Hospitals Coventry and Warwickshire, Coventry; P Tran - University Hospitals Coventry and Warwickshire, Coventry; I Patchett - University Hospitals Coventry and Warwickshire, Coventry; H Salim - University Hospitals Coventry and Warwickshire, Coventry; S Yusuf - University Hospitals Coventry and Warwickshire, Coventry; S Panikker - University Hospitals Coventry and Warwickshire, Coventry; P Banerjee - University Hospitals Coventry and Warwickshire, Coventry; F Osman - University Hospitals Coventry and Warwickshire, Coventry; M Kuehl - University Hospitals Coventry and Warwickshire, Coventry; T Dhanjal - University Hospitals Coventry and Warwickshire, Coventry

Introduction: Implantable cardiac-defibrillators (ICD) can prevent sudden cardiac death but the risk of recurrent ventricular arrhythmia (VA) and ICD therapies persists. Strategies to minimize such risks include medication optimization, device reprogramming or ventricular tachycardia (VT) catheter ablation (CA). However, the timing and choice of these strategies at ICD follow-up may not be as consistent in the real-world as the regulated conditions of clinical trials. Whether these decisions are influenced by the type of arrhythmia, ICD therapy or patient characteristics remain unclear.

Aim: We evaluated ICD follow-up strategies in patients with ischaemic (ICM) and non-ischaemic cardiomyopathy (NICM) to refine the outpatient management of these complex patients and ultimately improve patient outcomes.

Methods: REFINE-VT is a retrospective study of 514 consecutive patients with ICD/CRT-D who attended ICD follow-up between June 2018 to September 2019 at the University Hospitals Coventry & Warwickshire (UHCW) tertiary cardiology department. All follow-ups were face-to-face. Patients were divided into 2 groups according to the absence or presence of sustained VA (e.g. >30 seconds of VT and/or appropriate ICD therapy), described as 'negative event' and 'positive event' groups, respectively. The types of strategies employed in response to a positive event were categorized into 4 groups: (1) Medication change only (2) Device programming +/- medication (3) Referral for VT CA (4) No intervention.

Results: 514 consecutive patients with ICD (52%) or CRT-D (48%) were analysed. Overall mean age was 67 ± 14 years with 79% male patients. ICM was diagnosed in 329 (64%) patients and NICM in 185 (36%). 437 (85%) patients had no significant VA and/or ICD therapy referred to as the negative group. A total of 77 patients (15%) suffered VA and/or ICD therapies, of whom 22 patients (26%) experienced a second event. 31% (n=24) of this positive event group received no preventative strategy.

Table 1: Comparison between patients with ICDs experiencing a single versus two events (i.e. significant arrhythmia ± ICD therapy) during the study period

	Single event only (n=57)	Two events (n=20)	p-value
Total VT ablation referrals – no (%)	14 (25)	6 (30)	0.77
Device re-programming	2 (4)	2 (10)	0.3
Amiodarone started/increased	9 (16)	6 (30)	0.17
Beta-blocker started/increase	6 (11)	2 (10)	1

We observed an inconsistent approach to the choice of strategies across different types of arrhythmias and ICD therapies. E.g. the odds of intervening were significantly higher if ICD shock was detected compared to anti-tachycardia pacing (ATP) (OR 8.4; 95% CI, 1.7–39.6; p=0.007). Even in patients with two events, the rate of referral for VT ablation and escalation of antiarrhythmics were similarly as low as patients with a single event (*Table 1*).

Conclusion: This is the first contemporary study that has evaluated how strategies that reduce the risk of recurrent ICD events are executed in a real-world population. We have demonstrated that the decision to intervene and choices of strategy remain inconsistent and partially biased by the type of arrhythmia and ICD therapy at follow up. The impetus to intervene appears to favour patients with detected ICD shocks than those with ATP even though both are known to be associated with adverse clinical outcomes. This supports the need for an evidence-driven multi-disciplinary VT clinic to refine and standardize our approach to this heterogeneous population. ❑

Oral Abstracts 3 – Mapping & Ablation

33/Ripple mapping to enhance 3D visualisation of low amplitude, abnormal bipolar electrograms

European Journal of Arrhythmia & Electrophysiology. 2021;7(Suppl. 1):abstr33

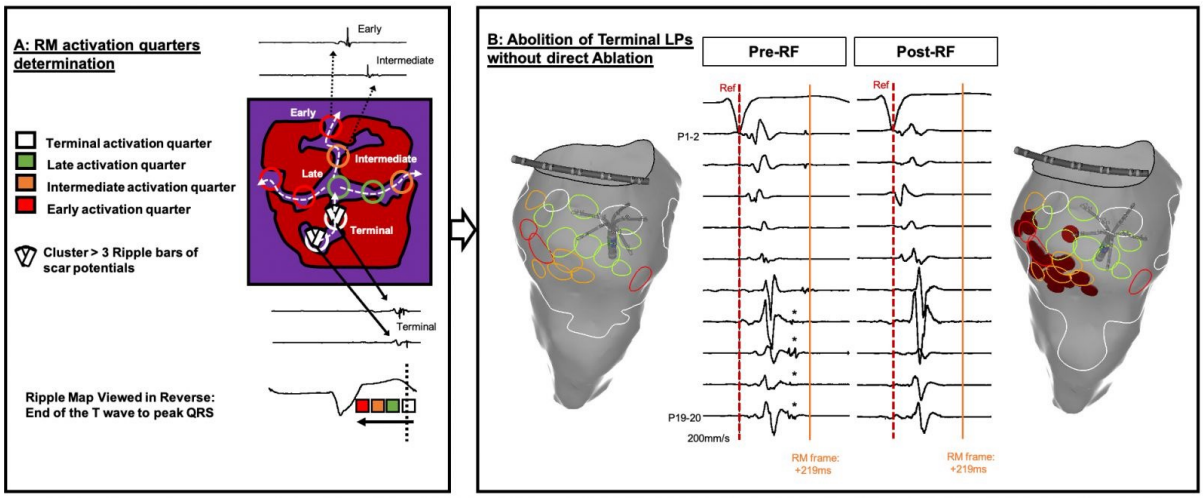
G Katritsis (Presenting Author) - Imperial College London, London; V Luther - Imperial College London, London; S Jamil-Copley - Nottingham University Hospitals Trust, Nottingham; M Koa-Wing - Imperial College Healthcare NHS Trust, London; Z Whinnett - Imperial College London, London; N Qureshi - Imperial College Healthcare NHS Trust, London; FS Ng - Imperial College London, London; P-B Lim - Imperial College Healthcare NHS Trust, London; L Malcolme-Lawes - Imperial College Healthcare NHS Trust, London; N Cortez-Dias - Hospital De Santa Maria, Lisbon; L Carpinteiro - Hospital De Santa Maria, Lisbon; J de Sousa - Hospital De Santa Maria, Lisbon; R Martin - Newcastle Hospitals NHS Foundation Trust, Newcastle; S Murray - Newcastle Hospitals NHS Foundation Trust, Newcastle; M Das - Newcastle Hospitals NHS Foundation Trust, Newcastle; A Chow - Queen Mary University London and Barts Health NHS Trust, London; NS Peters - Imperial College London, London; NWF Linton - Imperial College London, London; P Kanagaratnam - Imperial College London, London

Background: Ripple mapping (RM) displays the entire morphology of bipolar electrograms in 3D, facilitating identification of low amplitude pathways often obscured by large far-field signals. We tested the hypothesis that RM improves characterisation of low amplitude signals in three subgroups where such signals are common: atrial tachycardia, the LV conduction system and post-infarct LV scar.

Methods and Results: Scar-related atrial signals: We reviewed 28 cases of perimitral AT, ablated with either RM or conventional LAT mapping. A slow conducting scar-related isthmus was identified and ablated in 12 pts, all using RM to distinguish non-activating scar from low-voltage signals. Conventional mitral isthmus (MI) linear ablation was performed in 16 pts. Scar-related isthmus ablation terminated AT in 100% vs 63% with MI linear lesions (p=0.027). Slow conducting isthmuses could be identified by applying RM in 63% of those who had MI lines. Isthmuses were narrow (8.9 ± 3.5 mm), slow (31.8 ± 5.5 cm/s), low voltage (0.11 ± 0.05 mV) tissues bordered by scar. Ventricular pre-systolic signals: High-density maps of the LV during SR (points: 3,086 ± 482) in 17 pts undergoing VT ablation map were reviewed using RM. Two distinct wavefronts, from split presystolic bipolar EGMs (PSP), could be seen on all RMs irrespective of QRS morphology. PSPs were grouped into left anterior fascicle (LAF) and left posterior fascicule (LPF). The LAF was significantly shorter than the LPF: 43.7 vs 67.9 mm (p=0.0006), but conduction speeds similar: 1.6 vs 1.4 cm/s (p=0.5). The LPF was significantly shorter in Pt with LBBB (67.2 vs 18.1 mm; p<0.0001). LPF length inversely correlated with QRS duration (r -0.59; p=0.013). Ventricular post-systolic signal: RM was applied prospectively to 11 pts with post-infarct VT. High-density mapping of LV scar (3050 ± 554.5 points) was performed during SR (n=7), or pacing (n=4). RM identified channels of slow conduction within the scar (4 anterior, 7 inferior) of all pts. Component low-amplitude scar potential (SPs) were further categorised temporally: early, intermediate, late, terminal SPs by reviewing the RM in reverse to limit far-field interpretation. SP timing ranged: 98.1 ± 60.5 ms to 214.8 ± 89.8 ms. Earliest SPs were present at the border, occupying 16.4% of scar, whilst latest SPs occupied 4.8% at the opposing border (in 45.5%) or core (in 54.5%). Analysis took 15 ± 10 min to locate channels and identify ablation targets. Selective ablation of early SPs (*Figure 1*) led to elimination of the terminal SPs in all (mean ablation 16.3 ± 11.1 min). We then tested this observation as the procedural endpoint for substrate modification of post infarct VT in 50 pts at 5 centres (NCT: NCT03997201; mean age 70.2 ± 7.1 years, mean EF 32.9 ± 9.5%). The primary endpoint was combined ICD therapy, VT recurrence and mortality at 1 year. The protocol was abandoned in 2 and the RM endpoint met in 37 (74%). Where the endpoint was met, VT was non-inducible in 91%, and 86% are free of VT at median 6.5 [1.2 – 12.0] months. Where the endpoint was not met, VT was non-inducible in 55%, and 80% are free of VT at 4.6 [1.2 – 7.8] months. 3 pts died without VT recurrence. On an ITT basis, 40/50 (80%) were free from the primary endpoint at median 5.7 [1.8 – 12.0] months.

Conclusion: RM was able to map low amplitude signals in both atria and ventricle. This enabled ablation to be directed at novel targets for peri-mitral AT and post-infarct VT. Prospective randomised trials are needed to determine if these endpoints are superior to current strategies. ❑

Figure 1



Oral Abstracts 3 – Mapping & Ablation

34/Feasibility study of using a diamond tip temperature-controlled radiofrequency ablation system for ischaemic cardiomyopathy (ICM) ventricular tachycardia (VT) ablation

European Journal of Arrhythmia & Electrophysiology. 2021;7(Suppl. 1):abstr34

J Al-Sheikhli (Presenting Author) - University Hospital Coventry and Warwickshire, Coventry; I Patchett - University Hospital Coventry and Warwickshire, Coventry; V Lim - University Hospital Coventry and Warwickshire, Coventry; L Marshall - University Hospital Coventry and Warwickshire, Coventry; S Yusuf - University Hospital Coventry and Warwickshire, Coventry; S Panikker - University Hospital Coventry and Warwickshire, Coventry; W Foster - University Hospital Coventry and Warwickshire, Coventry; M Kuehl - University Hospital Coventry and Warwickshire, Coventry; F Osman - University Hospital Coventry and Warwickshire, Coventry; T Dhanjal - University Hospital Coventry and Warwickshire, Coventry

Introduction: The DiamondTemp ablation (DTA) catheter system delivers high-power, open-irrigated, temperature-controlled radiofrequency (RF) ablation. This study assesses the feasibility of this new technology for VT ablation in patients with ICM.

Method: 10 patients (mean age 73.4 years [64–84 years]) with a diagnosis of ICM were recruited over 3 months. 4 patients were classified as high risk and 6 as intermediate risk using the PAINESD score. All patients were on optimal anti-arrhythmic drug therapy: B-blocker (n=10), amiodarone (n=7), mexiletine (n=3). The Ensite Precision Cardiac Mapping System was used to construct substrate maps with the Advisor HD Grid mapping catheter with an average point density of 2,344/26,165 (points used/points collected). Ablation lesions were delivered as per standard protocol: Temperature set to 60°C for an empirical lesion duration of 60 s, or shorter if i) failure to achieve a temperature of 45°C, ii) impedance drop of 15 Ω reached or iii) rising impedance. Metrics recorded during the ablation included time, power, impedance, and temperature, were collected at a rate of 1 Hz. Mapping was performed as per the UHCW VT mapping and ablation workflow with analysis of pre- and post-ablation bipolar and unipolar total scar area (TSA), border-zone area (BZA), dense scar area (DSA), late potential area (LPA), mean bipolar and unipolar voltages of ablation target areas (ATA). Standard VT induction protocols was performed at the end of each procedure.

Results:Average number of lesions per case was 51.8 ± 17.7, average time per lesion was 44.5 ± 11.1 s, average power per case was 47.8 ± 1.2 W, average temperature per case was 49.8 ± 2 °C, average maximum temperature per lesion was 55.2 ± 2 °C at an average duration of 25.8 ± 8 s and the average impedance drop per lesion was 11.2 ± 2.4 Ω at an average duration of 23.0 ± 7 s. Map data analysis is displayed in *Table 1*. There was a significant reduction in the average BZA of 4.4 cm^2 or 12% (p=0.026) and LPA of 3.5 cm^2 (p=0.0449). There was a significant reduction in the mean bipolar voltage of ATA, 0.14 mV (p=0.0007) and mean unipolar voltage of ATA, 0.59 mV (p=0.0072). There was no inducible clinical or non-clinical VT at the end of 9 procedures, with no stimulation performed at the end of 1 case due to pericardial tamponade requiring drainage.

Table 1: Pre-ablation & post-ablation substrate map analyses.

	Pre-ablation	Post-ablation	p-value
Mean bipolar TSA, cm^2	42.0 ± 26.4	41.2 ± 24.2	ns
Mean bipolar DSA, cm^2	31.4 ± 23.4	36.0 ± 22.2	0.0113
Mean bipolar BZA, cm^2	10.7 ± 5.8	6.2 ± 4.2	0.0255
Mean % bipolar BZA	28 ± 11	16 ± 11	0.0260
Mean unipolar TSA, cm^2	44.1 ± 25.5	42.0 ± 20.8	ns
Mean unipolar DSA, cm^2	39.7 ± 25.3	39.5 ± 22.1	ns
Mean unipolar BZA, cm^2	4.3 ± 2.3	2.6 ± 3.0	ns
Mean % unipolar BZA	13 ± 10	9 ± 9	ns
Mean LPA, cm^2	4.2 ± 4.9	0.7 ± 0.9	0.0449
Mean bipolar voltage of ATA, mV	0.44 ± 0.16	0.3 ± 0.15	0.0007
Mean unipolar voltage of ATA, mV	3.79 ± 1.19	3.2 ± 1.1	0.0072

Conclusion and implications: The DTA catheter system resulted in a significant reduction of both mean bipolar and unipolar voltages of the ATA. The average bipolar BZAs and LPAs were significantly reduced with no inducible clinical or non-clinical VT at the end of the tested procedures. This is the first study to report the efficacy and safety of the DTA catheter system in VT ablation, which positively impacts on key substrate ablation targets with consistent on-table endpoint testing outcomes. Further studies investigating both long-term clinical outcomes and performance to comparable ablation technology is required. ❑

Oral Abstracts 3 – Mapping & Ablation

35/Single-centre ventricular tachycardia (VT) ablation practice in structural heart disease (SHD) in the UK

European Journal of Arrhythmia & Electrophysiology. 2021;7(Suppl. 1):abstr35

N Jathanna (Presenting Author) - Nottingham University Hospitals NHS Trust, Nottingham; S Ross - Nottingham University Hospitals NHS Trust, Nottingham; R Oliver - Nottingham University Hospitals NHS Trust, Nottingham; T Robinson - Nottingham University Hospitals NHS Trust, Nottingham; A Staniforth - Nottingham University Hospitals NHS Trust, Nottingham; S Jamil-Copley - Nottingham University Hospitals NHS Trust, Nottingham

Introduction: Catheter ablation of VT in SHD, endorsed by current guidelines, reduces arrhythmic events and device-delivered therapy. Expert UK consensus recommends services provide a minimum of 20 VT ablations per 1 million population. Limited details exist about local practice in the UK. Nottingham University Hospitals NHS Trust complex VT ablation service commenced in 2016, covering a regional catchment area of >1.15 million.

Methods: We retrospectively analysed our SHD VT ablation service from 2016 – 2020. We assessed procedural indication, methods, demographics, procedural success, complications, 1 year mortality & VT freedom. Procedural success was defined as non-inducibility or completion of ablation strategy if no programmed stimulation (PES) occurred.

Results: 74 procedures were undertaken in 57 patients using the CARTO mapping systems and substrate mapping. 12.1% utilised epicardial access. Aetiologies were ischaemic (ICM) & non-ischaemic (NICM). Procedures increased annually; 8 in 2016 (50% ICM) to 22 in 2020 (68.1% ICM). The NICM cohort included dilated cardiomyopathy, myocarditis, arrhythmogenic right ventricular cardiomyopathy, sarcoid and undifferentiated. ICM predominated over NICM (63.5% vs 36.5%). Median age was 64.15 years (*Table 1*). Recent/active VT storm represented the primary indication in 58.1% (43) of cases. 60.8% of all procedures were electively undertaken of which recent VT storm was the indication in 31.1%. Where medication data was available for elective cases, 75%, 95.8% and 70.8% were on amiodarone, beta blockers or both, respectively. 48.6% of the cohort were out of area and a significantly higher proportion of these cases were due to VT storm (77.8% vs. 39.5%; p=0.001). 10 procedures (13.5%) did not progress to ablation. Operator-defined procedural success rates were 45.9%, 57.4% and 25.9% for mixed, ICM and NICM, respectively. Major complications, within 30 days of the procedure, occurred in 8 (10.8%) including 2 cardiac tamponades requiring urgent surgical rescue and 1 death (haemorrhagic stroke in cerebral amyloid). Despite higher PAAINESD scores in ICM, no statistical association was found with complications. Of 27 with follow-up device data, ICM & NICM had 1 year VT freedom of 51.7% & 47%, respectively. Significant reduction in ATP episodes was seen 1 year post ablation (17.8 v 0.89; p=0.027) with a trend towards reduced shocks (1.8 v 0.16; p=0.68). Amiodarone could be stopped in 47.4%.

Table 1.

	ICM	NICM
Age, yrs (SD)	66.9 ± 9.27	50.7 ± 13.4
Male (%)	93.6	81.5
VT storm indication (%)	66	44
PAAINESD (IQR)	15 (13–18)	4 (0–9)
Ablation Technique (%)	Removal of LPs (64.3)	Pace mapping (59)
PES (%)	64.3	31.8
1 year VT Freedom (%)	51.7	47
1 year mortality (%)	7.1 (1 stroke, 2 progressive heart failure)	0

Conclusion: Increasing VT ablation numbers are observed at our centre with the service improving awareness, education with dedicated VT clinics. Higher than expected VT storms were seen suggesting delayed referral from secondary care. Despite being a relatively new service with a high-risk population (VT storm and PAAINESD score), outcomes are comparable to larger scale published work at more established centres, our complication rate are 10.8% with 52.8% of patients experiencing VT freedom for at least 1 year. Coupled with significant reductions in device therapies, the service provides an opportunity for optimisation of patient care serving the local area with gradually rising numbers aligning to NHSE recommendations. ❑

Oral Abstracts 3 – Mapping & Ablation

36/Elimination of major vascular access complications (VAC) using ultrasound-guided vascular access and vessel closure protocols during Invasive EP procedures (IEPP)

European Journal of Arrhythmia & Electrophysiology. 2021;7(Suppl. 1):abstr36

SV Verma (Presenting Author) - Baptist Heart and Vascular Institute, Pensacola, Florida; EG Giedrimas - Baptist Heart and Vascular Institute, Pensacola, Florida; NH Hernandez - Baptist Heart and Vascular Institute, Pensacola, Florida; SB Beard - Baptist Heart and Vascular Institute, Pensacola, Florida; SP Pala - Baptist Heart and Vascular Institute, Pensacola, Florida; TA Alsheikh - Baptist Heart and Vascular Institute, Pensacola, Florida

Introduction: Vascular access complications (VAC) are common complications associated with invasive electrophysiology procedures (IEPP) and can lead to significant morbidity and mortality. Reducing the risk of VAC is of considerable interest to Electrophysiologists. We studied the impact of vascular access and vessel closure protocols utilizing ultrasound-guided vascular access (UG) on the incidence of IEPP associated VAC in our institution in a calendar year. Our goal was to achieve a major complication rate of less than 2.5%.

Methods: All patients undergoing IEPP during the calendar year 2020 were included. Patients undergoing EP study, AFIB, SVT, PVC and VT ablations and Watchman device implantation were included. Specific protocols to reduce complications included- Elimination of arterial access for the purpose of blood pressure monitoring, reduction in the number of sheaths per case, universal use of UG for common femoral venous and arterial punctures, and immediate sheath removal in the laboratory facilitated by the use of FDA approved vascular closure devices (VCD)- Perclose Proglide™ (Abbott) in 39.2% of cases or Vascade- MVP™ (Cardiva Medical,Inc) in 33.9% of all cases. Selection of VCD was based upon physician preference.VCD was used in 73% of all EP cases, otherwise manual pressure was held for hemostasis. Intravenous protamine sulfate was used for heparin reversal when applicable. Complications were recorded using prospective physician self-reporting, independent verification by retrospective review of billing codes related to VAC and institutional monitoring. Complications were classified as major if they included AV fistula, pseudoaneurysm or hematoma required surgical or invasive intervention, blood transfusion or readmission. Major and minor complications were recorded and compared to historical cohort from 2018 and 2019.

Results: A total of 690 patients underwent IEPP performed by 4 electrophysiologists in three laboratories at two hospitals. We recorded only 2 minor hematomas (not requiring surgery, thrombin injection or transfusion). 0 patients had AV fistula, pseudoaneurysm or hematoma classified as major. There were 0 procedural deaths recorded from any cause.

Conclusions: We demonstrated that it is possible to drastically reduce and possibly eliminate major vascular complications during EP procedures with careful use of ultrasound guidance for access and judicious use of vascular closure devices. ❑

Oral Abstracts 3 – Mapping & Ablation

37/Catheter ablation in adults with Wolff–Parkinson–White syndrome: a 'real-life' experience

European Journal of Arrhythmia & Electrophysiology. 2021;7(Suppl. 1):abstr37

AX Ying (Presenting Author) - University of Cambridge, Cambridge; B Costa Lemos Silva di Nubila - Royal Papworth Hospital, Cambridge; K Divulwewa - Royal Papworth Hospital, Cambridge; SC Agarwal - Royal Papworth Hospital, Cambridge; DA Begley- Royal Papworth Hospital, Cambridge; AA Grace - Royal Papworth Hospital, Cambridge; PM Heck - Royal Papworth Hospital, Cambridge; CA Martin - Royal Papworth Hospital, Cambridge; GJ Mellor - Royal Papworth Hospital, Cambridge; MS Virdee - Royal Papworth Hospital, Cambridge; SP Fynn - Royal Papworth Hospital, Cambridge

Introduction: Radiofrequency catheter ablation (RFA) is 1st line treatment in symptomatic adult patients with Wolff–Parkinson–White syndrome (WPW). Patients with WPW are often quoted a high success rate for RFA but does this reflect reality? There is a paucity of recent literature, and ongoing service developments in the UK may have affect outcome. Recent significant expansion of departments in the UK means individual operator experience of such cases is reduced. On the other hand, technological developments (such as 3D mapping, steerable sheaths, etc.) may have a positive impact on success rates. We retrospectively assessed the outcome of catheter ablation of WPW at a large UK tertiary cardiology centre over a 13-year period to determine if success rates in this 'real-life' setting were in keeping with the reported literature, and if they had changed over time.

Methods: We collected data on all patients with WPW scheduled for first time RFA between January 2006 and December 2018. All patients undergoing re-do RFA during this time were excluded. For comparison, we divided this time frame into three periods: 2006–2009, 2010–2013 and 2014–2018.

Results: Of the 512 patients, the mean age was 38.6 years and 59.1% (243/512) of patients were male. The outcome of patients undergoing RFA is listed in the *Table 1*. The number of patients scheduled for RFA remained relatively constant; the number of patients scheduled per consultant reduced. The overall success rate was 86.5% and this figure remained constant throughout the 13-year period. The most common accessory pathway location was left free-wall (LFW) pathway, accounting for 44.9% (184/410) of all pathways ablated. The success rate is significantly higher for LFW pathways compared to non-LFW pathways. Significant complications occurred in 1.17% of cases. 19.9% of patients scheduled for an ablation had no ablation attempted for various reasons ('safe' pathway, proximity to AV node, etc.). There was a significant increase in percentage of cases where ablation was not attempted over the period ($p<0.001$).

Discussions and conclusions: The number of adult cases of WPW scheduled for RFA year-on-year remains constant. The complication rate is in line with published literature. The RFA success rate is lower than that reported in an Isareli study ($p<0.001$). When divided by pathway location, the success rate of LFW pathways is not significant different from that reported ($p=0.061$), whereas that of non-LFW pathways is significant lower ($p<0.001$). This could potentially be explained by the lack of availability of 3D mapping for routine cases at our centre. 3D mapping was previously only used in complex, re-do ablations. With our findings, it has been decided that 3D mapping will become routinely available for patients with WPW undergoing RFA at our centre. Further, 1 in 5 cases scheduled for ablation did not proceed to ablation. This highlights an area where realistic expectation setting for patients is needed. ❑

Table 1: Outcome of patients with Wolff–Parkinson–White syndrome scheduled for first-time radiofrequency ablation. Outcome was not known in four patients.

	2006–2009	2010–2013	2014–2018	p-value
Overall success rate, % (n/N)	85.6 (137/160)	86.6 (103/119)	87.4 (111/127)	0.908
Success rate by accessory pathway location, % (n/N)				
Left free-wall	91.5 (65/71)	91.8 (45/49)	95.3 (61/64)	0.654
Non-left free-wall	82.8 (72/87)	84.1 (58/69)	78.7 (48/61)	0.710
Percentage not attempted, % (n/N)	10.5 (19/181)	20.4 (31/152)	29.1 (52/179)	<0.001

Oral Abstracts 3 – Mapping & Ablation

38/A combined endo-epicardial approach, utilising the pericardial CO_2 insufflation technique, to reliably and safely achieve linear radiofrequency lesion sets for persistent atrial fibrillation

European Journal of Arrhythmia & Electrophysiology. 2021;7(Suppl. 1):abstr38

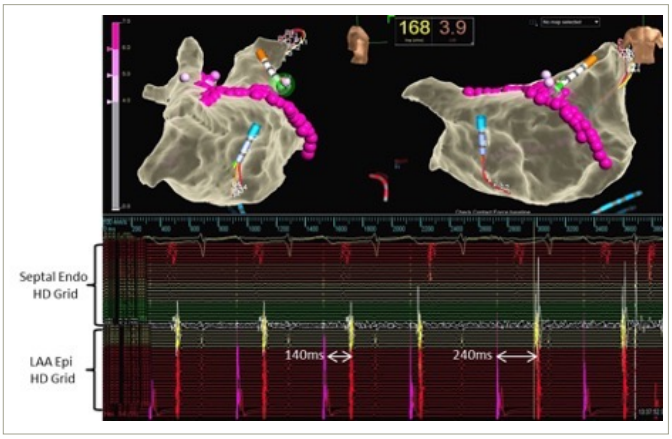
R Amin (Presenting Author) - University Hospitals Sussex NHS Foundation Trust, Brighton; K Moosa - University Hospitals Sussex NHS Foundation Trust, Brighton; J Juliá Calvo - University Hospitals Sussex NHS Foundation Trust, Brighton; J McCready - University Hospitals Sussex NHS Foundation Trust, Brighton; J Silberbauer - University Hospitals Sussex NHS Foundation Trust, Brighton; I Mann - University Hospitals Sussex NHS Foundation Trust, Brighton

Introduction: Recurrence of persistent atrial fibrillation (PsAF) has been attributed to conduction gaps, and non-transmural linear lesion sets. Hybrid thorascopic endo-epicardial AF ablation has been shown to reduce AF recurrence when compared to endocardial ablation alone, however with higher complication rates. We propose that the percutaneous pericardial CO_2 insufflation technique to access the pericardial space can be safely and effectively used for epicardial mapping and ablation of the left atrium (LA).

Methods: In a single centre, 11 patients with PsAF and previous pulmonary vein isolation (PVI) only, underwent concurrent endo-epicardial AF ablation, using the subxiphoid percutaneous pericardial access technique using CO_2 insufflation of the pericardial space, whilst on uninterrupted anticoagulation. Heparinisation targeted an activated clotting time of 350 s. Endo-epicardial geometry and bipolar voltage maps were created, and endocardial ablation performed. The target LSI was 5 for the inferior line, and 6 on the roof and anterior mitral line (AML). If required, additional epicardial ablation was undertaken to establish PVI, and block the LA inferior and roof lines and an AML.

Results: Epicardial access was successful in all 11 patients, with less than 5 mls epicardial bleeding, as was epicardial mapping of the LA using both the transverse and oblique pericardial sinuses. Endocardial ablation alone achieved block in 73% (8 of 11) of roof lines, 91% (10 of 11) of inferior lines and 18% (2 of 11) of AMLs. Epicardial ablation directed on the roof line was required to achieve block in 1 case, and on the upper third of the AML to achieve roof line block in 2 cases. Epicardial ablation of the inferior line was required in 1 case to achieve block. In 9 cases, epicardial ablation directly on the AML was required to achieve trans-mitral block (*Figure 1*). Of the 9 reconnected pulmonary veins following prior PVI, 8 of 9 were reisolated with endocardial ablation and 1, a left upper PV, required epicardial ablation to achieve isolation.

Figure 1: Epicardial ablation on the AML resulting in trans-mitral block. Pacing is from the right atrial appendage, there is one Advisor™ HD Grid placed endocardially on the septal side of the AML and another placed on the lateral side of the AML, in the left atrial appendage



Discussion: Use of the percutaneous subxiphoid pericardial CO_2 insufflation technique to achieve epicardial access for LA mapping and ablation is feasible, and safe whilst on uninterrupted anticoagulation. Limited success in ablation for PsAF beyond PVI may be due to difficulty in creating trans-mural linear lesions. Epicardial ablation can be safely performed to achieve linear block in the roof, anterior and inferior LA. Epicardial structures such as the septopulmonary bundle may contribute to difficulty blocking roof lines endocardially, and account for remote isolation of the roof line via epicardial ablation on the AML. ❑

Posters

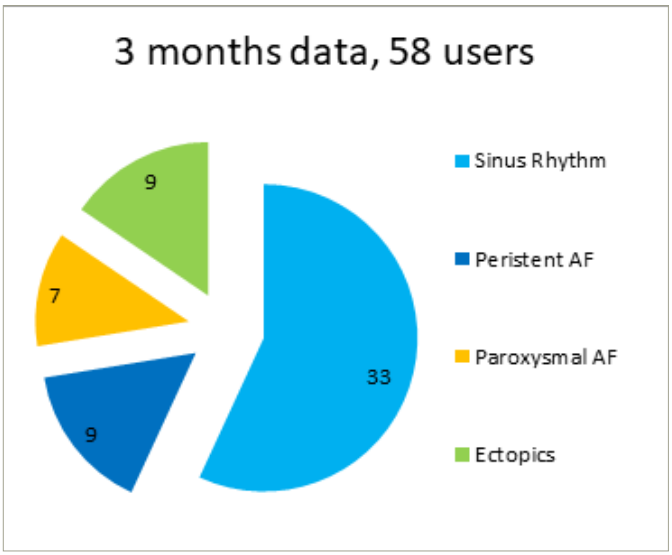
39/THE trial of a smartphone photoplethysmography based application to identify probable atrial fibrillation and ectopic activity in an NHS arrhythmia nurse remote follow up clinic

European Journal of Arrhythmia & Electrophysiology. 2021;7(Suppl. 1):abstr39

C Chapman - University Hospitals of Morecambe Bay NHS Foundation Trust, Kendal; D Ferguson (Presenting Author) - University Hospitals of Morecambe Bay NHS Foundation Trust, Kendal; S Pelton - University Hospitals of Morecambe Bay NHS Foundation Trust, Kendal

The COVID-19 pandemic has had a major impact on how Arrhythmia services are run throughout the UK. There was a need to quickly establish remote clinics without access to diagnostics such as ECG monitoring. Traditionally patients were seen by Arrhythmia nurses in a face to face setting with 12 lead ECG recording available. We set out to trial a smartphone app called Fibricheck for follow up patients in Arrhythmia Clinic. Charitable funds were made available for a 3 month trial. Patients were telephoned a week prior to the remote clinic and asked to record 4 traces a day for 7 days. The data was then available to the Arrhythmia Nurse in clinic to assist with rhythm recognition and potential diagnosis. The app was found to be particularly useful for patients post cardioversion and when a diagnosis of ectopic activity or paroxysmal AF was suspected. It was also useful in titrating medication as heart rate data could be averaged out easily. Patient feedback has been very positive with over 90% of users finding the App to be very useful in confirming diagnosis and heart rate. Use of the App avoided patients having to attend a health care setting for a monitor or an ECG and all follow up arrhythmia clinics were conducted by telephone. We are currently trying to access funding to extend the trial into standard practice, as it use points to a cost saving on outpatient rooms and travelling costs for patients. ❑

Figure 1



Posters

40/Implantable loop recorder wounds- single center review of an outpatient wound closure strip model of care

European Journal of Arrhythmia & Electrophysiology. 2021;7(Suppl. 1):abstr40

H Harvie (Presenting Author) - Barts Heart Centre, London; K Belleca - Barts Heart Centre, London; J Binoy - Barts Heart Centre, London; H Caldeira - Barts Heart Centre, London; R Mravljak - Barts Heart Centre, London; R Ang - Barts Heart Centre, London; MJ Earley - Barts Heart Centre, London; C Monkhouse - Barts Heart Centre, London

Background: Implantable loop recorder (ILR) implants are increasingly done in an outpatient setting by different disciplines. A key component of the implant is the closure of the wound with the scar appearance often the only reminder of surgery. Several techniques for wound closure exist; sutures, staples, glue, and wound closure strips (WCS). Our service has utilised WCS for 5 years. These are porous surgical tape strips which are applied across the wound, pulling the skin on either side of the wound together avoiding the risk of tight or loose sutures, micro damage to the skin and needlestick injury to the operator. Post-COVID-19 pandemic a new process was adopted utilising a two-room model for implant to comply with local COVID-19 restrictions, with a virtual follow up and a wound image review for ILR patients. We sought to review our current practice of wound closure method to critique any complications or wound appearance.

Methods: This is a single centre, retrospective audit of ILR wounds closed with WCS. The wound was assessed by pre-defined criteria: device infection, presence of haematoma, keloid/hypertrophic scarring, device erosion, skin puckering and need for medical review of wound. The wound photos were reviewed by a group of ILR implanters. The study was approved approval from the hospital Clinical Effectiveness Unit (Ref 10849).

Results: 140 consecutive patients' (51% F, age 55 ± 17) wounds were reviewed with the photo occurring 46 ± 33 days post implant. No device infections, hematomas or bruising were reported. 4 (3%) patients wounds were escalated for review, of these: 1 (0.7%) device was explanted and re-sited due to pre-erosion at the scar site; 1 device was explanted due to pain from the device site with no aesthetic compromise. One incomplete skin adhesion and 1 further patient with pain from the device site, which were both managed conservatively. Keloid/hypertrophic scarring were present in 5 patients (4%), and skin puckering was seen in 1 patient (0.7%). Of these patients there was no difference in age, gender, or operator.

Discussion: There is no published literature on wound closure for ILR procedures. Guastafierro A., et. al. 2020 assessed a similar incision for carpel tunnel syndrome in a single centre study using WCS vs sub cuticular sutures. There was no difference between either group in terms of scar appearance or pain, but WCS was a more cost effective method. Our cohort of patients also reported keloid/hypertrophic scars in only 4% of patients, which is lower than expected for surgical procedures, which could be explained by the small incision site in combination with closure method.

Limitations/Recommendation: Long-term wound maturation was not assessed due to only one photograph being received; this limits assessment of scar maturation and whether keloid or hypertrophic scarring was more prevalent. Standardizing wound assessment was a challenge as intervention was delivered and assessed by implanters. Recommendations could include an independent wound review and a wound assessment tool (Stony Brook Scar Evaluation Scale) to quantify appearance.

Conclusion: WCS for ILR implants produces a low complication rate with good cosmetic appearance. This evidence can be a baseline standard for ILR implanting services. ❑

Posters

41/An experience of a nurse-led DC cardioversion service at a district general hospital

European Journal of Arrhythmia & Electrophysiology. 2021;7(Suppl. 1):abstr41

R Dharmapuri Jayavelu (Presenting Author) - Worcestershire Acute NHS Trust, Worcester; T Braby - Worcestershire Acute NHS Trust, Worcester; K O'dowd - Worcestershire Acute NHS Trust, Worcester; D Ramnarase - Worcestershire Acute NHS Trust, Worcester

Introduction: Worcestershire Acute NHS trust provides a nurse-led outpatient direct current cardioversion (DCCV) service since 2013. We do 300 DCCVs per year. A few clinic patients reported awareness at the time of cardioversion which prompted us to audit the service. We aimed to determine the efficacy of this service and the peri-procedural patient experience.

Methods: A prospective survey was done using questionnaires for patients who underwent DCCV. The questionnaire comprised 19 questions which included demographics, an anxiety scale, a visual analogue scale for post-procedure pain score, a Likert scale gauging patient experience, and an open-ended question about the overall experience. We retrospectively collected data from our clinical systems in terms of echocardiographic, electrocardiographic, procedural data (pad position, sedative agent, energy delivered), pharmacotherapy, acute success, and AF freedom at 3 months. Data were analysed using R version 4.1.0 for Linux and graphs were plotted using Microsoft Excel.

Results: 51 patients underwent elective DCCV during the 2-month period. 58% were males and mean age 66 (± 12.3). Mean CHADSVASC was 3 (± 2), mean BMI was 30.6 (± 6.2), mean ejection fraction was 46.2 (± 4.2), 91% had dilated atria, 63% were hypertensive and 37% were diabetic. 92% were acutely successful. 25% experienced pain from the shock and in this cohort, 60 % reported less pain than expected, 39% had pain as expected and 1% had more pain than expected. 98% would accept future DCCVs. 59% of patients who had acutely successful DCCV are awaiting a 3-month follow-up. 55% of patients who remained in sinus rhythm at 3 months received antiarrhythmic pre-treatment. All patients had pre- and post DCCV 12-lead electrocardiograms. 82.3% had pre-DCCV transthoracic echocardiograms.

Conclusion: Our cardiac specialist nurse-led cardioversion service plays a vital role in the rhythm management of atrial fibrillation and atrial flutter. Most patients had a pleasant experience and would undergo future DCCVs. The acute success rate was 92% suggesting good patient selection. AF recurrence was linked to known factors of dilated atria, elevated BMI (p=0.017), and hypertension. As expected, the antiarrhythmic pre-treatment cohort had higher AF freedom at 3 months. We plan at reassessing the 6-month AF freedom. ❑

Posters

42/Radiation exposure associated with atrial fibrillation ablation compared with common radiation sources: a contemporary experience from a high-volume operator

European Journal of Arrhythmia & Electrophysiology. 2021;7(Suppl. 1):abstr42

AS Hameed (Presenting Author) - St Bartholomew's Hospital, London; C Butcher - St Bartholomew's Hospital, London; K Pretorius - The London Bridge Hospital, London; J Horrocks - St Bartholomew's Hospital, London; R Schilling - The London Bridge Hospital and Welbeck Heart Health, London

Background: Techniques for atrial fibrillation (AF) ablation have evolved and reduced patient radiation dose. There are limited contemporary data comparing the dose from AF ablation with other common radiation sources.

Purpose: To assess the radiation dose of contemporary AF ablation techniques; cryo-balloon (CB) and radiofrequency ablation (RF). To compare these doses with common sources of radiation exposure.

Methods: All patients underwent an AF ablation, under general anaesthetic, by a single high-volume operator between January 2018 and December 2019. The primary method of pulmonary vein isolation (PVI) was either CB or RF. 3D mapping was used for RF but not for CB. Transeptal punctures were guided by trans-oesophageal echo. Summary procedural radiation doses were compared to established average dose exposure published in 2011 by Public Health England.

Results: A total of 183 patients were included (Age 60 ± 11, 78.7% male). Overall: Paroxysmal or Permanent AF in 51% and 49% respectively; EHRA class 2 and ≥3 in 78% and 20% respectively; No underlying structural disease in 85%, LA diameter 43 ± 5 mm. The method for PVI was CB in 106 and RF in 77 patients. Overall median dose was 2.7 µgy/m2 (IQR 0-14.1). Median dose for CB were higher than RF (5.9 µg/m2 IQR 2-19 and 0 µgy/m2 IQR 0-4, p<0.001). Comparison between established average dose exposure are shown in *Table 1*.

Conclusion: Radiation exposure during contemporary AF ablation is low. CB has higher patient doses than RF ablation but still lower than a transatlantic flight. Clinician dose behind lead shields and skirts is likely to be lower. The musculoskeletal harm from wearing lead, in this setting, therefore may outweigh the potential radiation protection benefit. ❑

Table 1

Table 1: Comparison between dose received from established averaged radiation doses defined by Public Health England (PHE) and the dose received dependent on ablation strategy

Established Published Average Dose Exposure		Ablation Strategy*	
Source of exposure	Dose (mSv)	Median relative dose received compared to CB (0.012mSv)	Median relative dose compared to overall dose for AF ablation (0.006 mSv)
Dental x-ray	0.005	2.39	1.2
100g of Brazil nuts	0.01	1.19	0.6
Chest x-ray	0.014	0.852	0.429
Transatlantic flight	0.08	0.149	0.075
CT scan of the head	1.4	0.00852	0.00429
UK average annual radiation dose	2.7	0.00442	0.00222
CT scan of the chest	6.6	0.00181	0.000909
Average annual radon dose to people in Cornwall	6.9	0.00173	0.00087

*Relative dose when comparing source of exposure to RF is infinite as median dose is 0 mSv.

Posters

43/Cardiac tamponade as a complication of transseptal puncture: associations and operator-dependent variables during left atrial ablation at Barts Heart Centre

European Journal of Arrhythmia & Electrophysiology. 2021;7(Suppl. 1):abstr43

E Maclean (Presenting Author) - St Bartholomew's Hospital, London; K Mahtani - St Bartholomew's Hospital, London; C Butcher - St Bartholomew's Hospital, London; N Ahluwalia - St Bartholomew's Hospital, London; M Finlay - St Bartholomew's Hospital, London; S Honarbakhsh - St Bartholomew's Hospital, London; A Creta - St Bartholomew's Hospital, London; A Chow - St Bartholomew's Hospital, London; V Sawhney - St Bartholomew's Hospital, London; V Ezzat - St Bartholomew's Hospital, London; MJ Earley - St Bartholomew's Hospital, London; M Dhinoja - St Bartholomew's Hospital, London; S Sporton - St Bartholomew's Hospital, London; MD Lowe - St Bartholomew's Hospital, London; PD Lambiase - St Bartholomew's Hospital, London; F Khan - St Bartholomew's Hospital, London; SY Ahsan - St Bartholomew's Hospital, London; RJ Hunter - St Bartholomew's Hospital, London; RJ Schilling - St Bartholomew's Hospital, London; O Sega - St Bartholomew's Hospital, London

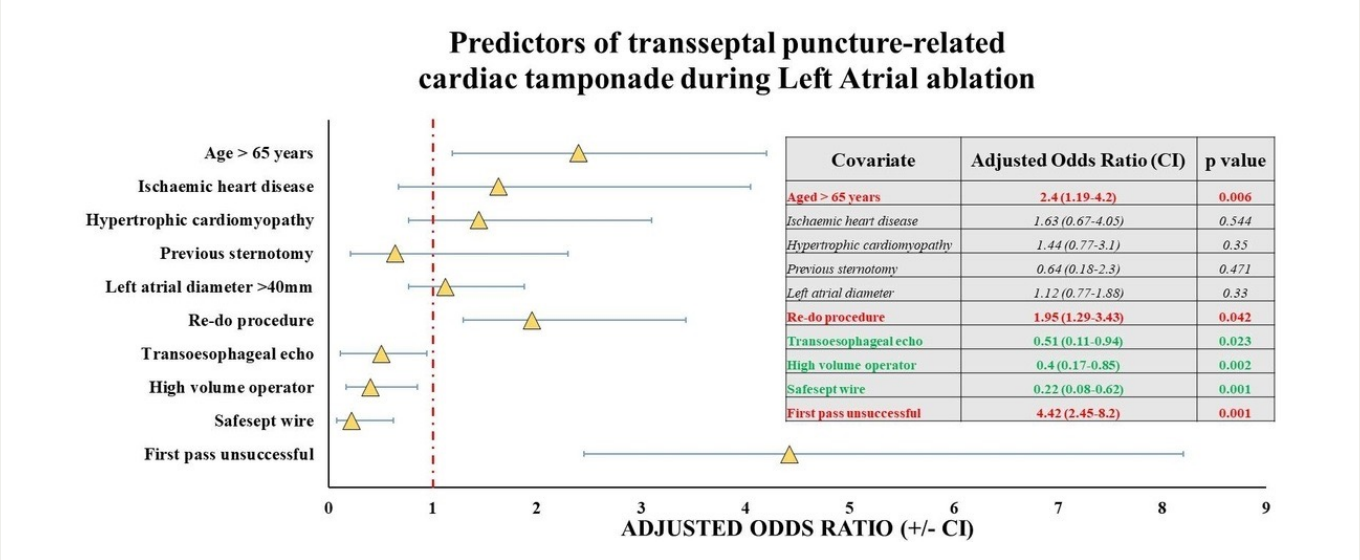
Introduction: Cardiac tamponade is a high morbidity complication of transseptal puncture (TSP). We examined the incidence and predictors of TSP-related cardiac tamponade (TRCT) for all patients undergoing left atrial ablation at our centre from 2016-2020.

Methods: Patient and procedural variables were extracted retrospectively. Cases of cardiac tamponade were scrutinised to adjudicate TSP culpability. Adjusted multivariate analysis (C=0.83) examined predictors of TRCT (OR (95% CI)).

Results: 3,239 consecutive TSPs were performed; cardiac tamponade occurred in 51 patients (incidence: 1.6%) and was adjudicated as TSP-related in 35 (incidence: 1.1%). Patients of above-median age (OR 2.4 (1.19-4.2), p=0.006) and those undergoing re-do procedures (OR 1.95 (1.29-3.43, p=0.042) were at higher risk of TRCT. Of the operator-dependent variables, choice of transseptal needle (Endrys vs BRK, p>0.1) or puncture sheath (Swartz vs Mullins vs Agilis vs Cryosheath, all p>0.1) did not predict TRCT. Adjusting for operator, indication, equipment and demographics, failure to cross the septum first pass increased TRCT risk (OR 4.42 (2.45-8.2), p=0.001), whilst top quartile operator experience (OR 0.4 (0.17-0.85, p=0.002), use of transoesophageal echocardiogram (TOE: OR 0.51 (0.11-0.94), p=0.023), and use of the SafeSept wire (OR 0.22 (0.08-0.62), 0.001) reduced TRCT risk. An increase in SafeSept wire use over time (2018: 20.4%, 2019: 37.5%, 2020: 60.2%) correlated with an annual reduction in TRCT (R^2=0.85, p=0.017) and was associated with a relative risk reduction of 70% (total cost to prevent a TRCT: £4,600).

Conclusions: During left atrial ablation, the independent predictors of TRCT were patient age, re-do procedure, operator experience, unsuccessful first pass, TOE guidance, and use of the SafeSept wire. The SafeSept wire offers minimally traumatic septal perforation and safe advancement into the left atrium to support sheath access; it will be adopted routinely for fluoroscopy-guided TSP in an effort to improve patient safety. ❑

Figure 1



Covariate	Adjusted Odds Ratio (CI)	p value
Aged > 65 years	2.4 (1.19-4.2)	0.006
Ischaemic heart disease	1.63 (0.67-4.05)	0.544
Hypertrophic cardiomyopathy	1.44 (0.77-3.1)	0.35
Previous sternotomy	0.64 (0.18-2.3)	0.471
Left atrial diameter	1.12 (0.77-1.88)	0.33
Re-do procedure	1.95 (1.29-3.43)	0.042
Transoesophageal echo	0.51 (0.11-0.94)	0.023
High volume operator	0.4 (0.17-0.85)	0.002
Safesept wire	0.22 (0.08-0.62)	0.001
First pass unsuccessful	4.42 (2.45-8.2)	0.001

Posters

44/As-required oral anticoagulation guided by rhythm monitoring for stroke prevention in patients with non-valvular atrial fibrillation: a systematic review and meta-analysis

European Journal of Arrhythmia & Electrophysiology. 2021;7(Suppl. 1):abstr44

Andre Briosa e Gala (Presenting Author) - Oxford University Hospitals NHS Foundation Trust, Oxford; MTB Pope - Oxford University Hospital NHS foundation Trust, Oxford; M Leo - Oxford University Hospitals NHS Foundation Trust, Oxford; J Paisey - University Hospital Southampton NHS Foundation Trust, Southampton; N Curzen - University Hospital Southampton NHS Foundation Trust, Southampton; TR Betts - Oxford University Hospital NHS Foundation Trust, Oxford

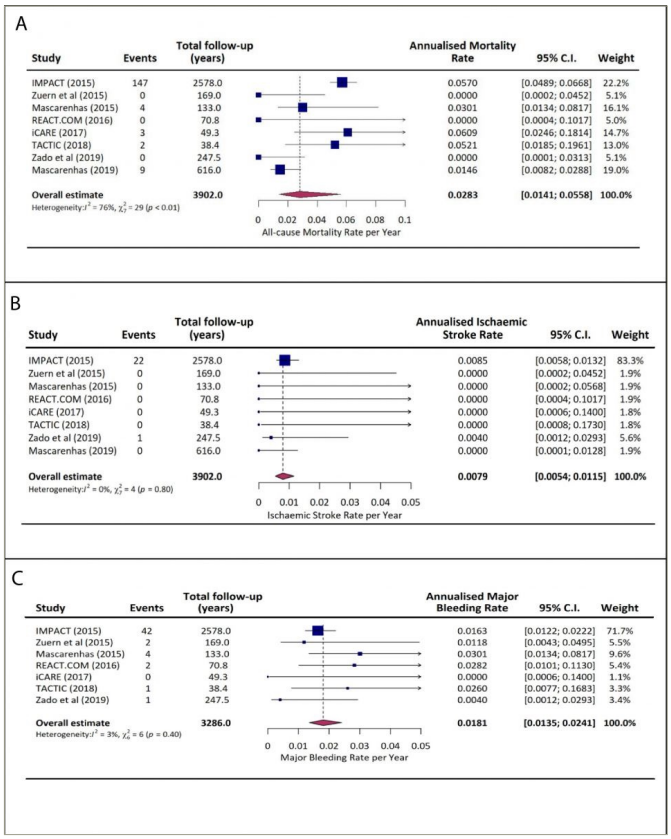
Introduction: Thromboembolic risk appears to be higher in patients with non-paroxysmal atrial fibrillation (AF) and with longer AF episodes. However, guidelines recommend chronic oral anticoagulation (OAC) in patients with AF and additional stroke risk factors without considering AF burden or temporal patterns. Therefore, indefinite OAC may expose patients with short, infrequent AF episodes, to a significant bleeding risk but with limited benefit in stroke reduction. Targeted "as-required" OAC during periods of AF may be an alternative management strategy.

Methods: This systematic review was registered in Prospero (CRD42020209564) and performed in accordance with the PRISMA guidance. Medline and Embase were searched from January 2004 to October 2020 for studies with an "as-required" OAC strategy: OAC anticoagulation during AF episodes which was then stopped if sinus rhythm was maintained. Outcomes of interest (all-cause mortality, ischaemic stroke, major bleeding) were extracted and event rate per year of follow-up and 95% confidence intervals (CI) were calculated. Random effects model was used for pooled estimates.

Results: Of the 1,936 studies retrieved, eight met the inclusion criteria: six prospective observational studies without a control group, one randomised control trial (RCT) and one randomised pilot study (total of 3262 patients on "as-required" OAC strategy). The overall annualised all-cause mortality rate was 2.8% (95% CI: 1.4%-5.6%) per patient-years of follow-up, but the heterogeneity was high (I^2 = 76%). Across all 8 studies, the annualised ischaemic stroke and major bleeding rate was low (0.79% [95% CI: 0.54%-1.15%] and 1.8% [95% CI: 1.3%-2.4%], respectively). REACT.COM and TACTIC-AF reported a reduction in OAC utilisation of 94% and 75%, respectively. IMPACT, the only RCT, showed no difference in the composite of thromboembolism and major bleeding. However, poor adherence to protocol, the population studied (only 10% had a diagnosis of atrial tachyarrhythmias at enrolment) and OAC regime used (80% on vitamin-k antagonist) preclude any definitive conclusions.

Conclusion: Although the overall estimated event rates were low, an adequately powered RCT is required to conclusively demonstrate non-inferiority of an "as-required" approach with direct oral anticoagulants guided by continuous rhythm monitoring to chronic OAC. ❑

Figure 1



Posters

45/Drive-through cardiac implantable electronic device (CIED) clinic post-peak COVID-19

European Journal of Arrhythmia & Electrophysiology. 2021;7(Suppl. 1):abstr45

Z Muddassir (Presenting Author) - West Middlesex University Hospital, London; R Shaikh - West Middlesex University Hospital, London; S Khan - West Middlesex University Hospital, London

Background: Interruption of health services during COVID-19 resulting in delays for patients with cardiac implantable electronic devices (CIED) needing face-to-face appointments due to limited home monitoring or a need for essential troubleshooting.
Purpose: To provide a drive-through CIED clinic to safely perform cardiac physiologist led checks whilst maintaining social distancing with patients.
Methods: An outdoor area was assigned post-peak COVID-19 to house the clinic with personal protective equipment (PPE) and clinic equipment available. A retrospective evaluation was undertaken (14/7/20 – 28/7/20) through feedback questionnaires containing closed and open-ended questions.
Results: 16 patients' feedback was collected. 81.25% found easy clinic accessibility. 93.75% felt comfortable and safe (one patient did not answer). 68.75% preferred drive-through to a hospital, 12.50% liked both and 6.25% preferred the hospital (two did not answer). High satisfaction rates were backed with comments that excellent care was provided in a safe environment. Improvement suggestions included having a toilet near-by and a need for clear clinic signage.
Conclusions: This project enable essential CIED optimisation to be held in a minimal COVID-19 area, in line with joint CIED guidelines published. The clinic closed for winter; however, implementation of a permanent outdoor structure will allow for continued reduced risk, reassurance and delivery of patient preferred care. ❑

Posters

46/Predictors and clinical outcomes in patients undergoing cardiac resynchronization therapy (CRT) versus CRT upgrade in a real-world tertiary centre

European Journal of Arrhythmia & Electrophysiology. 2021;7(Suppl. 1):abstr46

C Sohrabi (Presenting Author) - Electrophysiology Department, Barts Heart Centre, St Bartholomew's Hospital, London; N Papageorgiou - Electrophysiology Department, Barts Heart Centre, St Bartholomew's Hospital, London; JSC Del Mundo - Electrophysiology Department, Barts Heart Centre, St Bartholomew's Hospital, London; N Aziminia - Electrophysiology Department, Barts Heart Centre, St Bartholomew's Hospital, London; M Finlay - Electrophysiology Department, Barts Heart Centre, St Bartholomew's Hospital, London; A Creta - Electrophysiology Department, Barts Heart Centre, St Bartholomew's Hospital, London; PD Lambiase - Electrophysiology Department, Barts Heart Centre, St Bartholomew's Hospital, London; S Ahsan - Electrophysiology Department, Barts Heart Centre, St Bartholomew's Hospital, London; P Moore - Electrophysiology Department, Barts Heart Centre, St Bartholomew's Hospital, London; M Dhinoja - Electrophysiology Department, Barts Heart Centre, St Bartholomew's Hospital, London; S Sporton - Electrophysiology Department, Barts Heart Centre, St Bartholomew's Hospital, London; MJ Earley - Electrophysiology Department, Barts Heart Centre, St Bartholomew's Hospital, London; RJ Schilling - Electrophysiology Department, Barts Heart Centre, St Bartholomew's Hospital, London; C Hayward - Electrophysiology Department, Barts Heart Centre, St Bartholomew's Hospital, London; R Providência - Electrophysiology Department, Barts Heart Centre, St Bartholomew's Hospital, London; R Hunter - Electrophysiology Department, Barts Heart Centre, St Bartholomew's Hospital, London; AW Chow - Electrophysiology Department, Barts Heart Centre, St Bartholomew's Hospital, London; A Muthumala - Electrophysiology Department, Barts Heart Centre, St Bartholomew's Hospital, London

Introduction: The role of pre-implant and intra-procedural parameters on mortality and hospitalisation for heart failure (HHF) in patients undergoing implantation with cardiac resynchronization therapy pacemaker (CRT-P) or defibrillator (CRT-D) versus CRT upgrade is poorly defined. In the present study we aimed to evaluate mortality predictors and clinical outcomes in patients undergoing CRT-P/D versus CRT upgrade.

Methods: This was a single-centre retrospective study of nine-hundred and thirty-three (933) patients receiving de novo implantation of CRT-P/D or CRT upgrade between 2016-2020: CRT-P (n=264), CRT-D (n=448), and CRT upgrade (n=221). The mean left ventricular ejection fraction was 34.9 ± 12.8 and median follow-up was 29.0 (17-41) months.

Results: We found that recipients of CRT-D were significantly younger (68.0 ± 11.9) than CRT-P (76.2 ± 10.8) and upgrade (71.8 ± 14.0; p<0.001) and had a higher uptake of oral anticoagulants (p=0.001) and aldosterone antagonists (p<0.001). CRT-P recipients were more likely to have baseline atrial fibrillation (AF; p<0.001). Overall mortality was significantly higher in upgrade (14.1%) and CRT-P (12.9%) patients versus those receiving CRT-D (8.7%) (p=0.039). On multivariate analysis, chronic kidney disease (CKD) and anaemia predicted both mortality (OR: 3.5 [2.1-5.9; 95% CI] p<0.001, and OR: 1.8 [1.1-3.2; 95% CI] p=0.024, respectively) and HHF (OR: 3.8 [1.6-9.2; 95% CI] p=0.003, and OR: 2.9 [1.3-6.6, 95% CI] p=0.012, respectively). In addition, the presence of diabetes mellitus predicted HHF (OR: 2.2 [1.0-4.7; 95% CI] p=0.047), while AF was associated with a higher likelihood of mortality as compared to patients in sinus rhythm (13.6% vs. 10.1%; p=0.045). In patients with CRT-D, use of a bipolar lead was associated with a significantly higher rate of mortality (16.7% vs. 10.7%; p=0.024) and HHF (8.0% vs. 4.0%; p=0.011) compared with use of a multipolar lead.

Conclusion: Our results showed that mortality is higher in patients receiving CRT upgrade or CRT-P as compared to CRT-D recipients. In addition, CKD, anaemia, diabetes mellitus, and presence of AF are associated with either higher mortality or HHF or both. The use of bipolar leads in patients with CRT-D was associated with poorer clinical outcomes compared to use of multipolar leads. ❑

Posters

47/Association between very high NT-proBNP levels, and haemoglobin and ferritin

European Journal of Arrhythmia & Electrophysiology. 2021;7(Suppl. 1):abstr47

A Sabharwal (Presenting Author) - Mid Yorkshire Hospitals NHS Trust, Wakefield; S Sala - Mid Yorkshire Hospitals NHS Trust, Wakefield; V Nayar - Mid Yorkshire Hospitals NHS Trust, Wakefield

Introduction: The adverse prognosis in heart failure (HF) correlates with both NT-proBNP and high-sensitivity CRP levels. The latter indicates a greater underlying inflammatory process in more severe heart failure. This inflammatory response is also evidenced by elevated ferritin (acute phase reactant) and reduced haemoglobin (bone marrow suppression) amongst these patients. It is unclear if there is a linear relationship between NT-pro BNP with ferritin and haemoglobin levels.

Methods: We conducted a retrospective, cross-sectional study evaluating ferritin and haemoglobin values amongst patients with very high NT-proBNP levels (greater than 10,000 pg/ml).

Results: From October to December 2020, 150 patients were identified with very high NT-proBNP levels at a district hospital serving a local population of 500,000. 45 patients had a measured haemoglobin and ferritin level. We noted a direct correlation between NT-proBNP with ferritin and an indirect correlation between NT-proBNP and haemoglobin. With NTproBNP on the x-axis and haemoglobin on the y-axis, the trend line equated y = -0.0003x + 124.88. With NTproBNP on the x-axis and ferritin on the y-axis, the trend line equated y = 0.0043x + 311.6.

Conclusion: At very high NT-proBNP levels, haemoglobin levels decrease, and ferritin levels increase in a linear manner (small sample size did not allow for statistical significance). This is corroborated by data showing a direct relationship between high-sensitivity CRP and worsening heart failure. It is unclear if either ferritin or haemoglobin (or their temporal trend) can be utilised as a surrogate for measuring the underlying inflammatory process or in determining the prognosis in heart failure. ❑

Posters

48/Atrial fibrillation related stroke - better primary/secondary care communication needed

European Journal of Arrhythmia & Electrophysiology. 2021;7(Suppl. 1):abstr48

Mr Motta (Presenting Author) - NHS Kernow CCG, Newquay; Mr Wilcock - Royal Cornwall Hospital Trust, Truro; Dr Dhulkotia - Launceston Medical Centre, Launceston

Introduction: Protecting individuals from atrial fibrillation (AF)-related stroke through the appropriate initiation of anticoagulation therapy is a national priority. Based on QOF 2019/20, in Cornwall 1,340 (10%) people with AF at risk of stroke were not prescribed anticoagulant therapy. Like many health systems, for the last couple of years our provider acute trust stroke team has retrospective reviewed patients admitted with ischaemic stroke. Results so far have demonstrated that of 689 cases of ischaemic stroke reviewed in 2020, 165 had a prior diagnosis of AF and 85 (51%) of these were not anticoagulated on admission. NHS Kernow CCG medicine optimisation (MO) team was asked to support secondary care to understand why there was an increase in 2020 in the proportion of admitted patients with AF who were not anticoagulated.

Method: The stroke team shared a list of 85 patient (69 patients plus 16 additional anonymised deceased patients) known only by their NHS identification number and GP practice identification code. The list was from the full year 2020, and identified patients admitted with a stroke and with a prior diagnosis of AF but not anticoagulated. 33 GP practices registered in Cornwall were identified through the list. The MO team has started investigating these patients' records in order to establish if there were any common themes or reasons for lack of anticoagulation.

Results: Thirty-four patients (from 15 practices) have been reviewed so far. Nineteen (56%) were male and the majority - 21 (62%) patients - were over 80 years old. Nineteen (56%) of the 34 patients had a record on the GP system of AF before the admission for stroke, and 15 (44%) did not have any such record. The reasons for these 19 patients not being on anticoagulant were due to contraindications for 10 (53%) patients, such as subdural haematoma, rectal haemorrhage, age-frailty, ulcerative oesophagitis; declined anticoagulant for five (26%) patients; actually prescribed anticoagulant for three (16%) patients; and one patient (5%) was diagnosed a few months before the stroke, but upcoming surgery delated the therapy.

Conclusion: For 15 of the 34 patients, it would appear that the hospital categorisation of having AF and not being on anticoagulant was incorrect in that the GP record did not make mention of an AF diagnosis before the stroke. Nineteen patients with a pre-existing diagnosis had a valid reason recorded in the GP system for not being on an anticoagulant - this may not have been clear to the stroke audit team. Whilst declining treatment is an acceptable outcome of properly undertaken shared decision-making (five of our patients), patients' beliefs about AF related stroke and anticoagulation may need to be explored. Three of these 19 were actually on an anticoagulant prior to admission. However, increasing vigilance and better understanding of risk/benefit of anticoagulants can prevent the occurrence of future strokes and associated morbidity. The audit has raised some important questions about how secondary care record AF diagnosis and management in primary care, but also further awareness and campaigns would be recommended to improve detection of stroke risk factors in the community in order to combat the rising incidence of stroke in the elderly population. ❑

Posters

49/Multi-disciplinary heart failure- Device clinic improves management of heart failure patients following complex device implantation

European Journal of Arrhythmia & Electrophysiology. 2021;7(Suppl. 1):abstr49

A Chawla (Presenting Author) - Nottingham University Hospitals NHS Trust, Nottingham; V Koonal - Nottingham University Hospitals NHS Trust, Nottingham; MJ Ng Kam Chuen - Nottingham University Hospitals NHS Trust, Nottingham

Introduction: Complex device therapy (CDT) [cardiac resynchronisation therapy pacemaker or defibrillator (CRTP or CRTD) and implantable cardioverter defibrillator (ICD)], is recommended in patients with heart failure (HF) with severe left ventricular systolic dysfunction if they are still symptomatic despite optimisation HF medication. Several patients however, will only tolerate optimal doses of these drugs after CDT, the latter protecting them from significant bradycardia or improving renal and haemodynamic function. Furthermore, post-implant follow up of CDT patients is variable in our centre, with patchy clinician review and technical follow up in the General Pacing Clinic (GPC) without the necessary time and technical expertise to optimise device function.

Methods: We set up a HF-Device clinic staffed by a HF nurse and a highly skilled pacing physiologist, supervised by a Consultant Cardiologist. The aims were to optimise device programming for HF symptoms and battery longevity; optimise HF medication and overall care; ensure community HF nurse care where appropriate; identify clinical issues such as occurrence of new atrial fibrillation (AF). Patients were invited to attend in person, although some opted for telephone appointments. If they did not attend, their remote CDT downloads were analysed and recommendations made for further optimisation of their HF care. Patient demographics, device and clinical findings, and device and clinical interventions were documented.

Results: Between 7th July 2020 and 6th April 2021, 65 clinic visits occurred involving 57 patients [mean age 73, ± 11.56 years; range 28-90); 40 (71%) male; 19(34%) ischaemic cardiomyopathy; 23 (41%) dilated cardiomyopathy; 15 (20%). Other cardiomyopathy; 28 [(50%) had AF]. Of the 65 clinic visits, 7 (11%) were for ICD; 33 (51%) for CRTD and 25 (38%) for CRTP; 47 (72%) were in-house and 18 (28%) were remote appointments. Sources of referral included 43 (77%) 6-week post implant checks, 6 (11%) 3-month post implant checks; 4 (7%) from GPC, and 3 (5%) from consultants. 16 (25%) visits were scheduled due to ongoing technical or clinical issues. *Table 1* shows a summary of the technical and clinical findings and respective interventions.

Table 1: Findings and interventions during HF Device clinic.

Technical findings	7
Increased LV lead threshold	5
Not programmed appropriately	1
Phrenic nerve stimulation	1
Technical interventions	30
LV lead vectors and output optimised	17
Other CRT settings optimised	7
Basic Pacing settings optimised	6
Clinical device findings	30
New AF	10
Non sustained VT	5
Sub-optimal biventricular pacing	11
Treated/untreated VT/VF episodes	4
Clinical interventions	84
Change in medication	44
Blood tests	11
Referral to community HF nurse	7
Discussed with/referred to cardiologist	22

Legend: HF: heart failure; LV: left ventricular; CRT: cardiac resynchronisation therapy; AF; atrial fibrillation; VT/VF: ventricular tachycardia/fibrillation

Conclusion: During the course of 65 clinic visits, the HF-Device clinic identified a total of 37 technical and clinical abnormalities. 30 technical device interventions and 84 clinical interventions took place to address these, as well as to optimise patients' clinical status and device settings. The HF-Device clinic has enabled us to strengthen and standardise the management of our HF device patients following CDT. ❑

Posters

50/Junctional bradycardia and transient global amnesia: a case report

European Journal of Arrhythmia & Electrophysiology. 2021;7(Suppl. 1):abstr50

R Gardiner (Presenting Author) - St James's Hospital, Dublin; D Ranganathan - St James's Hospital, Dublin; S O'Callaghan - St James's Hospital, Dublin; R Murphy - St James's Hospital, Dublin

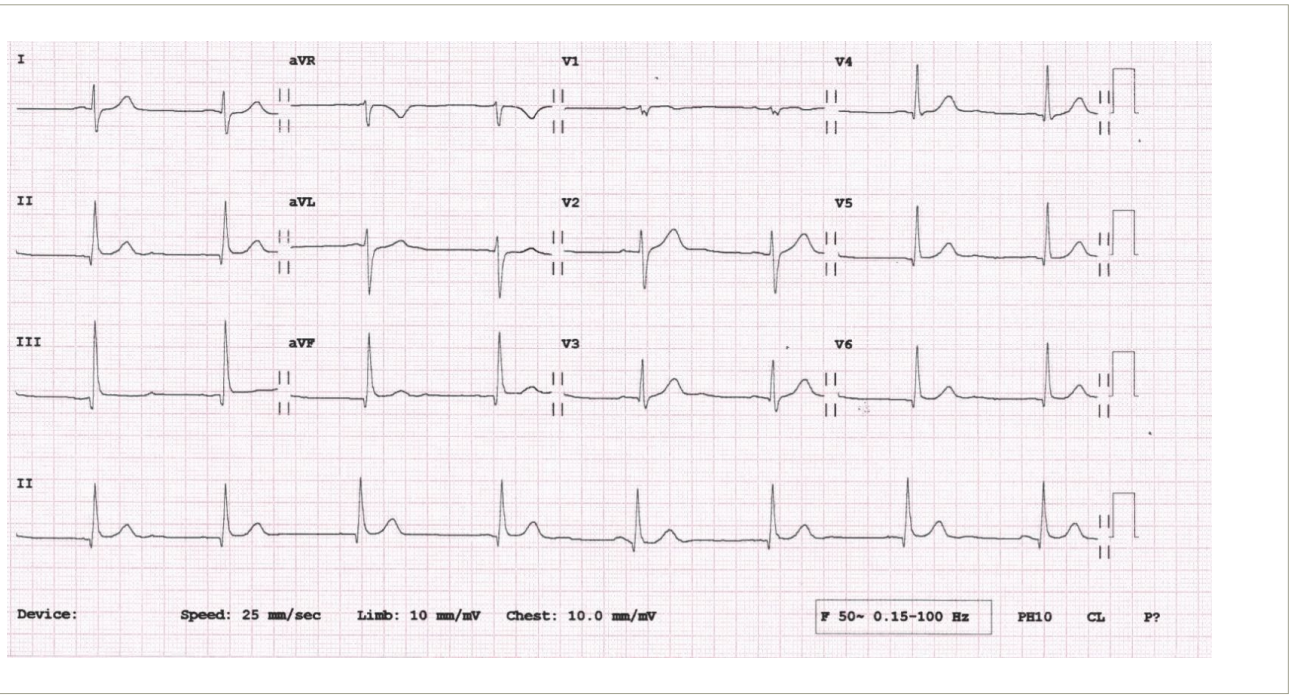
Introduction: Transient global amnesia (TGA) is a clinically important syndrome with a poorly understood aetiology. Patients display sudden and severe anterograde memory impairment associated with differing levels of retrograde amnesia and executive dysfunction. One theory is that TGA occurs as a result of hypoxia and ischaemia affecting susceptible parts of the brain. We report a case of TGA in a patient who was found to have a bradyarrhythmia. We propose that cerebral hypoperfusion resulted in this episode of TGA.

Case presentation: A 70-year old male with a background of hypertension and hypercholesterolaemia presented to the Emergency Department following an episode of altered behaviour and cognition. He had no recollection of the day's events. His daughter reported he was acting strangely and driving recklessly around the city. On review he was asymptomatic but had a memory gap for approximately 10 hours of that day. On physical examination he was alert and fully orientated. His heart rate was 49 beats/minute (bpm) and his blood pressure was 169/77 mmHg. Cardiovascular examination revealed no murmurs or evidence of heart failure. Neurological exam was non-contributory. He scored 29/30 on the Mini Mental State Exam. Electrocardiogram showed a junctional bradycardia with a ventricular rate of 49 bpm, no ST segment changes and a corrected QT interval of 398 ms (*Figure 1*). The ventricular escape rate was as low as 26 bpm on 24 hour telemetry. Brain CT showed mild cerebral atrophy and MR-Angiogram revealed age-appropriate chronic small vessel ischaemic changes. Cerebrospinal fluid analysis, encephalocardiogram and transthoracic echo were normal. Given the history and risk factors, investigations first focused on ruling out a transient ischemic attack, autoimmune encephalitis and transient epileptic amnesia. Following this, we concluded that his symptoms were in keeping with TGA. He had a dual chamber permanent pacemaker (PPM) implanted. A pacemaker check 1 year later showed atrial pacing of 96.8% and ventricular pacing of 0.2% with an underlying ventricular escape rate of 40 bpm. No further amnesic episodes had occurred.

Discussion: Although various mechanisms have been suggested (such as hypoxia, migrainous phenomena, epilepsy and psychogenic disorders), there is no consensus on the pathogenesis of TGA. The hippocampus is involved in formation and retrieval of new episodic memories and is believed to be the primary site of involvement in TGA. On a cellular level, the highly metabolically active neurons in the hippocampus are particularly vulnerable to ischaemia.

There is evidence to suggest that low heart rates can contribute to 'cardiac dementia'. This is a term that refers to progressive ischemia of the brain secondary to asymptomatic dysrhythmias and hypotension. Brain CT scans of bradycardic patients show more advanced atrophy when compared to age-matched subjects with normal heart rates. Bradycardic patients who underwent PPM insertion were shown to have improvement in cognitive function. Changes in haemodynamics may play an important role in the regulation of cerebral circulation, especially in elderly patients who may suffer from blunted cerebral autoregulation. In this case, we postulate that the degree of cerebral hypoperfusion resulted in transient cerebral dysfunction that presented as an episode of TGA. Physicians need to investigate for bradyarrhythmias in patients with TGA and be cognizant of the potential therapeutic avenue of PPM implantation. ❑

Figure 1



Posters

51/Remote Monitoring Service Role during COVID-19: out of sight, but not out of Heart

European Journal of Arrhythmia & Electrophysiology. 2021;7(Suppl. 1):abstr51

S Silva (Presenting Author) - Royal Papworth Hospital, Cambridge; A Yardley - Royal Papworth Hospital, Cambridge; I Turner - Royal Papworth Hospital, Cambridge

Background: Royal Papworth Hospital is a tertiary center which manages over 7,000 pacemaker (PPM), implantable defibrillator (ICD) and biventricular (CRT-P and CRT-D) patients each year. Patients are normally seen in face-to-face (F2F) clinics, including outreach and home visits, at least once per year with more complex devices also having remote follow-up (RFU). This typically results in a combined total of over 10,000 appointments (appt) per year. During the COVID-19 pandemic, starting in March 2020, the device service was rapidly re-structured to allow safe follow-up of patients with minimal F2F appts, as many were shielding (average age of 75 years). A process was developed by the physiology team to triage patients into low, medium and high risk groups, selecting only the highest risk patients to attend F2F appts for detailed assessment or programming changes. In parallel with this we embarked on a program of enrolling selected patients into RFU by posting RFU boxes and offering telephone virtual appts. Patients not suitable for RFU had appts deferred when appropriate. There was also a specialist group of physiologists and cardiologists assessing any possible early box changes.

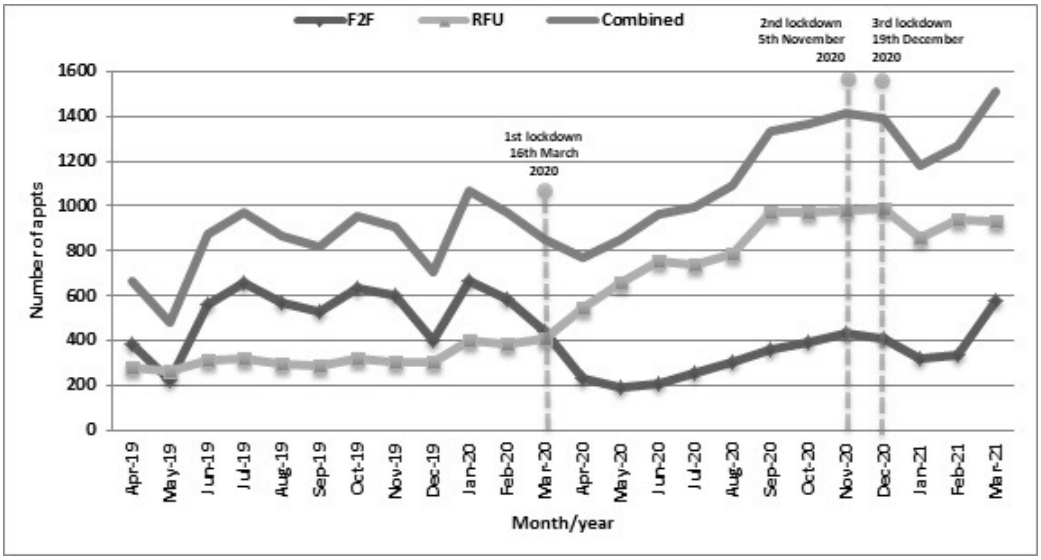
Objective: To assess the impact of changes imposed by COVID-19 restrictions on cardiac devices follow-up and how re-structuring the service with careful triaging enables to quickly adapt to these new conditions with greater use of RFU.

Methods: We retrospectively reviewed patient records for the year before (March 2019-March 2020) and for the year after COVID-19 (March 2020-March 2021) to look at the number of appts for each patient, the type of appt and the outcomes in terms of patient management.

Results: In the year pre COVID-19 we followed up 7,339 patients (1446 via RFU - 19.7%) and post 7158 patients (4061 via RFU - 56.7%) - p<0.001 using analysis of proportions. The percentage of patients on RFU with each type of device increased significantly (PPM 0.6% to 38%, CRTP 28% to 84%, ICD 62% to 86%, CRTD-57% to 84%, all p<0.001). 93% of patients contacted accepted remote follow-up. 3% of the patients contacted were deemed unsuitable (factors such as dementia making them unable to set-up RFU) and 4% of patients refused RFU. Failure to attend rates fell from 9.6 to 8% under the new scheme. The major limiting factor in further expanding RFU services is the lack of RFU compatibility on older devices and availability of RFU equipment from companies. Rota allocations showed that around 320 man/hours per month were used on clinical follow-up prior to COVID-19 and around 360 man/hours per month post. The majority of the increase was due to the time to triage patients and also the longer time taken to contact patients via phone for RFU sessions. RFU did however allow some staff to work from home and weekend RFU cover was also introduced to respond to service demands. The number of each type of appointment with the various lockdowns is shown in the graph below. There were no apparent increases in emergency admissions for pacing issues or emergency box changes pre and post suggesting that the scheme is safe.

Conclusions: With careful use of a systematic triaging system and increased reliance on RFU virtual clinics it is possible to maintain a safe and effective device follow-up service whilst also limiting unnecessary visits to hospital by the patients in an effort to reduce COVID-19 transmission. ❑

Figure 1



Posters

52/Cardiac implantable electronic device wound surveillance in the COVID-19 era: feasibility and outcomes - a single centre experience

European Journal of Arrhythmia & Electrophysiology. 2021;7(Suppl. 1):abstr52

J Collinson (Presenting Author) - Essex Cardiothoracic Centre, Mid- and South Essex NHS FT, Basildon; J Shipton - Essex Cardiothoracic Centre, Mid- and South Essex NHS FT, Basildon; S Toora - Essex Cardiothoracic Centre, Mid- and South Essex NHS FT, Basildon; J Sibley - Essex Cardiothoracic Centre, Mid- and South Essex NHS FT, Basildon; S Tan - Essex Cardiothoracic Centre, Mid- and South Essex NHS FT, Basildon; N Srinivasan - Essex Cardiothoracic Centre, Mid- and South Essex NHS FT, Basildon

Introduction: BHRS guidelines state an objective of device follow up is to monitor the device site for signs of infection.

The COVID-19 pandemic changed our centres follow up practice where 2–6-week post implant checks were performed 'remotely' as a telephone consultation. To ensure the device site was monitored at this check we developed a process of wound surveillance with patients asked to send in a photo of their device site to coincide with their telephone appointment. We performed a retrospective audit to review this method of wound surveillance, to assess the process and look for areas of service improvement.

Method: All patients with a 2–6-week 'remote' post implant check were asked to send a photo of their device site to a secure email address, prior to their planned appointment. Where patients were not able to send a photo, a series of questions about the wound site were asked (see *Figure 1*). Wound concerns were referred to our specialist arrhythmia nurses for review. Reports between 15th June 2020 and 16th April 2021 were retrospectively reviewed and analysed for:

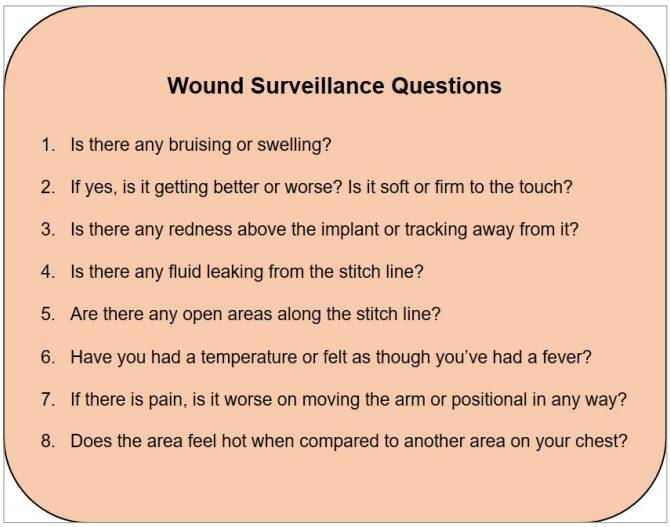
- photo received status and whether the photo was attached to file
- comments on the wound status
- wound concerns requiring escalation.

Notes and email communications were reviewed to determine outcomes of escalated concerns.

Results:

- 686 checks were performed 'remotely' at the 2–6-week post implant stage.
- 345 (50.3%) were pacemakers checks. 341 (49.7%) were ICD or CRT-P/D checks.
- 398 (58%) patients were able to send a photo of their wound site.
- 288 (42%) were unable to send a photo and were asked a series of questions.
- 47 patients (6.9% of all patients) were referred to our specialist nurses for review.
- 39 patients were from the photo received group (9.8% of all from the photo received group).
- 17 (43.6%) required a hospital visit to inspect the wound. 22 (56.4%) received a call only and required no intervention.
- 8 patients were referred from the questions only group (2.8% of all from the questions only group).

Figure 1



- All 8 (100%) attended hospital for a face to face assessment.
- 11 patients in total (1.6%) required an intervention.
- 8 from the photo received group. 3 from the questions only group.
- 7 required a stitch to be trimmed or the site re-dressed
- 3 required a 7 day course of antibiotics
- 1 patient required a system explant

Conclusion: Wound photos can be used as a method of wound surveillance for patients undergoing 'remote' device follow up checks; however, many patients lack the ability or resource to send a photo.

Where patients were not able to send a photo, a streamlined series of questions provided safe reassurance and monitoring of the wound.

To justify the time needed to manage wound photos, strategies are required to increase patient participation.

With low numbers of patients requiring interventions, a system of robust questioning with wound photos only when there are wound concerns, may be a better and more resource efficient method of wound monitoring. ❑

Posters

53/Emergency pacemaker implants in nonagenarians: bedside determinants of prognosis

European Journal of Arrhythmia & Electrophysiology. 2021;7(Suppl. 1):abstr53

E Maclean (Presenting Author) - St Bartholomew's Hospital, London; K Mahtani - St Bartholomew's Hospital, London; M Parker - St Bartholomew's Hospital, London; P Moore - St Bartholomew's Hospital, London; A Chow - St Bartholomew's Hospital, London; S Sporton - St. Bartholomew's Hospital, London; A Muthumala - St Bartholomew's Hospital, London; C Monkhouse - St Bartholomew's Hospital, London

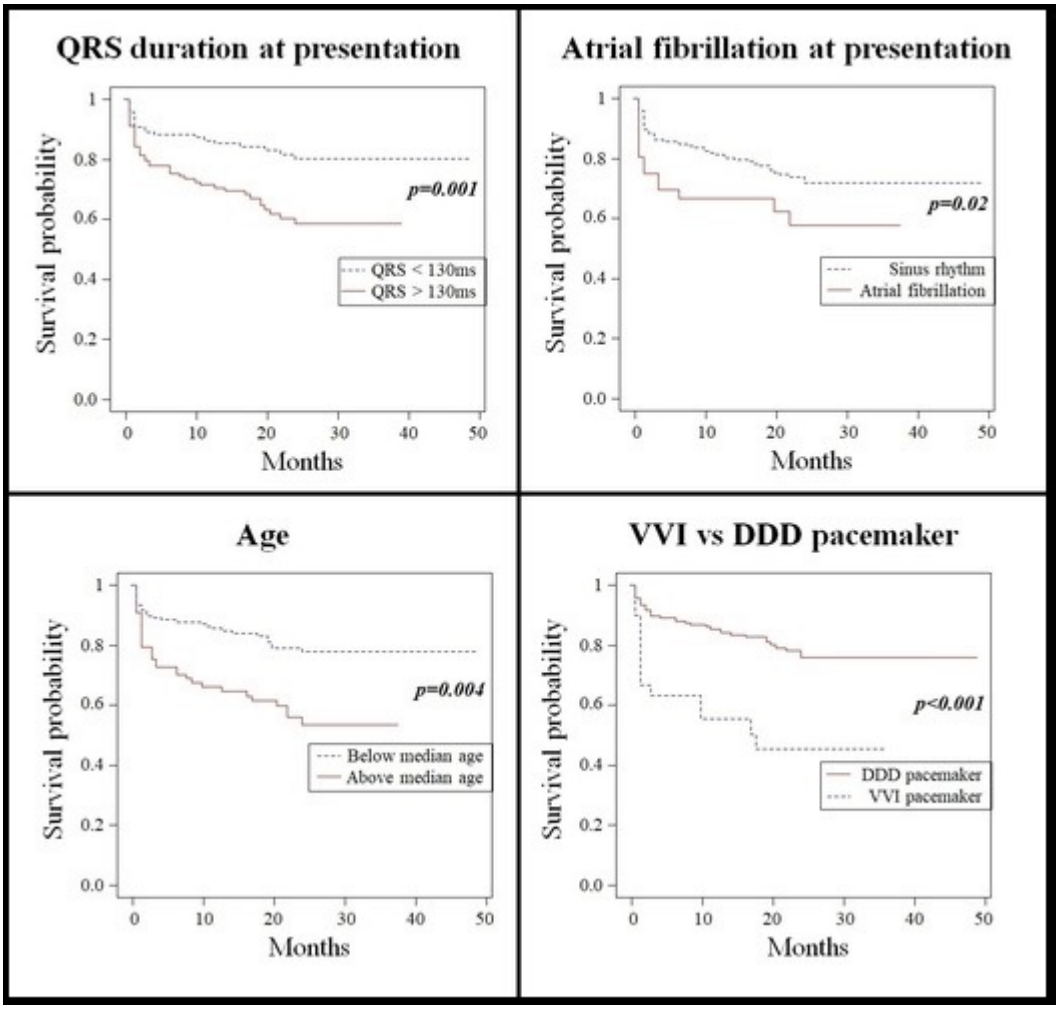
Introduction: Nonagenarians are under-represented in clinical trials of cardiac implantable electronic devices (CIEDs). Complete heart block (CHB) is a time-critical emergency and, particularly in elderly patients, the absence of test results or a comprehensive medical history can challenge operator decision-making, especially when permanent pacing is preferred. In patients over 90 years of age undergoing emergency CIED implant for CHB, we examined the prognostic value of data available from bedside examination and focussed echocardiogram alone.

Methods: Data were extracted for the period 2016-2019. Bedside covariates were age, sex, previous cardiac surgery, atrial rhythm, LV systolic function, syncope at presentation, and QRS duration. Cox-proportional hazards regression examined associations with mortality (adjusted HR, 95% CI).

Results: 232 patients were included (age 94.1 ± 3.3 years, 50.2% male, dual chamber device implanted: 71.9%, single chamber: 26.4%, CRT: 1.7%). Mortality was 13.8% at 90 days and 27.2% at 27.1 ± 16.7 months. The independent predictors of mortality were pre-procedural QRS duration >130 ms (HR 2.4 (1.4-4.1) p=0.001), age (HR 1.07 (1.02-1.15) p=0.004) and AF (HR 2.0 (1.1-3.6) p=0.02). Sex, syncope at presentation, LV function or previous cardiac surgery were not associated with patient mortality (all p>0.1). In 196 patients without AF, 84.7% were implanted with dual chamber pacemakers; this was associated with an adjusted survival benefit versus single chamber pacing (HR 0.38 (0.25-0.56) p<0.001) despite two atrial lead re-interventions in the dual chamber group.

Conclusions: Nonagenarians undergoing emergency CIED implant have a reasonable prognosis. Data ascertained at the bedside can help predict survival; in the absence of AF, dual chamber pacing may confer a mortality benefit, however this association requires further investigation. ❑

Figure 1



Posters

54/Smartphone electrogram for atrial fibrillation screening in Malaysian elderly

European Journal of Arrhythmia & Electrophysiology. 2021;7(Suppl. 1):abstr54

JG Ang (Presenting Author) - Hospital Taiping, Taiping; HH Hasnan - Hospital Ipoh, Ipoh; KR Narasamuloo - Hospital Sultanah Bahiyah, Alor Setar; AS Abdullah - Hospital Sultanah Bahiyah, Alor Setar; SK Krishinan - Hospital Sultanah Bahiyah, Alor Setar

Introduction: Atrial fibrillation (AF) is the commonest cardiac arrhythmia in clinical practice that is associated with increased risk of stroke, heart failure and cardio-vascular mortality. It is often undiagnosed and undertreated as patients tend to be asymptomatic. Systemic screening at community level for atrial fibrillation with smartphone electrogram had shown to pick up undiagnosed AF, but the data in Asia Pacific region is scarce. Hence, the aim of this study is to assess the feasibility of smartphone electrogram for atrial fibrillation screening in Malaysian elderly.

Methods: In the period between 1st January 2018 to 31st December 2018, 2,149 participants were screened with smartphone electrogram using Kardia Mobile (AliveCorVR, Mountain View, CA, USA) in the community-based AF screening programme. The inclusion criteria included age ≥65 years old who consented to the study. The electrograms were classified into three groups, namely sinus rhythm, AF and uninterpretable. Participants with uninterpretable electrogram were referred conventional 12-lead ECGs, which were reviewed by the prime investigator.

Results: 137 (6.4%) out of 2,149 smartphone electrogram were uninterpretable. 44 (2%) participants had newly diagnosed AF, with 31 (70.4%) were asymptomatic. The prevalence rates of AF detected by smartphone electrogram was 6.9% and prevalence rates of AF detected by smartphone electrogram or self reported by participants was 8.1%. Using multivariable logistic regression analysis, independent predictors of AF include male gender, history of stroke, heart failure, valvular heart disease and thyroid disease.

Conclusion: Community screening for AF with smartphone electrogram was feasible and effective. The prevalence rates of AF in Malaysian elderly was comparable to western population. High proportion of newly diagnosed asymptomatic AF (70.4%) illustratrated the importance of community screening in elderly population. ❑

Posters

55/A single tertiary centre experience of post pandemic bradycardia pacemaker follow-up

European Journal of Arrhythmia & Electrophysiology. 2021;7(Suppl. 1):abstr55

S Asghar - Leeds Teaching Hospitals, Leeds; ZE Patterson (Presenting Author) - Leeds Teaching Hospital, Leeds; P Hobbs - Leeds Teaching Hospitals, Leeds

Background: In the response to the COVID-19 pandemic the accepted arbitrary 12 month follow up of pacemaker patients was called into question. With the inability of seeing patients face to face service delivery was altered to ensure that hospital visits were kept to a minimum whilst maintaining patient safety and care. Appointments were deferred as considered appropriate. A variation in practice between centres regarding follow-up appointment schedules pre and "post" pandemic exists. The aim was to assess the appropriateness and safety of extending bradycardia pacemaker follow-up durations to 18 months, from a yearly review, in stable patients.

Methods: This was a retrospective service evaluation in sequential patients attending pacemaker follow-up before and after the change from routine 12 month appointments to extended appointment duration as a response to the COVID-19 pandemic at Leeds Teaching Hospital NHS Trust (LTHT). Data was collected from all patients who met the inclusion criteria of follow up of 12 months in the pre COVID-19 group (4th November 2019- 3rd December 2019) and compared to extended follow up >18 months in the post COVID-19 group (9th March 2021- 26th April 2021). Clinically relevant follow up data was obtained from Trust databases with safety data and clinical outcomes evaluated.

Results: A total of 161 patients met all the inclusion criteria and were assessed. Patients were excluded from the dataset if they had a follow up pacemaker appointment of <12 months. Patients were grouped according to pre COVID-19 (n=81) with an average follow up of 12.1 months ± 0.4 and post COVID-19 (n=80) with an average follow up 22.9 months ± 2.9. Data showed a significant reduction in reported symptoms (13.8% vs 3.7%; p=0.24), arrhythmia burden (52% vs 22.2%; p=<0.001) and reprogramming requirements (30% vs 3.7%; p=<0.001) in the post COVID-19 extended follow up group compared to the pre COVID-19 annual review group. In addition, there was no difference between groups for requirement for medication review, incidence of premature battery depletion, lead issues or adverse events requiring intervention.

Table 1: Clinical data comparison pre- and post-COVID-19

Clinical data	Pre-COVID-19 (n=80)	COVID-19 (n=81)	p-value
Interval (months)	12.1 ± 0.4	22.9 ± 2.9	<0.001
Symptoms [n(%)]	11 (13.8)	3 (3.7)	0.024
Arrhythmia [n(%)]	42 (52.5)	18 (22.2)	<0.001
Medication review [n(%)]	3 (3.8)	1 (1.2)	0.31
Battery [n(%)]	1 (1.3)	3 (3.7)	0.32
Lead issue [n(%)]	1 (1.3)	2 (2.5)	0.57
Reprogramming [n(%)]	24 (30.0)	3 (3.7)	<0.001
Adverse events [n(%)]	0 (0)	0 (0)	1.0
Dependent [n(%)]	17 (21.3)	30 (37.0)	0.028

Lastly, there was a significant higher proportion of patients that had no underlying R-wave in the post COVID-19 extended follow up group (37% vs 21.3%; p 0.028) compared to the pre COVID-19 annual review group (*Table 1*).

Conclusion: To our knowledge, this is the first service evaluation comparing the clinical outcomes and safety data of extending for stable patients. This service evaluation has demonstrated that in pacemaker dependent patients, that are seen at 18 month appointment intervals there is a reduction in arrhythmia burden and reprogramming requirements. The significant reduction in symptoms reported post COVID-19 could be attributed to the change in physiologist performing the checks in addition to lack of documentation of symptoms reported. This service evaluation has demonstrated that 18 month appointments could be used for all patients and has no detrimental effect to patient safety or care. ❑

Posters

56/A study to investigate stroke, bleeding and device thrombosis outcomes in patients undergoing combined AF ablation and left atrial appendage occlusion

European Journal of Arrhythmia & Electrophysiology. 2021;7(Suppl. 1):abstr56

BS Kailey (Presenting Author) - Imperial College Healthcare NHS Trust, London; CS Shi - Imperial College Healthcare NHS Trust, London; P Padam - Imperial College Healthcare NHS Trust, London; P Kanagaratnam - Imperial College Healthcare NHS Trust, London

Introduction: Percutaneous left atrial appendage occlusion (LAAO) has been shown to be non-inferior to warfarin in preventing strokes in patients with AF. However, relative contra-indication to anticoagulation or embolic strokes despite therapeutic anticoagulant remain the most common indications. There is also limited data to suggest that maintaining sinus rhythm by AF ablation could reduce the long term risk of stroke, but long-term anticoagulation is still recommended. Combining AF ablation with LAAO enables both symptom control and synergistic stroke reduction.

Methods: Patients undergoing combined LAAO + PVI procedure or LAAO alone between 2011 – 2021 at Imperial College Healthcare were reviewed. Post procedural anticoagulation plan was decided on a case by case basis at an MDT with multi-speciality input.

All patients were assessed in outpatient clinic on an annual basis. Here data was collected regarding recurrence of atrial arrythmias, significant bleeding events and embolic ischaemic events.

Results: 72 patients with AF and an indication for an LAAO device underwent either a combined LAAO implantation and PVI procedure (56 patients) or an LAAO alone (16 patients).

Procedural complications: The overall intra-procedural complication rate requiring intervention was 6.9%. This consisted of two groin complications, a retroperitoneal haematoma, a temporary phrenic nerve palsy and a pericardial effusion. Post-procedurally there were three significant bleeding events in the 30 day follow up period with patients a DOAC/antiplatelet respectively.

Post-procedural anticoagulation and device thrombosis: Due to intrinsic bleeding risks a significant proportion of patients were unable to take any form of post procedural anticoagulation to prevent device thrombosis following LAAO insertion; 51.7% of patients were either on no anticoagulation (21%) or single antiplatelet therapy (31%).

On the TOE checks only one patient was found to have thrombus on their device.

Long-term outcomes: In the 56 patients that underwent the combined procedure they were followed for an average of 1.81 +/- 1.6 years and 53.6% of patients remain in sinus rhythm.

Amongst the whole patient cohort (72 patients) they were followed up for an average of 2.65 years. The expected ischaemic stroke rate was 7.63 strokes and our observed stroke rate was 1.

Discussion: This is the first data to show the relative safety of no post-procedural anti-platelet or anticoagulant (51.7%) in those who have undergone a PVI + LAAO procedure. Patients who cannot take post procedural anti-platelets are often deemed unsuitable for this device which can be counterintuitive as it is their bleeding risk that derives them most benefit from this procedure. We have shown it may be safe to be on no anti-thrombotic agents post LAAO and AF ablation. ❑

Posters

57/Incidence of ventricular tachycardia after surgical aortic valve replacement

European Journal of Arrhythmia & Electrophysiology. 2021;7(Suppl. 1):abstr57

Rok Mravljak (Presenting Author) - Barts Health NHS Trust, London; P Waddingham - Barts Health NHS Trust, London; C Monkhouse - Barts Health NHS Trust, London; J Elliott - Barts Health NHS Trust, London; S Mohanakumar - Barts Health NHS Trust, London; J Malcolmson - Barts Health NHS Trust, London; S Jones - Barts Health NHS Trust, London; M Orini - Barts Health NHS Trust, London; J Bennett - Barts Health NHS Trust, London; M Earley - Barts Health NHS Trust, London; P Lambiase - Barts Health NHS Trust, London; GD Thornton - Barts Health NHS Trust, London; TA Treibel - Barts Health NHS Trust, London

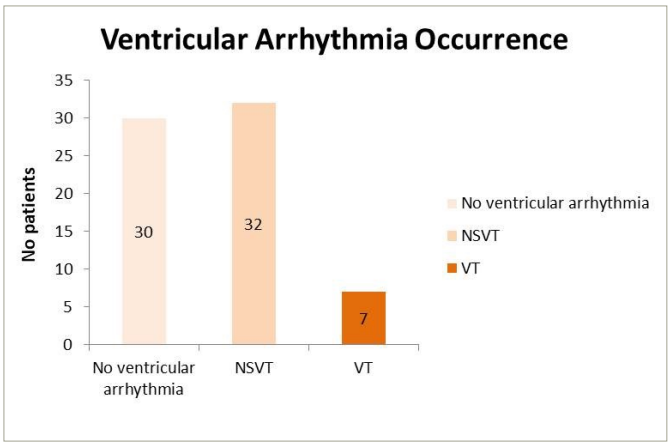
Introduction: Surgical aortic valve replacement (SAVR) improves outcome in patients with severe aortic stenosis (AS). Nevertheless, late mortality remains high (between 15-35% at 3.5 years in some series) following SAVR. Whether this is related to heart failure or brady-/tachy-arrhythmia is unknown, and the burden of ventricular arrhythmia after SAVR remains poorly characterised.

Objectives: To determine the incidence of ventricular arrhythmia, post SAVR for severe AS in patients with implantable electronic devices.

Methods: 134 consecutive patients undergoing SAVR for severe AS between April 2015 and May 2018 who had a pacemaker or defibrillator implanted post-AVR were retrospectively reviewed. Exclusions were more than moderate other valve disease, history of cardiomyopathy (n=18) and follow up at different centre (n=47). The primary outcome was the incidence of ventricular tachycardia, defined as ≥5 consecutive beats of broad complex tachycardia. Device and mortality data were reviewed via patients' electronic records.

Results: 69 out of 134 patients with a device implanted post AVR were included (age 67 ± 14 years, 52 [75%] males) with 19 (27.5%) having undergone AVR and concomitant CABG. Common comorbidities were arterial hypertension (n=52; 75%), diabetes mellitus (n=10; 15%) and chronic kidney disease (n=4; 6%) with only a minority of patients having significant LV impairment (n=3, 4%). Devices implanted were permanent pacemaker (PPM; 83%), cardiac resynchronization therapy device CRT-P (11%) and CRT-D (6%). Bradycardia indications for implantation were atrioventricular block (77%), and sinus node disease (23%). 52 (75%) patients were prescribed ≥1 antiarrhythmic medication (Bisoprolol, Metoprolol, Sotalol or Amiodarone) with 4 (6%) taking a combination of two antiarrhythmics (Bisoprolol + Amiodarone, Bisoprolol + Digoxin). Data showed high incidence of paroxysmal atrial fibrillation (AF) post-op (N=61; 88%) with 18 (26%) patients remaining in persistent AF.

Figure 1



39 (57%) patients had ventricular arrhythmia, of which 32 (46.4%) patients had NSVT (<30 RR intervals) and 7 (10%) had sustained VT. Median duration of ventricular arrhythmias was 17 RR intervals (IQR: 8-27). During a median follow-up duration of 2.75 years (IQR: 2-3) 9 patients (13%) died, one of post-op complications, one of acute cardiac arrhythmia and 7 unknown. Of those that died after 30 days, 4 (44%) had documented evidence of NSVT/VT.

Conclusion: Ventricular tachycardia (VT/NSVT) is common in patients after SAVR for severe AS. 44% of patients who died post discharge had evidence of ventricular arrhythmia detected by the implanted device. Further prospective studies are required to determine the aetiology of arrhythmias, the region of substrate and their association with poor outcomes. ❑

Posters

58/Assessing the overall impact of using conscious sedation for performing external cardioversion

European Journal of Arrhythmia & Electrophysiology. 2021;7(Suppl. 1):abstr58

MZ Seegoolam (Presenting Author) - Queen's Hospital Burton, Burton-on-Trent; G Sargent - Queen's Hospital Burton, Burton-on-Trent; U Ali - Queen's Hospital Burton, Burton-on-Trent; S Timbrell - Queen's Hospital Burton, Burton-on-Trent; A Gill - Queen's Hospital Burton, Burton-on-Trent

Introduction: Direct Current Cardioversion (DCC) is one of the most effective means of converting atrial fibrillation into sinus rhythm. This is often chosen over medical cardioversion due to its shorter overall procedure duration, high success rate and low risk of proarrhythmias. It is indicated in haemodynamically unstable patients and stable patients who are unlikely to spontaneously reverse back into sinus rhythm.

Traditionally, DCC has been performed under general anaesthetic (GA). However, more recently studies have shown that it can be performed safely under conscious sedation using IV midazolam. In order to confirm this data, a quality improvement project was carried out to compare success rates between the two methods in patients undergoing DCC.

Method: 181 patients who underwent DCC at Queen's Hospital Burton in 2019-2020 were identified. 92 of these were performed under GA, whilst 89 were performed under conscious sedation. These were then analysed to compare complication rates between the two groups.

Results: The majority of cases performed under GA were done in 2019 (78%), compared to 75% Midazolam cases done in 2020. 87% of cases performed under GA were successful, compared to 93% using Midazolam (Pearson Chi2 p=0.157, p>0.05). There was no difference in length of stay between the two groups. 78% under GA had no complications, compared to 84% using Midazolam. Mean waiting time was longer for Midazolam (91.52 days vs 61.14 for GA), but this can be attributed to delays secondary to the COVID-19 pandemic.

Conclusion: Although none of the results were statistically significant, using conscious sedation did not adversely affect our success or complication rates. This gives us the potential to turn this into a nurse-led service, which should lower waiting times and improve efficiency. ❑

References

1. Cardioversion in atrial fibrillation described. An article from the e-Journal of Cardiology Practice.Vol. 11, N° 6 - 29 Nov 2012
2. ESC Guidelines 2020.

Posters

59/A combined endo-epicardial approach, utilising the pericardial CO2 insufflation technique, to reliably and safely achieve linear radiofrequency lesion sets for persistent atrial fibrillation

European Journal of Arrhythmia & Electrophysiology. 2021;7(Suppl. 1):abstr59

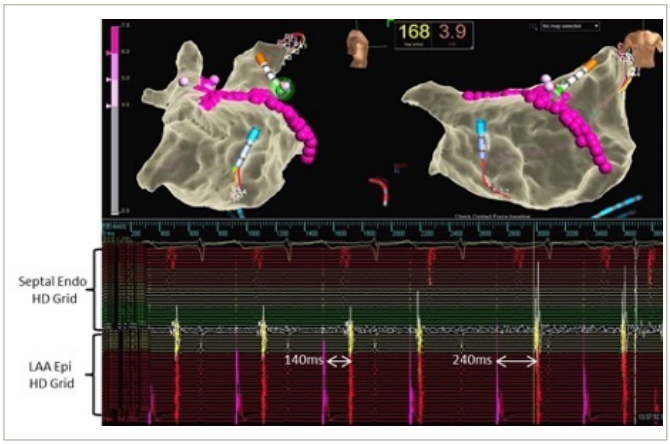
R Amin (Presenting Author) - University Hospitals Sussex NHS Foundation Trust, Brighton; K Moosai - University Hospitals Sussex NHS Foundation Trust, Brighton; J Juliá Calvo - University Hospitals Sussex NHS Foundation Trust, Brighton; J McCready - University Hospitals Sussex NHS Foundation Trust, Brighton; J Silberbauer - University Hospitals Sussex NHS Foundation Trust, Brighton; I Mann - University Hospitals Sussex NHS Foundation Trust, Brighton

Introduction: Recurrence of persistent atrial fibrillation (PsAF) has been attributed to conduction gaps, and non-transmural linear lesion sets. Hybrid thorascopic endo-epicardial AF ablation has been shown to reduce AF recurrence when compared to endocardial ablation alone, however with higher complication rates. We propose that the percutaneous pericardial CO_2 insufflation technique to access the pericardial space can be safely and effectively used for epicardial mapping and ablation of the left atrium (LA).

Methods: In a single centre, 11 patients with PsAF and previous pulmonary vein isolation (PVI) only, underwent concurrent endo-epicardial AF ablation, using the subxiphoid percutaneous pericardial access technique using CO2 insufflation of the pericardial space, whilst on uninterrupted anticoagulation. Heparinisation targeted an activated clotting time of 350 s. Endo-epicardial geometry and bipolar voltage maps were created, and endocardial ablation performed. The target LSI was 5 for the inferior line, and 6 on the roof and anterior mitral line (AML). If required, additional epicardial ablation was undertaken to establish PVI, and block the LA inferior and roof lines and an AML.

Results: Epicardial access was successful in all 11 patients, with less than 5 mls epicardial bleeding, as was epicardial mapping of the LA using both the transverse and oblique pericardial sinuses. Endocardial ablation alone achieved block in 73% (8 of 11) of roof lines, 91% (10 of 11) of inferior lines and 18% (2 of 11) of AMLs. Epicardial ablation directed on the roof line was required to achieve block in 1 case, and on the upper third of the AML to achieve roof line block in 2 cases. Epicardial ablation of the inferior line was required in 1 case to achieve block. In 9 cases, epicardial ablation directly on the AML was required to achieve trans-mitral block (*Figure 1*). Of the 9 reconnected pulmonary veins following prior PVI, 8 of 9 were reisolated with endocardial ablation and 1, a left upper PV, required epicardial ablation to achieve isolation.

Figure 1: Epicardial ablation on the AML resulting in trans-mitral block. Pacing is from the right atrial appendage, there is one Advisor™ HD Grid placed endocardially on the septal side of the AML and another placed on the lateral side of the AML, in the left atrial appendage.



Discussion: Use of the percutaneous subxiphoid pericardial CO_2 insufflation technique to achieve epicardial access for LA mapping and ablation is feasible, and safe whilst on uninterrupted anticoagulation. Limited success in ablation for PsAF beyond PVI may be due to difficulty in creating trans-mural linear lesions. Epicardial ablation can be safely performed to achieve linear block in the roof, anterior and inferior LA. Epicardial structures such as the septopulmonary bundle may contribute to difficulty blocking roof lines endocardially, and account for remote isolation of the roof line via epicardial ablation on the AML. ❑

Posters

60/The future is here! Initial experience of the follow up of the first 100 novel Bluetooth, remote programmable, implantable loop recorders

European Journal of Arrhythmia & Electrophysiology. 2021;7(Suppl. 1):abstr60

H Page (Presenting Author) - St Bartholomew's Hospital, London; S Martin - St Bartholomew's Hospital, London; R Mravljak - St Bartholomew's Hospital, London; J Binoy - St Bartholomew's Hospital, London; K Belleca - St Bartholomew's Hospital, London; H Harvie - St Bartholomew's Hospital, London; H Caldiera - St Bartholomew's Hospital, London; C Monkhouse - St Bartholomew's Hospital, London

Introduction: Implanted loop recorders (ILR) provide long term cardiac monitoring to investigate arrhythmias. ILRs biggest limitation is the low specificity of automated recordings, creating huge volumes of electrograms (EGMs) to be inspected. This burden of work puts strain on services, increases the risk of misdiagnosis, and can lead to inappropriate patient management. To compound this, connectivity of remote monitoring (RM) remains a considerable problem, whereby a significant amount of time is used to establish and maintain connectivity, impacting both resources and patient safety. A new generation Bluetooth ILR was utilised by our centre. It features enhanced algorithms for arrhythmia detection, Bluetooth smartphone connectivity via an App, remote reprogramming and full remote ECG access without manual transmissions. We sought to audit these new features to assess their EGM accuracy and RM connectivity, in a virtual follow up programme, a common follow up regime in the COVID-19 era.

Methods: We retrospectively audited patients with the novel device, at a tertiary centre, implanted between September 2020 and May 2021. During the follow up period we collected remote connectivity, episode EGMs of all types which were analysed individually to assess false positives. EGMs were reviewed by two Cardiac Scientists with any dubious EGMs escalated to a senior Cardiac Scientist. Ethical approval was attained from our departmental clinical effectiveness team.

Results: We collected 100 consecutive patients with a mean follow up of 59 ± 50 days. The patient/procedural characteristics are summarised in *Table 1*. 98% of patients had connectivity with the RM by the 1-month review. Of the remaining 2% that were unconnected, one had a monitor, which was unplugged and one utilised the app technology with no email verification. There was a combined total of 3,984 lifetime EGMs. 314 symptom activations and 583 had no EGMs available for review, due to large volumes in 1 transmission. From the remaining 3,087 EGMs, 964 (31.23%) were false positives. Importantly, a large contributor to the burden of false positives was due to atrial tachycardia (AT) detection which incorrectly classified sinus tachycardia as AT tachycardias in 842 recordings. This algorithm was deactivated remotely in all patients after 3 weeks of follow up. When excluding AT EGMs, the false positive burden was 3.95% (122). 23 patients had ≥1 false positive recording, 16 patients had false AT which was then disabled. 7 patients had pauses for undersensing which reduced to 4 after increasing sensitivity. Remote programming reduced the number of patients that had false positives by 82%.

Discussion: Our findings show a low burden of false positive EGMs, 1/10th of what is seen in the literature, where previous ILR devices report a false positive burden of 46-75%. Furthermore, remote reprogramming almost halved the inappropriate detection of pauses. 98% remote monitor connectivity also suggests the ease of use for this technology for patients and indicates that it is effective at monitoring a wide variety of patient demographics and ages.

Conclusion: The new generation Bluetooth ILR used in our centre demonstrates high level of remote monitor connectivity, high arrhythmia specificity, and a more streamlined service. Comparisons with other models should be considered and further assessment of the devices effects on cardiology service. ❑

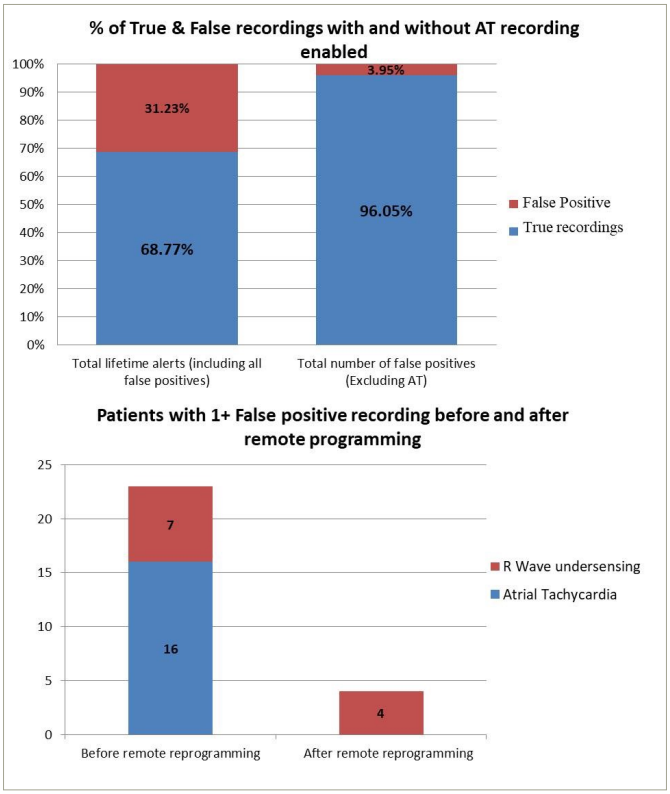
Table 1

Table 1.

Variable	*n* = 100
Gender	
Male	62 (62)
Female	38 (38)
Age at implant (years)	53 ± 17.9
Ethnicity	
White	36 (36)
Black	9 (9)
Asian	11 (11)
Chinese	2 (2)
Mixed	1 (1)
Other (Not specified)	42 (42)
Operator	
Cardiac Scientists	27 (27)
Doctor	11 (11)
Cardiac Nurses	62 (62)
Remote follow up technology	
App	61 (61)
Home monitor	39 (39)
Indication for implant	
Syncope	49 (49)
Palpitations	22 (22)
Cryptogenic stroke	19 (19)
Dizzy spells	6 (6)
Arrhythmia monitoring	4 (4)
Measured R wave at implant (mV)	0.48 ± 0.24

Values shown are mean ± SD or *n* (%)

Figure 1



Posters

61/Diagnostic benefit of inpatient 24-hour Holter monitoring: a retrospective analysis of hospital audit data

European Journal of Arrhythmia & Electrophysiology. 2021;7(Suppl. 1):abstr61

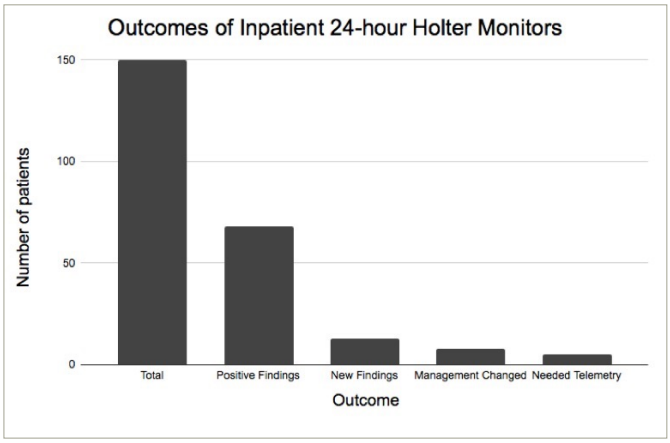
AY Jiang - Whipps Cross Hospital, Barts Health, London; R Patel - Whipps Cross Hospital, Barts Health, London; MA Alizadeh - Whipps Cross Hospital, Barts Health, London; R Outschoorn - Whipps Cross Hospital, Barts Health, London; S Toupchiani - Whipps Cross Hospital, Barts Health, London; O Dudek - Whipps Cross Hospital, Barts Health, London; V Sawhney - Whipps Cross Hospital, Barts Health, London; D Das - Whipps Cross Hospital, Barts Health, London; S Gupta - Whipps Cross Hospital, Barts Health, London; R Amersey - Whipps Cross Hospital, Barts Health, London; M Finlay - Whipps Cross Hospital, Barts Health, London

Introduction: 24-hour Holter monitors are frequently used in order to investigate arrhythmias in settings where limited telemetry resources are available. However, they are time-consuming to analyse, and fail to alert medical personnel to emergent arrhythmias. Their diagnostic yield is uncertain. We investigated the use of inpatient 24-hour Holter monitors at Whipps Cross Hospital to determine their suitability, diagnostic yield and safety profile.

Methods: We performed a retrospective analysis of 150 inpatient Holter monitors conducted at Whipps Cross Hospital, Barts Health NHS Trust, between October and December 2019 inclusive. The results of the 24-hour tapes were analysed alongside patient history, presenting complaint and subsequent changes to management. Positive findings were defined as an outcome other than sinus rhythm and were corroborated with previous ECGs and past medical history to ascertain if these were known or new findings. New findings were defined as major (those that changed management), and minor (changes that were noted but did not lead to a management change).

Results: 150 inpatient 24-hour Holter monitors were requested between October and December 2019. New findings were reported in 8.6% (13) of tapes, with only 5% (8) leading to management changes. Of the 150 tapes analysed, just 1.3% (2) resulted in an urgent inpatient intervention such as pacemaker insertion. Both of these patients had strong histories of cardiac collapse and would meet ESC criteria for continuous cardiac monitoring. The majority of management changes took place in a cohort of elderly patients found to be in atrial fibrillation and started on anticoagulation +/- rate control. 5 of these patients met the criteria for formal telemetry in place of 24-hour Holter monitoring.

Figure 1:



Conclusions: Inpatient 24-hour Holter monitoring has an extremely low diagnostic yield, and represents a safety risk when used as an alternative to telemetry. Guidance is required to support clinicians in deciding when inpatient 24-hour tapes are both indicated and safe. ❑

Posters

62/Regional survey of orthopaedic surgeons on requesting MRI scans for patients with implantable cardiac devices

European Journal of Arrhythmia & Electrophysiology. 2021;7(Suppl. 1):abstr62

A Brown (Presenting Author) - Northumbria Healthcare NHS Foundation Trust, Ashington; J Dundas - Northumbria Healthcare NHS Foundation Trust, Ashington; C Runnett - Northumbria Healthcare NHS Foundation Trust, Ashington; I Matthews - Northumbria Healthcare NHS Foundation Trust, Ashington; DP Ripley - Northumbria Healthcare NHS Foundation Trust, Ashington; H Thomas - Northumbria Healthcare NHS Foundation Trust, Ashington

Introduction: Historically a CIED was considered an absolute contra-indication to MRI due to perceived risk of device malfunction or tissue damage. More recent MR-conditional devices overcome this and there is also increasing data supporting safety in non-conditional devices. Despite widespread implantation of more expensive MRI conditional systems by cardiac teams, MRI remains an under-utilised modality in device patients. Orthopaedic teams request the largest number of MRI scans and if they are not aware of the evolution of CIED technology then their patients will be disadvantaged.

Method: We surveyed regional orthopaedic surgeons about their understanding and usage of MRI in patients with CIED's.

Results: 53 orthopaedic surgeons responded; 16 (30%) consultants, 34 (64%) specialty trainees, and 3 (6%) SAS grades. Six NHS trusts across the North East of England were represented; 46 respondents (87%) from secondary care and 7 (13%) between two tertiary centres.

No surgeon thought it was 'Always' possible to undertake MRI in a patient with a pacemaker, 41 (81%) thought it was 'Sometimes' possible and 10 (19%) wrongly thought it was 'Never' possible. When the same question was applied to ICDs, no surgeon thought it was always possible, and those who wrongly thought it was never possible increased to 27 (51%). For patients with implantable loop recorders, the results were 2 (4%) for always, 35 (66%) sometimes, and 15 (28%) never.

4 (7.5%) surgeons reported having requested an MRI for a patient with a CIED and having the examination carried out. 26 (49%) had tried but the scan was not performed, and 21 (40%) had never attempted to request an MRI scan for a CIED patient. 57% of surgeons felt that they would not know who to contact to arrange a scan. 94% felt that clinical outcomes might be improved if patients with CIED could be offered MRI scanning.

Discussion: Misunderstanding regarding the suitability for CIED patients to undergo MRI was common among our regional cohort of orthopaedic surgeons. Even loop recorders were felt to contraindicate scans but these pose no risk at all to the patient. Importantly surgeons feel that patients may have had better outcomes if MRI had been possible. This data highlights that if we are unable to educate and communicate effectively with other specialties who request MRI scans then our device patients will potentially receive suboptimal care despite efforts to implant MRI conditional devices.

Half of surgeons reported having requested an MRI for a device patient but not having it completed, with our assumption being that these scans were declined by the radiology department. Clear clinical pathways developed in collaboration with radiology departments and shared widely with all specialties are important to facilitate equity of care for device patients. It is the authors' view that change in behaviour amongst referrers, to actively refer CIED patients for MRI when indicated will help drive this change in more centres. ❑

Posters

63/Opportunistic AF detection during COVID-19 vaccination clinics by AF Association-trained volunteers using AliveCor Kardia in support of Public Health England's long term plan

European Journal of Arrhythmia & Electrophysiology. 2021;7(Suppl. 1):abstr63

B Lord (Presenting Author) - AF Association East Anglia, Bury St Edmunds; J Cannon (Presenting Author) - AF Association East Anglia, Bury St Edmunds; T Lobban - AF Association, Chipping Norton

Introduction: Atrial Fibrillation Association (AFA) recognised there was a prime opportunity to detect AF during COVID-19 vaccination clinics by offering heart rhythm checks. European Society of Cardiology (ESC) recent guidelines recommends single-lead ECG for detection and diagnosis of AF (class one recommendation). AFA-trained volunteers and healthcare professionals established a fluent pathway.

Concept: AFA in collaboration with two GP surgeries in West Suffolk developed a pathway which attracted clinical support.

- People receiving a COVID-19 vaccination consented for a single-lead ECG (AliveCor Kardia) for a heart rhythm check
- Everyone was provided with AFA's "Know your Pulse" plus "What is AF?" information leaflets
- Those detected to have "possible AF" were signposted to their clinician with a copy of their ECG and an AFA explanatory letter

Pilot: Adhering to strict "COVID-19 safe" protocol, heart rhythm checks in a cohort of one hundred 60 to 64 year olds detected two "possible AF" results which were reviewed by their GP. At no point did it disrupt or delay the delivery of vaccinations.

Roll-out deployment: Following the success of the pilot, we expanded the detection of AF to additional GP surgeries concentrating on 80+-year-olds using AFA-trained volunteers.

Results

Number of opportunistic heart rhythm checks undertaken	817
Detected with "possible AF"	73 (8.9%)
Of which no previous diagnosis of AF	47 (5.75%)

People with previously undiagonised AF yet detected with 'possible AF' using AliveCor Kardia were seen in-person or virtually by their GP within 48 hours. Clinically appropriate anticoagulation therapy and rate-limiting medication was prescribed. These results gained with single-lead ECG provided significantly greater yield than those found in a South of England COVID-19 vaccination setting where opportunistic pulse palpation (NICE guidance 2014 and repeated April 2021) undertaken by a clinician yielded only 8 'possible AF' in a cohort of 2,000.

Conclusion: The use of single-lead ECG (AliveCor Kardia) by AFA-trained volunteers in COVID-19 vaccination clinics proved highly successful in detecting 'possible AF', supporting Public Health England's Long Term Plan by detecting and diagnosing AF thus reducing AF-related strokes. A significantly greater yield was achieved than pulse palpation undertaken elsewhere in spite of the advice re-issued in the new NICE AF versus ESC guidelines. This approach could be rolled out across the NHS saving lives and saving money. ❑

Posters

64/Daily Remote Alert Monitoring (DREAM) driven model to replace scheduled follow-ups in pacemaker patients

European Journal of Arrhythmia & Electrophysiology. 2021;7(Suppl. 1):abstr64

EN D'Souza (Presenting Author) - Great Western Hospital, Swindon; MA Swift - Great Western Hospital, Swindon; J James - Great Western Hospital, Swindon; B Chandrasekaran - Great Western Hospital, Swindon; P Foley - Great Western Hospital, Swindon

Background: According to the 2020 National Institute of Cardiovascular Outcomes Research (NICOR) audit, 32,902 pacemakers were implanted in the United Kingdom. Management of these patients requires effective workflows capable of dealing with the vast amounts of diagnostic data recorded by the device and made available via remote monitoring platforms. The British Heart Rhythm Society (BHRS) recommends that these devices be interrogated in person or remotely once per year. The augment of COVID-19 has driven an increase in remote monitoring of cardiac devices nationally. Studies such as AWARE,COMPASS and PREFER have shown that daily alerts from remote monitoring reduce the time to detection and intervention of lead and device issues. Thus, the purpose of the project is to determine if a daily remote alert monitoring (DREAM) system can replace scheduled remote follow-ups safely in the future.

Aim: To observe detection times of patient events highlighted by daily alert triggers compared to conventional clinic and scheduled remote interrogations.

Methods: A prospective, single centre, service evaluation was carried out after successful completion of the ethics process. This project included one hundred patients with a Biotronik pacemaker implanted in 2018-2019. Patients were registered onto the home monitoring service centre™ website. They had clinic and scheduled remote interrogations in 2019-2021 alongside daily assessment of their alerts.

Results: The average follow-up duration for the patients was 475.6 days with a standard deviation of 139.97 days. During the follow up period 82 patients had remote monitoring alerts detected. Potentially clinically significant alerts were detected in 45 of the 100 patients. As a result of their daily remote alerts, 9 of these patients were admitted to the hospital. A paired T-test was carried out and showed a statistically significant difference in the detection time of patient events from the DREAM model versus scheduled interrogations. Detection times were <24 hours on average ± 0 days via alerts and 105 days on average ± 127 days by scheduled follow-ups (CI- 95%, p-0.04). No patients had clinically significant information detected via their yearly scheduled remote or clinic interrogation, which had not previously been detected via the DREAM model.

Conclusion: This demonstrates that the DREAM model is a safe method of patient follow-up due to its faster event detection times, making it superior to scheduled remote and clinic interrogations. Due to the lack of actionable events detected via scheduled follow-ups, they add little to no value when used in conjunction with a proactive alert management service model. However, further large scale studies are required to support and adopt this model within clinical practice. ❑

Posters

65/Pacemaker box change - more than meets the eye

European Journal of Arrhythmia & Electrophysiology. 2021;7(Suppl. 1):abstr65

OS Shaikh (Presenting Author) - Royal Papworth Hospital, Papworth; OO OMONIYI - Royal Papworth Hospital, Papworth; CK Katabira - Royal Papworth Hospital, Papworth; SA Agarwal - Royal Papworth Hospital, Papworth

Background: Elective Unit replacement or generator change of pacemakers/Intra-cardiac defibrillators (ICD), is a routine procedure performed in the catheter lab, usually as a day case and is associated with a low complication rate. Common complications, mentioned in the consent form include, bleeding, infection and lead displacement. Other complications include pneumothorax, ventricular perforation and tamponade if lead revision is also performed during the procedure.

Objectives: The aim of the project was to evaluate the incidence of all complications associated with box changes at our institution.

Methods: A retrospective analysis of all box change procedures carried out between 2016 –2020 was performed. All complications were recorded, with attention paid particularly to any novel complications not necessarily mentioned in the consent paperwork. Patient records were obtained, and any repeat procedures performed up to a year post initial box change were included in the analysis.

Results: A total of 892 generator changes were carried out. These included single and dual chamber pacemakers (553/892 -62%), ICDs (205/892-23%), and CRT P (134/892 – 15%) devices. Sub cutaneous ICD box changes were excluded from the group. Mean age was 61 years +/- 20 years. Mean BMI of the patients was 26 +/- 9. In terms of complications, a total of 7 out of 892 (0.8%) patients required a new lead, either at the time of generator change (3/7) or within one year of the procedure (4/7). Six out of 896 (0.7%) patients were diagnosed with infections, 2/6 of these cases were treated with antibiotics alone, and 4/6 patients underwent extractions. Five out of 892 patients (0.6%) developed large haematomas, 2/5 of these patients required a further procedure (haematoma evacuation), the remaining 3/5 patients were managed conservatively. 1 patient developed a pneumothorax when access was being obtained for new lead insertion. 1 patient had leads plugged into the incorrect port needing a revision. Fifteen out of 892 (1.7%) patients undergoing box change underwent a wound revision within 1 year of the initial box change procedure. This was mainly to resite the device mainly because of patient discomfort because of the device position., 3/15 patients were on Anti coagulation (Warfarin/NOAC), which had been stopped 2 days prior to the procedure, 5/15 patients had box changes with like for like replacements, with the other 10/15 having devices implanted with different manufacturers at the time of box change. 10/15 (67%) devices were Dual chamber pacemakers, 3/15 (20%) were ICDs and 2/15 (13%) were a CRT. This was in keeping with the overall proportion of devices implanted in each category.

Conclusion: Elective unit replacement is associated with complications including, lead failure, infection, haematoma, pneumothorax, incorrect lead placement into pacing box, and wound revision. The cumulative complication rate was just under 4% over the course of 1 year. Clinicians performing these procedures need to be aware of these complications so they can take steps to minimise this. In particular there was a significant risk of wound revision within a year, and specific steps should be taken to address this, as this seems to be under recognised. These steps may include deeper burial of the device for some individuals, especially those with a low BMI, extending the pocket at time of box change, and using a like for like replacement. ❑

Posters

66/An unexpected block – working up the young patient with unexplained atrioventricular block

European Journal of Arrhythmia & Electrophysiology. 2021;7(Suppl. 1):abstr66

M Thakur (Presenting Author) - Cambridge University Hospitals, Cambridge; RK Chattopadhyay - Cambridge University Hospitals, Cambridge; PA Chousou - Cambridge University Hospitals, Cambridge; PJ Pugh - Cambridge University Hospitals, Cambridge

Introduction: The development of atrioventricular block can be a sign of specific cardiac and medical pathologies including cardiac sarcoidosis, vasculitis and thyroid disease. There are no comprehensive guidelines to help facilitate a standardised workup for the younger patient with AV block, and the timing and relative yield of different investigative parameters. We sought to explore the utilisation of different tests, and the yield of such tests.

Methods: This was a single-centre observational study of patients under the age of 60 who received a pacemaker implant for treatment of AV block over the 5-year period to the end of April 2020. Patients' demographic, clinical and electrocardiographic features were reviewed alongside pre-specified components of a workup including biochemical tests (TSH, ESR, Serum ACE, ANA, ANCA, *Borrelia* serology), imaging (CT Thorax and Cardiac MRI) as well as a cardiac biopsy. The identification of any form of pathology on the pre-specified tests was considered to be a reflection of diagnostic yield.

Results: 1,265 patients underwent pacemaker implant during the study period, of whom 78 were under the age of 60. Of the 76 patients who had data available for analysis, 34 had an established explanation for the development of conduction disease, whereas for 42 this was unexplained. Considering this group of patients 25 had thyroid testing, 11 had a serum ACE measurement, 10 had some form of biochemical vasculitis screening and 5 had *Borrelia* serology. With respect to imaging 5 underwent CT thorax to detect pulmonary sarcoid, whilst 14 underwent a cardiac MRI. The timing of cardiac MRI can be difficult due to the stability of the patient and demands on the MRI service. 8 patients underwent MRI prior to insertion of a pacemaker. Of the 5 patients in whom a MRI was suggestive of an underlying cardiac pathology 3 were done before pacemaker implantation. 3 patients underwent endomyocardial biopsy during the pacemaker insertion. This was not associated with a diagnostic pickup. The above workup resulted in putative underlying diagnoses in 8 of the 42 cases of unexplained AV block.

Conclusion: The workup of younger patients presenting with AV block is variable but can be associated with the pickup of significant pathology. In a 5-year pacing dataset it was shown that biochemical, imaging and tissue diagnostics all played possible roles in the diagnosis of cardiac pathology. It may be prudent to create a standardised diagnostic algorithm for patients presenting with young age AV block, with a view to standardising patient workup, and the timing of tests to maximise diagnostic yield. ❑

Posters

67/Eligibility for the subcutaneous implantable cardiac defibrillator therapy using standard screening practice – our experience

European Journal of Arrhythmia & Electrophysiology. 2021;7(Suppl. 1):abstr67

M El Refai (Presenting Author) - University Hospital of Southampton, Southampton; M Abouel Asaad - University Hospital of Southampton, Southampton; VT - University Hospital of Southampton, Southampton; C Menexi - University Hospital of Southampton, Southampton; PR Roberts - University Hospital of Southampton, Southampton

Introduction: Subcutaneous ICD (S-ICD) was designed to avoid complications associated with transvenous ICDs. But not all patients are eligible for S-ICDs and eligibility is identified after screening S-ICD candidates using guidelines by the device manufacturer. The S-ICD is particularly valuable for younger patients such as congenital heart disease (CHD) and hypertrophic cardiomyopathy (HCM) patients requiring longer defibrillation protection, but information regarding suitability for S-ICD in these populations is scarce with few studies reporting ineligibility rates between 24.6-56 % and between 7-38% for the CHD and HCM patients, respectively. These rates may be due to abnormal T-wave morphology resulting from structural changes that characterizes these patients' groups. We report our experience with S-ICD screening in real-world population as a tertiary referral centre for complex cardiac devices in the UK.

Methodology: We performed a retrograde analysis on patients with an indication for an ICD who had screening for S-ICD eligibility at our centre between 2014 and 2021. Patients were considered eligible if they had at least one vector that passed the screening in two postures as recommended by the device manufacturer.

Results: A total of 189 (Mean age 47.2 years, 64.6% males) patients were included. Mean BMI was 27.9. Underlying heart conditions were dilated cardiomyopathy 47 (24.9%), structurally normal heart 46 (24.3%), HCM 37 (19.6%), ischaemic cardiomyopathy 36 (19%), CHD 19 (10.1%) and arrhythmogenic right ventricular cardiomyopathy 4 (2.1%). 182 (96.3%) patients met the eligibility criteria for an S-ICD. There was no statistically significant difference in the S-ICD eligibility based on age, sex, or BMI or between patients with different underlying heart conditions (*Figure 1*).

Conclusions: Our analysis showed that most of the patients- regardless of underlying cardiac condition- are likely to be deemed S-ICD eligible following current screening practices. ❑

Figure 1

Characteristic	N	Screening		p-value[1]
		Fail, N = 7	Pass, N = 182	
Gender	189			0.42
F		1 / 7 (14%)	66 / 182 (36%)	
M		6 / 7 (86%)	116 / 182 (64%)	
Age	189			0.38
Mean (SD)		53 (26)	47 (18)	
Median (IQR)		65 (31, 70)	48 (33, 61)	
Range		18, 85	9, 86	
Height	188			0.52
Mean (SD)		174 (10)	171 (13)	
Median (IQR)		174 (170, 179)	171 (165, 178)	
Range		159, 188	80, 201	
Weight	188			0.60
Mean (SD)		77 (12)	81 (20)	
Median (IQR)		80 (68, 88)	81 (67, 93)	
Range		58, 90	22, 138	
BMI	188			0.40
Mean (SD)		26 (5)	28 (11)	
Median (IQR)		24 (24, 27)	27 (23, 31)	
Range		19, 36	15, 144	
Underlying Heart disease	189			0.54
ARVC		0 / 7 (0%)	4 / 182 (2.2%)	
DCM		2 / 7 (29%)	45 / 182 (25%)	
GUCH		1 / 7 (14%)	18 / 182 (9.9%)	
HCM		2 / 7 (29%)	35 / 182 (19%)	
ICM		2 / 7 (29%)	34 / 182 (19%)	
Normal heart		0 / 7 (0%)	46 / 182 (25%)	

[1] Fisher's exact test; Wilcoxon rank sum test

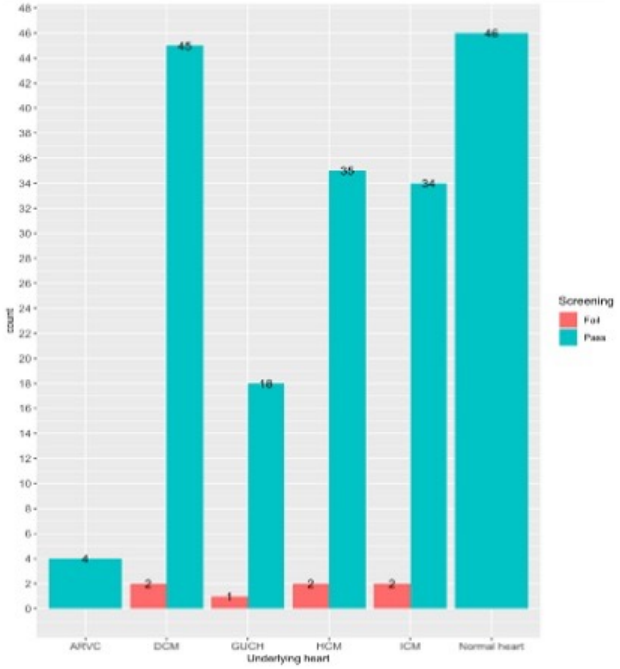


Figure: Results of S-ICD screening: > 96% of the patients met the eligibility criteria for S-ICD.

Posters

68/How often do we need to implant cardiac devices in COVID-19 patients - data from a single COVID-19-Hospital population

European Journal of Arrhythmia & Electrophysiology. 2021;7(Suppl. 1):abstr68

B Ignatiuk (Presenting Author) - Ospedali Riuniti Padova Sud, Monselice; L Leone - Ospedali Riuniti Padova Sud, Monselice; S Da Ros - Ospedali Riuniti Padova Sud, Monselice; D Montemurro - Ospedali Riuniti Padova Sud, Monselice; G Pasquetto - Ospedali Riuniti Padova Sud, Monselice

Background: Despite the millions of people infected by SARS-CoV-2 worldwide, there have only been few reports of cardiac device implantations in such subjects.

Purpose: We report a series of patients with SARS-CoV-2 who needed a permanent pacemaker.

Methods: Study of a single public hospital population in Northern Italy, entirely converted to a COVID-19-only facility during the SARS-CoV-2 pandemic. Data retrospectively collected from electronic medical history. We analysed the clinical profiles of patients implanted with pacemakers, the procedural safety, and the follow-up data.

Results: In total, 1,168 patients were hospitalized (during the spring outbreak from 21/02/2020 to 31/05/2020, and during the autumn phase, from mid-October until the end of 2020), mean age 72 years, 42% were females. All had a positive molecular nasopharyngeal swab for SARS-CoV-2 at admission. All but 5 were admitted because of COVID-19-related pneumonia requiring oxygen supplementation. The COVID-19 treatment was standardized according to the best knowledge of the time (including hydroxychloroquine and lopinavir during the spring outbreak and plasma/remdesivir during the autumn). In-hospital mortality was 22.3%.

Four patients received a transvenous pacemaker (one during the spring wave and three in the autumn phase). The clinical information is summarized in *Table 1*. Only one subject had an overt SARS CoV-2 pneumonia at presentation and had an underlying aortic disease. A second pacemaker was implanted because of conduction disease in a patient with only incidental positivity at swab without any clinical manifestation of COVID-19. Two patients had moderate pneumonia on HRCT, but one was implanted late after pneumonia resolution, during readmission because of bradycardia. No peri- and post-procedural complications were observed. Personnel was negative on serial swabs. Two patients died during the follow-up (five months and two weeks after implantation, respectively).

Conclusions: In this large cohort of COVID-19 patients with symptomatic pneumonia, the pacemaker implantation rate was not higher than the implant rate in the general population. The bradyarrhythmias might not be necessarily related to the SARS-CoV-2 infection. The procedure may be performed safely both for the patient and for the personnel. The outcome is related to the severity of COVID-19 disease and individual patient factors. ❑

Table 1

Table 1.

Age (yrs)	Gender	Indication	Presentation	Pneumonia (HRCT)	Comorbidities	Outcome
78	M	2:1 AV block	respiratory distress (intubated)	severe	moderate aortic stenosis, diabetes hypertension	dead (recurrent pulmonary infection)
84	F	sinus bradycardia, 1st degree AV block	confusion, hemisyndrome	mild/none	previous cerebral ischemia hypertension	alive
88	F	bradycardia-tachycardia syndrome	confusion, fever	moderate	hypertension diabetes dementia paroxysmal AF	dead (acute renal failure in diarrhoea)
71	M	paroxysmal complete AV block	confusion, presyncope	moderate	hypertension	alive

Posters

69/Patient and public involvement (PPI): a route to high-quality research in atrial fibrillation

European Journal of Arrhythmia & Electrophysiology. 2021;7(Suppl. 1):abstr69

I Kanella (Presenting Author) - Imperial College London, London; C Coyle - Hammersmith Hospital, London; P Kanagaratnam - Hammersmith Hospital, London

Background: PPI can improve the quality of research and strengthen health outcomes. It is increasingly a prerequisite for funding support. AF affects 43.6 million individuals globally posing a significant burden to patients and physicians. In view of the recent ESC guidelines for AF, incorporating patient insight in clinical research could optimise management outcomes.

Purpose: After identifying a gap in literature for PPI research in AF we aimed to understand patient priorities for:

- Preferred AF management strategies
- Research
- Willingness to participate in research
- Preferred end-points to measure treatment success.

Methods: We conducted a rapid response survey in an opportunistic cohort of 50 patients with AF who had undergone or awaited an AF ablation at our institution. A quantitative analysis was performed. Qualitative data was collected through 18 semi-structured interviews with a part of the sample, and interpreted with thematic analysis.

Results: 50 patients (male: 58%, mean age: 70 ± 10.74 years) with a history of symptomatic AF participated in the survey. 42 (84%) were treated with medication and 39 (78%) at least one catheter ablation. AF ablation was identified as a management priority. Patients perceived that ablation improves quality of life (QoL) and reduces AF burden significantly compared to cardioversion and anti-arrhythmic drug therapies (AADs) which were associated with short-lived effects. 34 patients (68%) felt the ~60% success rate for AF ablation is not adequate and so improvement is a research priority (n=47, 94%). 46 patients (92%) were willing to participate in catheter ablation research. 21 patients (42%) prefer to undergo one procedure (experimental or control arm) to minimise harm from additional ablation, and 26 (58%) both procedures at the same event. To assess efficacy of AF treatment, 43 patients (86%) favoured rhythm monitoring compared to a QoL validated assessment tool. However, all patients interviewed (n=18) felt patient reported outcomes (PROs) such as emotional and cognitive functioning are important when assessing efficacy.

Conclusions: Catheter ablation is a management priority for patients. The latest ESC guidelines reflect patient desires by considering ablation as a first-line treatment. Patients steer AF research objectives towards improving the success rate of catheter ablation which is currently considered insufficient. Both PPI research and ESC guidelines underline the important of a holistic approach in assessing the impact of AF by prioritising patient reported outcomes in assessing treatment success. PPI has highlighted the need for further work improving AF ablation techniques by developing a patient-tailored approach. ❑

Posters

70/The impact of the COVID-19 pandemic on cardiac rhythm management services at 2 major UK centres

European Journal of Arrhythmia & Electrophysiology. 2021;7(Suppl. 1):abstr70

J Cranley (Presenting Author) - Royal Papworth Hospital, Cambridge; W Ding - Liverpool Heart and Chest Hospital, Liverpool; G Mellor - Royal Papworth Hospital, Cambridge; D Gupta - Liverpool Heart and Chest Hospital, Liverpool

Introduction: The COVID-19 pandemic has had a major impact on healthcare services, however the effect has been heterogeneous.

We collated cardiac rhythm management (CRM) service provision data from two specialist cardiothoracic centres in the UK without Eds, the Liverpool Heart and Chest Hospital (LHCH) and Royal Papworth Hospital (RPH). We describe the impact of the pandemic at these two sites.

Methods: Caseload data between April 2019 and March 2021 was collected from RPH and LHCH databases. COVID-19 data was obtained from www.coronavirus.gov. The proportion of total beds occupied by COVID-19 patients was used as a surrogate for strain on hospital resources, termed 'Covid Strain'. Student's T tests were used to compare data.

Results: Pre-pandemic (April 2019-February 2020), despite having fewer beds than RPH (187 vs 300), monthly CRM procedure numbers were greater at LHCH: RPH 222 ± 27, LHCH 250 ± 26 (mean ± SD), p=0.02. There were differences in the proportion of different procedures, with RPH performing more accessory pathway ablations, lead revisions and ILR explants, and LHCH performing more AV node ablations, ICD, and CRT implants. During the first lockdown (March-June 2020) both centres were dramatically affected with a 97% and 98.2% drop in EP cases and a 36.7% and 56.9% drop in device procedures for RPH and LHCH respectively at their nadirs (relative to pre-pandemic averages). By contrast, during the second lockdown period (November 2020-March 2021) EP activity reduced by 79.8% at RPH but only 31.0% at LHCH, more strikingly, device activity was 58.6% reduced at RPH but showed no decline at LHCH (+3.8% compared to pre pandemic average). We hypothesised that this resilience might have been due to an altered casemix at LHCH during wave 2. However, the proportions of different procedures were unchanged and were the same as during wave 1 (when both centres had been similarly impacted). During lockdown 1 Covid Strain was similar between the two centres, peaking at 14.7% (RPH) and 9.7% (LHCH). However, during the second wave COVID-19 occupancy at LHCH reached a peak of 8.6% in December 2020 (lower than wave 1). At RPH however there was a sustained peak (reaching 18.8% - higher than wave 1) lasting until February 2021. It is likely therefore that it was the fact that RPH was working at higher capacity due to non-CRM workload that determined the differing second wave response. Panel A (upper) of *Figure 1* summarises the relative monthly number of procedures (bar chart) for LHCH (left) and RPH (right), as well as waiting lists (line chart) for EP (red) and device (blue). Both centres managed to protect device services, however EP waiting times have risen during the pandemic, particularly at RPH. Panel B (lower) demonstrates the Covid Strain over the pandemic.

Conclusions: By prioritising device procedures, device waiting lists were relatively spared. EP activity was heavily impacted at both centres, with a knock-on rise in waiting lists. RPH was under greater and more sustained pressure during wave 2 due to regional ICU load-levelling manoeuvres. ❑

Paediatrics

71/Prevalence of ECG changes and arrhythmias during childhood in Ebstein's Anomaly: 30-year review in South Wales

European Journal of Arrhythmia & Electrophysiology. 2021;7(Suppl. 1):abstr71

L James (Presenting Author) – Cardiff University, Cardiff; O Uzun – University Hospital of Wales, Cardiff

Objective: To assess the ECG changes and arrhythmias seen in Ebstein's patients.
Design: Retrospective longitudinal cohort.
Setting: University Hospital of Wales (UHW).
Population/Participants: 74 patients managed at UHW between 1990 and 2020.
Results: 53 cases eligible for the study were included. Right bundle branch block was seen in 65.2%, and delta wave in 18.8%. Wolff Parkinson White syndrome occurred in 17% of patients, and other types of supraventricular tachycardia in 17% of patients. 13.2% of patients experienced atrial fibrillation, 9.4% experienced atrial flutter and 1.9% had broad complex tachycardia. Postoperative heart block was seen in 44.4% of tricuspid valve repair patients, and 50% of tricuspid valve replacement patients.
Conclusions: Coexisting arrhythmias are common amongst Ebstein's patients, with Wolff Parkinson White syndrome being most prevalent. Right bundle branch block was the most common ECG finding, followed by delta wave. ❑

Paediatrics

72/Electrocardiographic findings in junior athletes before and after exercise in Latvia in two year time period

European Journal of Arrhythmia & Electrophysiology. 2021;7(Suppl. 1):abstr72

L Miļuna (Presenting Author) - Riga Stradins University, Riga; M Briuks - Riga Stradins University, Riga; E Šūpols - Riga Stradins University, Riga; K Kaļva - Riga Stradins University, Riga; L Marta Spīgule - Riga Stradins University, Riga; K Apsīte - Riga Stradins University, Riga; O Kalējs - Riga Stradins University, Riga

Introduction: Every year two out of all children up to age eighteen die from heart problems that can be noticed by regular electrocardiography (ECG). Some of these children had been diagnosed with serious heart conditions already but haven't showed up in routine tests or had continued to exercise with inappropriate workload. In Latvia junior athletes have once a year free compulsory health check-up tests up to the age of eighteen.

Aim of the study: To determine the findings that can be seen in electrocardiography before and after physical exercise and to check-up on the same athletes after a year.

Materials and methods: A total of 100 junior athletes at the age of 10 (in 2019th year) and 11-12 (in 2020th year) ECG were analysed. ECG's were taken from Latvia's sports physical and health tests, which included 100 ECG's at rest and 100 after physical activity and again 100 ECG's at rest and after activity one year later. Physical activity such as veloergometry tests or running for two minutes was offered to these young athletes each individually, based on their ECG at rest. Data were analyzed using IBM SPSS 26.

Results: Mode blood pressure in the study group was 100/60 mmHg. Mean body mass index in study group was 18.9. Mean heart rate at rest in the first year of study was 61 beats per minute and 73 beats per minute in second year. Mean heart rate after exercise in first year was 86 bpm but in second year 89 bpm. In 6 cases in first year and in 8 cases in second year was found right heart axis. Vertical heart axis was found in 13 cases in first year and in 12 cases second year ECG's. In first year at rest ECG's 1 person had 1st degree atrioventricular block but year later there were no signs of that in the same person ECG. 31 person had sinus arrhythmia in first year at rest ECG's and 41 after the activities. In second year 46 people had sinus arrhythmia (SA) but after exercise just 34 people had SA. In first year 2 people at rest had ectopic atrial rhythm, but after a year 6 people had it at rest. Incomplete right bundle branch block was found in 20 cases before exercise in first year and in 17 cases after exercise. In 20 cases was found incomplete right bundle branch block in second years ECG's and in 16 cases after exercise. Rest of the study group had normal heart rhythm in both years. Wandering atrial pacemaker was found in 2 ECG's at rest and also in 2 ECG's after exercise in first year. In 4 ECG's was found wandering trial pacemaker in second year at rest ECG and in 5 cases after exercise at second year. One person had left ventricular hypertrophy signs but year later there were no more signs of hypertrophy. Juvenile T waves were found in 12 cases in first year rest ECG and 10 cases in second year.

Conclusion: Diastolic blood pressure was a little bit lower than as it would normally be in children at the age of ten to twelve years for 5 mmHg. Study group have 5 trainings per week as mean range. Most of the athletes had sinus arrhythmia which is normal finding, as well as incomplete right bundle branch block, which as it turns out disappears in some cases after exercise. Juvenile T waves tend to disappear as the years go, in this study group only for two athletes it disappeared in a year. ECG is one of the best and cheapest diagnostic tool to rule out cardiac problems early. As the signs in ECG changes in a year at this age, it could be useful to take an ECG test even twice a year. ❑

Paediatrics

73/Wide complex rhythm causing progressive mitral regurgitation in a neonate: is it preexcitation or accelerated idioventricular rhythm?

European Journal of Arrhythmia & Electrophysiology. 2021;7(Suppl. 1):abstr73

G Jee (Presenting Author) - University Hospital of Wales, Cardiff; A Wong - University Hospital of Wales, Cardiff; V Ofoe - University Hospital of Wales, Cardiff; O Uzun - University Hospital of Wales, and Cardiff University School of Medicine, Cardiff

An 11-day old female with no known risk factors for arrhythmias was noted to have ectopic beats postnatally. Subsequent electrocardiogram demonstrated an intermittent regular broad QRS complex rhythm at the same speed as the preceding sinus beats which resembled pre-excitation. Besides a small patent foramen ovale, initial echocardiogram showed normal cardiac morphology and function. Although the neonate remained asymptomatic throughout, pharmacological treatment with flecainide was commenced in view of sustained arrhythmia and progressive mitral regurgitation. Close review of the 12 lead ECG revealed isorhythmic dissociation which led to the diagnosis of accelerated idioventricular rhythm. In addition to increasing flecainide dosage, initiation of propranolol was required to achieve satisfactory rate control owing to incessant arrhythmia. This combination treatment was well tolerated and achieved successful control of the neonate's arrhythmia with improvement in mitral regurgitation and cardiac function. ❑

Index of presenting authors