BHF Healthcare Innovation Fund Awards

Round 1: A total of £818,479 was awarded in March 2024 to five projects as part of the funding call from September 2023 to November 2023.

Round 2: A total of £921,572.20 was awarded in September 2024 to four projects as part of the funding call from April to June 2024.

The standard of applications received was high and the successful projects were identified as part of a competitive process subject to expert peer review. The Innovation Fund Committee assessed the applications on the following criteria:

- Novelty
- Feasibility of proposed design
- Potential for scalability
- Intended patient impact and
- Value for money.

Round 1 Awards:

Project Title	Lead Applicant	Institution	Amount Awarded
Modernising heart failure service provision in the UK: a '4x4' model of care delivery	Louise Clayton	Leicester University Hospitals	£202,716
West of Scotland Cardiac Device Psychology Service	John Sharp	Golden Jubilee Hospital, Glasgow	£99,446
Real-time ambulance to GP notification of atrial fibrillation: A digital solution to prevent stroke	Chris Wilkinson	Hull York Medical School	£99,969
Piloting a biopsychosocial service to enhance engagement in physical activity in people living with adult congenital heart disease (ACHD).	Helen Wallis	University Hospital Wales	£99,034
Triple Cardiovascular Disease Detection with an Artificial Intelligence-enabled Stethoscope – Primary Care Clinician Use for Screening	Nicholas Peters	Imperial College, London	£317,313.48

Round 2 Awards:

Project Title	Lead Applicant	Institution	Amount Awarded
Implementation testing of the HEart faiLure carer support Programme (HELP) in the United Kingdom.	Professor Donna Fitzsimons	Queens University Belfast	£250,077.00
A software based tool for starting and uptitrating medications for patients with heart failure and reduced ejection fraction	Dr Michael Kuehl	University Hospital Coventry & Warwickshire	£229,765.40
Little Hearts at Home - Parent and Carer Portal	Jemma Blake	Alder Hey Hospital	£129,804.36
Multicentre Atrial fibrillation Virtual ward Implementation Across NHS Hospital Sites (MAVIA NHS)	Andre Ng	University of Leicester	£311,925.44

A high-level summary of each application listed above is provided overleaf.

Title: Modernising heart failure service provision in the UK: a '4x4' model of care delivery

Lead Applicant: Louise Clayton – Leicester University Hospitals

Award: £202,716	**Duration**: 17 Months

Summary of the application:
This project aims to test the scalability of a novel framework for implementation of heart failure drug therapy for patients.

Unmet need
The burden of HF in the UK is high and increasing. In a population-based study, involving 4 million individuals within the UK, the estimated number of individuals with newly diagnosed HF increased by 12% between 2002-2014, in the context of an ageing population and improved survival from acute and chronic cardiovascular disease. The estimated number of prevalent HF cases in the UK over this period has also increased dramatically by 23%. As a result, the volume of work and caseload size of our HF workforce have increased markedly over the past decade. Many services are struggling to manage the additional demand of an ageing population and provide quality care for our HF patients. A survey performed by the BSH HF nurse forum in 2017 reported that the majority of HF services across the UK were unable to provide timely post-discharge follow up of patients admitted with HF. In this setting, the current care model, proposed and initiated 20 years ago, may no longer be fit for purpose. In order to provide high-quality care to the increasing number of patients with complex, comorbidities, we must look to modernise existing models of care to improve HF care delivery.

Pharmacological therapies such as renin-angiotensin system inhibitors, beta blockers (BB), mineralocorticoid receptor antagonists (MRA) and sodium glucose co-transporter 2 inhibitors (SGLT2i) now form the 4 pillars of treatment for patients with HFrEF.. Although the benefits of comprehensive pharmacological therapy is clear, real-world attainment of target doses and the utilisation of novel agents such as Angiotensin receptor neprilysin inhibitor (ARNI) and SGLT2i remain low. Suboptimal HF treatment may be a key contributor to poor outcomes in HF patients. Increasing effort has been put on identifying to optimise initiation and up titration of evidence-based HF medications. A recent multinational randomised controlled trial showed that most patients admitted for acute HF and not treated with optimal doses of HF therapies can be rapidly and safely up-titrated to recommended doses of drugs (ARNI/BB/MRA) within a few weeks after discharge with regular clinical and laboratory assessments. This approach was associated with a 34% reduction in HF readmission or all-cause death up to day 180.

As already described, standard delivery of the 4 pillars of drug treatment heart failure with reduced ejection fraction (HFrEF) has a “start low, go slow” format; initiation of one medicine at low dose, followed thereafter by up-titration of that agent and sequential introduction of the other agents. Until earlier this year, current guidelines, for example the European Society of Cardiology Heart Failure guidelines recommend initiation of beta-blocker at the lowest dose available, and doubling the dose at “not less than two week intervals”. For Mineralocorticoid Receptor Antagonist treatment, the recommendation is for initiation at low dose and to “Consider dose up-titration after 4-8 weeks”. This approach remains standard across the UK and other countries. Based on the results from a single trial, STRONG-HF, a focused update of ESC

guidelines in 2023 states “high-intensity care for initiation and rapid up-titration of oral HF therapies and close follow-up in the first 6 weeks after discharge for an acute HF hospitalization is recommended to reduce HF readmission or all-cause death. During the follow-up visits, particular attention should be paid to symptoms and signs of congestion, blood pressure, heart rate, NT-pro BNP values, potassium concentrations, and eGFR”. The focused update acknowledges the limitations in STRONG-HF, such as patient selection and low rates of evidence-based therapy in the usual care arm.

On this background, the potential benefit of rapid introduction and titration of 4 pillars is gaining traction. However, establishing patients with LVSD on maximum tolerated doses of the 4 pillars often remains a protracted process, a situation exacerbated by limited specialist staff to deliver care.

Proposal

In our single-centre pilot study, we demonstrated feasibility of the 4x4 approach in a cohort of patients with HFrEF, the group for which treatment with the 4 pillars is indicated. The current application will assess the feasibility of the 4x4 approach in routine care across the UK. We will include centres in which delivery of the 4 pillars involves allied health care professionals, reflecting modern workforce expertise and utilisation. We will assess safety and tolerability of rapid titration to a real world population across multiple sites, and the generalisability of 4x4 as a standardised approach to medicines management in this patient group, reducing inequity of delivery and access to services with more efficient utilisation of specialist staff.

Aims:

To assess:

- 4x4 as a standard mechanism for delivery of medical treatments in patients with HFrEF
- Safety and tolerability of 4x4
- Barriers to success of the 4x4 approach; are there specific patient characteristics identifying patients as unlikely to succeed ?
- Variation among sites in proportion of patients established on 4 pillars of treatment Acceptability to patients of 4x4
- Health economics assessment of 4x4

Deliverables:

To demonstrate:

- 4x4 can be established in the UK healthcare system
- 4x4 can be delivered to scale in differing health care settings
- 4x4 facilitates establishment of 4 pillars of care in the majority of patients with HFrEF

We have agreement from 12 sites in the UK (and 1 in New Zealand) committed to delivery on the aims of this project. The sites are geographically and socioeconomically diverse. The general opinion from participants and patients is that this project is a 'must do' and should be addressed as a time critical project.

As highlighted earlier, outcomes for heart failure patients remain poor despite clear evidence for improvements if patients can gain access to treatment in a timely fashion. At each site, 4x4 will be delivered by one or more members of the usual care team, overseen by a local senior clinician, responsible for delivery of the project. For

each patient there will be a maximum of 4 visits at weekly intervals, in the home , community or virtual setting that requires an intervention to take place at each appointment. Patients will be informed on the proposed approach and potential benefits, as well as need for this to be a partnership.

All 4 pillars of treatment should be initiated, and where possible optimised, in the time frame of 4 visits in 4 weeks. Sequencing of medications will not be mandated, but at the discretion of the local health care team. Each site will recruit 40-50 patients to the innovative 4x4 project. Participant sites are geographically distributed across the UK, including sites in England, Wales, Northern Ireland and Scotland.

We propose to include a single site in Auckland New Zealand (Prof R Doughty/ Melinda Copley). By doing so we will assess the applicability of 4x4 out with the UK healthcare system. The Auckland site will recruit a similar number of patients to UK sites; initial analysis of the outcomes of our project will include data from the UK sites only; subsequently we will include data from Auckland, ensuring inclusion of an overseas site does not unduly influence interpretation of our findings.

Evaluation
The evaluation will be summative and focus on process, impact and health economics measures using a mixed methods approach.

Each site will collate data on:

- achieved doses of treatments; safety;
- tolerability; side effects;
- barriers to dose-optimisation.

We will assess quality of life impact, symptom improvement and survey patients' satisfaction of 4x4, and also guidance on future roll out. Data will be collated centrally and analysed alongside healthcare economic modelling. Each site will have funding to support clinician time for delivery of 4x4, data collection and administrative work as a consequence of clinical reviews. Each site will be governed by their local clinical audit processes.

Scalability
Should the project prove successful, it will show that our new approach to managing heart failure is feasible, safe and economically viable. The sample size of 400-500 patients across 12 sites in the UK is also a strength of the project as it will allow us to showcase a range of approaches by different clinicians.

Title: West of Scotland Cardiac Device Psychology Service	
Lead Applicant: John Sharp - Golden Jubilee National Hospital	
Value: £99,446	**Duration**: 12 Months

Summary:
This project aims to test a model of using digital technology to provide a regional psychological service to support to patients who have an implanted cardiac device in Scotland.

Unmet need:
Up to 40% of people with cardiac devices can experience related psychological distress which can be tackled with appropriate expert support. There is a clear unmet need though as access to such services can vary significantly.

The regional heart failure service is a tertiary referral service for patients with advanced heart failure from the West of Scotland, a population of approximately three million people, providing complex device therapy, such as implantable cardioverter defibrillators (ICDs) and cardiac resynchronisation therapy (CRT). A significant proportion (~40%) of people in receipt cardiac devices experience notable psychological distress. Currently, there is substantial variation in access to psychocardiology for people in Scotland following device implantation as there is no psychology resource attached to the regional heart failure service and only three of NHS Scotland's 14 regional health boards have any dedicated psychocardiology resource. There is a longstanding and hitherto unmet need to improve recognition and response to emotional and behavioural sequelae associated with cardiac devices.

The provision of psychological support for people with cardiac disease is an area of significant unmet need, despite its recommendations in a number of guidelines and strong evidence of its value. It is often identified as a key gap in the patient journey, and this has been a key finding from the Scottish Heart Disease Lived Experience Network.

Proposal
The proposed test will establish a new regional psychological service for those in receipt of a cardiac device. The project will test the provision, effectiveness and adoption of evidence based treatment delivered remotely from a central location utilising the use of video enabled therapies. This use of an innovative model of service delivery will work across regional borders with treatment being delivered as part of routine practice in 1 to 1 and group settings as appropriate.

Individuals will be able to access the new service from across multiple regional health boards with treatment being delivered in patients own home regardless of geographical location. Clinical staff will be situated in a "central hub" hosted within the regional heart failure service in the Golden Jubilee University National Hospital.

The test will focus its learning on how to maximise the use of video enabled technologies and assess the impact of the service model to reduced inequalities of service provision and its ability to increase access to vital treatment and support to

those currently excluded from service due to lack of service availability, geographical location, or mobility/health issues.

Number of patients to be included in the test period

The West of Scotland Regional Heart Failure service implants approximately 450 devices per year with approximately 180 of these patients requiring some level of psychological intervention. Within the test period we will seek to establish and offer a programme of psychological prehabilitation for all prospective device recipients, provide direct psychological intervention to a minimum of 50 patients through 1 to 1 therapy and deliver an additional 30 patients therapies via group settings.

Evaluation methodology

Data for evaluation will be collected using a number of different approaches and methodologies including: data collated from within the Near Me platform (uptake, satisfaction and reach), information gathered through routine clinical practice (clinical outcomes and referral numbers), semi-structured interviews of organisational and patient perspectives (acceptance, training and satisfaction).

Route to adoption and general implementation in the Health Service

The initial test will be within the WoS Regional Heart Failure Service. This comprises:

- NHS Greater Glasgow & Clyde
- NHS Ayrshire & Arran
- NHS Lanarkshire
- NHS Highland
- NHS Dumfries & Galloway
- NHS Western Isles

Participating regions will be invited to adopt clinical pathways and service models developed within the project. Delivery will be supported through the current Near Me service infrastructure. Support for the scale up and implementation has been secured through the existing Near Me service infrastructure this is already operational and fully established nationally with the national Near Me team providing ongoing technical implementation advice and support. Service implementation support and expertise will be provided through the national Digital Mental Health Programme and the Clinical Priorities Unit within Scottish Government. The Heads of Psychological Services group will provide the appropriate regional support for the expansion process, psychological clinical governance and strategic alignment to national policy and priorities while the Heart Disease Task Force will provide support for engagement, and clinical input from cardiology services.

The growth in digital solutions including video enabled therapies and computerised cognitive behaviour therapy (cCBT), can reduce the barriers to accessing evidence-based psychological therapies. This project aims to use digital platforms to test a cross regional psychological service to support to patients in with an implanted cardiac device. This model proposes to use digital and video enabled therapy to allow experts in psychological therapies to reach patients outside of the geographical boundaries and therefore increase access.

Title: Real-time ambulance to GP notification of atrial fibrillation: A digital solution to prevent stroke

Lead Applicant: Chris Wilkinson – Hull York Medical School

Value: £99,969	**Duration**: 24 Months

Summary:
Many people with Atrial Fibrillation (AF) remain undiagnosed and untreated, due to the lack of obvious symptoms, leaving them at risk of experiencing a stroke. This proposal aims to test a novel method of identifying new AF patients via the ambulance service for follow up within primary care.

Unmet need:
Atrial fibrillation and atrial flutter (collectively known as AF) are the most common sustained cardiac arrhythmias and are associated with an increased risk of stroke and systemic embolism. Although this risk is substantially reduced by the use of oral anticoagulant (OAC) medications, approximately one third of patients with AF in England are currently undiagnosed, and so are untreated - and therefore remain at elevated risk of stroke. Stroke affects up to 100,000 people per year in the UK with an associated care cost of £26 billion.

Improving AF identification is an important component of prevention as the linked activity of increasing OAC prescription uptake over time for people with AF is associated with a significant reduction in stroke admissions. The move away from face to face visits, is leading to a decline in opportunistic pulse checks requires alternative approaches

Ambulance services often attend calls to patients for various issues who they do not need to take to hospital. Their routine use of ECGs often identify patients with AF, but this is not automatically notified to the GP and the patient therefore remains at risk

Previous scoping work undertaken by the applicant team comprising interviews in 13 ambulance services and 'deep dive' activity within 2 of them. Their findings included an absence of formal pathways for ensuring ongoing care for people identified with an incidental finding of new AF amongst those not conveyed to hospital.

Proposal

Hull York Medical School and North East Ambulance Service (NEAS) propose to develop and test a technology led pathway on patients attended by paramedics who are noticed to have undiagnosed AF, but do not require transfer to hospital. The aim is to test the pathway on approximately 700 patients with potential undiagnosed AF who are estimated to be seen by the service during the project lifetime.

The BHF grant will enable the following activities within the project:

Technology Development: The development and coding of a software solution that will link the NEAS Cleric system, with GP systems and to include a bespoke data field enabling paramedics to flag the discovery of new AF. The two systems will be linked so that it will allow the attending paramedic to record the newly observed AF which in turn will create an alert and generate an automated notification to the GP electronic system, incorporating a letter and the ECG carried out. The letter and the

ECG will support patients to be followed up by the GP to arrange an appointment in relevant cases begin appropriate drug treatment to reduce their risk of stroke.

Training: An AF Champion Paramedic will lead the development and delivery of a multi format training programme to support paramedics to understand the importance of AF identification and oral anticoagulation. The training will support paramedics in accurate ECG interpretation for AF identification. They will also be trained on how to effectively use the technological solution. This training will be delivered in multiple formats including, face to face, online and supported by the development of written resources to support consistent application of the pathway the ECG to the patients GP via the NEAS and GP existing electronic record systems, highlighting their need to be followed up.

Expansion: The team will also explore how the pathway can be adopted nationally in the event of a successful pilot by forming a community of practice across other ambulance service as well as feeding back findings into nationally recognised bodies such as National Association of Ambulance Service Medical Directors (NASMED)

Evaluation methodology

Their evaluation will comprise of two key areas:

1) A quantitative outcome evaluation will use EMS data linked with primary care data. The team will quantify uptake rates of the intervention amongst potentially eligible patients, and compare new entry to the primary care 'AF register' and OAC prescription rates by pathway use, and compare with the preceding year.
2) A process evaluation consisting of semi-structured interviews with EMS clinicians, GPs, and general practice managers to understand the ways in which notification is actioned or not in clinical practice, and identify ways in which the intervention could be improved.

The team will engage an experienced qualitative researcher with previous experience of the proposal to lead an 'end-to-end' rapid qualitative service evaluation with selected key stakeholders.

Scalability

The team delivering the project have already assessed the potential for scalability noting that electronic patient care records are in use in 13 Ambulance services and can be achieved if the project evaluation is positive.

Several services are also using the same platform as NEAS and through sharing of the software changes rapid upscaling can be implemented to reach a population of up to 21 million people.

Broad support for the idea has already been identified across ambulance services during the scoping stage.

Finally, the team will create a network (community of practice) of people in ambulance services interested in this area to share learning and opportunities. This will support future collaborations and wider adoption as other services will already be engaged with the project. Updates and information will also be fed into national

bodies such as the National Ambulance Research Steering Group (NARSG), the lead paramedics group and the National Association of Ambulance Service Medical Directors (NASMED) who are key decision makers.

The findings will be shared at relevant conferences such as the EMS999 Forum and College of Paramedics annual research events, and published in journals that are widely read by practitioners such as the British Paramedic Journal and British Journal of General Practice.

Title: Piloting a biopsychosocial service to enhance engagement in physical activity in people living with adult congenital heart disease (ACHD).

Lead Applicant: Helen Wallis – University Hospital Wales

Value: £99,034.70	**Duration**: 12-15 Months

Summary:
This proposal is for an exercise programme for adults with congenital heart disease (ACHD) in South Wales. Patients will receive individualized support from physiotherapy, nursing and psychology to help them overcome the barriers and concerns about exercising, with the aim of improving health and wellbeing.

Unmet need:
ACHD patients are born with their condition. Many have already undergone previous surgery and may face further surgery or interventions. Additionally, they face further risk of acquired heart disease. Research suggests that patients living with adult congenital heart disease (ACHD) are at increased risk of developing cardiovascular (CV) risk factors, and compared to the general population, ACHD patients are more likely to be sedentary. Local data from the applicant showed that 58% of patients were either overweight or obese.

These patients will benefit from a programme of physical activity to improve their health and prevent development of further heart disease. Despite patients being encouraged to exercise, many reported a reluctance to increase their activity levels. There were many barriers to people with ACHD engaging in exercise. These included:

- Biological factors: (i.e. health status, mobility, breathlessness, fatigue)
- Psychological factors (i.e., beliefs about exercise, motivation, confidence, anxiety)
- Social factors (i.e., opportunity and access)

As well as the biopsychosocial barriers cited. Many patients were cautioned against exercise in childhood. They have limited experience of exercise and express anxiety about the risk of exercise on their cardiovascular (CV) status. Many private gyms report a reluctance to accept patients with ACHD.

Proposal

The project aims to implement a biopsychosocial approach to address the barriers and improve health outcomes for ACHD patients, by increasing physical activity, optimise medical treatments and enhance positive health behaviours in the ACHD population, through access to a 12 week programme.

Patients will receive individualized support from physiotherapy, nursing and psychology to help them overcome the barriers and concerns about exercising, with the aim of improving health and wellbeing. The programme will utilise a virtual platform for remote access to the team as well as the Giraffe Exercise app to allow patients to exercise at home. The programme will also provide opportunity to attend face to face sessions for exercise and to access psychosocial support and guidance.

Number of patients to be included in the test period

This proposal and funding is to pilot for an exercise programme for adults with congenital heart disease (ACHD) in South Wales. The pilot is for approximately 125 patients.

Evaluation methodology

Evaluation will be focussed on a range of validated patient measures for tracking progress and sharing outcomes. Baseline measures will be established be reassessed during and at completion of the 12-week programme.

Physical Measure: The team plan to assess quantitative changes in cardio-respiratory fitness and qualitative data will also be captured about patients' perceived level of fitness and ability. Validated questionnaires will be used to measure quality of life and psychology measures (e.g PHQ9 depression questionnaire). In addition, the team will gather qualitative feedback on patient experience / reported outcomes of the project (PREMs). This will be co-developed with the local patient experience team.

Regular meetings will take place within the team to assess the progress of the project and the evaluation measures.

Scalability

If the pilot proves that this approach is both viable and effective, the team propose to support early stage scaling through satellite ACHD clinics across South Wales.

Findings and outcomes will be shared with the South Wales and South West Congenital Heart Disease Network through the Governance Meetings and also present project finding a at national conferences.

Title: TRICORDER-PLUS: Triple Cardiovascular Disease Detection with an Artificial Intelligence-enabled Stethoscope – Primary Care Clinician Use for Screening

Lead Applicant: Nicholas Peters - Imperial College London

Value: £317,313.48	**Duration**: 18 Months

Summary:
This project aims to test a pathway in which Artificial Intelligence enabled digital Stethoscopes are used to improve rapid identification testing and earlier treatment of patients with undiagnosed Heart Failure (HF), Atrial Fibrillation (AF) and Valvular Heart Disease (VHD)

Unmet need
The most common and deadly forms of heart disease are usually diagnosed late, when patients are very unwell, causing poor quality of life, premature death and substantial costs for the NHS. HF alone is considered to cost the NHS is over £6 Billion per year – 4% of its annual budget.

70-80% of new HF diagnoses are made late, at emergency hospital admission. When compared to earlier diagnosis in primary care, this route to diagnosis results in poorer patient quality of life, clinical and health economic outcomes compared with earlier diagnosis, made by GPs. A key reason is that early initiation of inexpensive, guideline-directed, disease-modifying treatment – particularly for the most common form of HF, with reduced left ventricular ejection fraction (HFrEF) improves survival, quality of life, and reduces NHS costs. Critically, these therapies are effective in pre-symptomatic patients with reduced left ventricular ejection fraction (LVEF) ≤40%. Poor outcomes in AF and VHD – both treatable and associated with HF – are similarly driven by late diagnosis. These conditions could all be treated effectively if diagnosed early.

For HF, natriuretic peptide (NP) blood testing initiates the NICE recommended diagnostic pathway. Abnormal NP results trigger a referral for specialist review, diagnostic transthoracic echocardiography (TTE), and initiation of medical therapy.

However, the current evidence for extending NP testing to targeted screening is equivocal and without additional diagnostics, there is no viable, cost-effective solution. The absence of a quick, easy, point-of-care test that increases appropriate NP testing and use of the NICE diagnostic pathway is a clear unmet need which could improve outcomes for patients.

Proposal
The proposal is based on a two-phase implementation activity to assess the effectiveness of the AI stethoscopes as a method for early targeted testing for HF in primary care. In phase one, a validation exercise was undertaken on suspected HF patients in parallel with currently accepted gold standard diagnostic HF investigations. This demonstrated the stethoscope operated with a high degree of accuracy and sensitivity as a testing tool. In phase two the stethoscope was tested in a primary care setting on a targeted patient cohort to evaluate its effectiveness against the following aims:

- Determine feasibility and performance of AI-stethoscope for detection of NT-proBNP >400ng/mL in primary care
- Determine uptake of targeted screening for HF
- Identify undiagnosed patients with HF earlier than current practice

Following positive outcomes in both phases of early testing the team now intend to undertake early-stage scale testing against the following aims:

- Deliver an upscaled targeted screening programme for HF using the AI-stethoscope
- Measure the clinical and health economic impact of the programme, following National Screening Committee (NSC) criteria.
- Use implementation science methodology to establish a blueprint for deployment of this programme at the level of the NHS Integrated Care System – covering key clinical, information governance, financial and behavioural economic factors

The team will use data-informed targeting with 10 GP practices across London (urban) and Devon (rural) to invite patients for triple heart disease screening, with a particular focus on HF, in patients with no existing (coded) HF. Patients will be invited for a brief AI stethoscope examination and, where indicated, a confirmatory blood test. In patients where HF is detected, GPs will invite them to community HF clinics and undergo guideline approved treatment for their condition including appropriate drug therapy. The project will work with the National Steering Committee (NSC) to measure the patient-centred clinical, health economic, and wider holistic outcomes needed for the NHS to adopt this approach nationally.

Evaluation

The evaluation will examine the effectiveness of the model through analysis of data obtained from the AI Stethoscope, Electronic Patient Health Record Data and an ethics approved database of pseudonymized primary and secondary care clinical and health economic data.

This data will be used to evaluate performance against a primary outcome of incidence of HF from the targeted screening programme, following specialist review.

Additionally patient centric data will be captured and measured including healthy days at home and pre and post-screening anxiety. Clinical measures will also be examined, including unplanned emergency department attendance or hospitalisation, incidence of AF, or VHD, prescription of guideline-directed medical therapy for HF, AF and 12 month mortality. Health Economic data will also be captured and measured to support the development of commissioning focused blueprints

Scalability

If the project proves successful, the programme team will create a replicable 'blueprint' of the clinical, regulatory, financial and data governance for commissioning the screening services at the level of the NHS Integrated Care Board. This blueprint is being developed in collaboration with the National Screening Committee, with the ambition to submit to their annual call in July 2025.

Title: Implementation testing of the HEart faiLure carer support Programme (HELP) in the United Kingdom.

Lead Applicant: Donna Fitzsimons - Queens University Belfast

Value: £250,077.00	**Duration**: 24 months

Summary:

This project will test the **HE**art fai**L**ure carer support **P**rogramme (HELP), which is an initiative to support carers to look after patients with heart failure (HF). This programme will enhance the capability of carers to effectively support patients with self-management, which will result in improved quality of life (QoL) and reduced hospital admissions. The HELP programme includes an information booklet, and 6 online educational support sessions delivered weekly. Specialist Heart Failure Nurses (SHFNs) will be trained to deliver HELP to approximately 180 carers of patients with HF. The initiative will be tested in 3 sites each within a separate United Kingdom (UK) nation, which will involve an investigation of:

1) Implementation fidelity (what was implemented & how closely this reflected what was intended)
2) Contextual factors (barriers to and facilitators of implementation)
3) Carer and patient-related outcomes (e.g., hospital admissions, GP visits, QoL, carer burden, and carer preparedness)
4) Cost of HELP implementation

This information will offer guidance to policy makers and commissioners to inform the large-scale, roll-out and embedding of HELP in routine clinical practice.

Unmet need:

It is estimated that there are around 64.3 million people living with HF worldwide, which has risen significantly over the last twenty-eight years because of an aging population. Self-management is recognised as a key strategy for managing HF, and effective self-management of symptoms can reduce hospital readmissions and increase patient QoL. However, as HF progresses, it becomes increasingly difficult to manage the symptom burden, and many patients rely heavily on support from family carers. Research demonstrates that carers experience poor mental and physical QoL, which has been linked to their caring role and the health status of the patient they care for.

The European Society of Cardiology guidelines for managing HF acknowledge the important role carers play in supporting patients to manage their condition, however, there is little guidance provided on how to support carers. Despite the increasing amount of literature highlighting the unmet needs, poor physical and mental health, and lack of support for carers of patients with HF, there are no supportive interventions co-designed with carers to exclusively target their requirements within the UK.

Proposal

The project will undertake an expansion of a previously successful pilot phase, which feasibility tested an online educational intervention platform (co-designed with

academics, carers, and healthcare professionals) called the HEart faiLure carer support Programme (HELP). This pilot demonstrated that delivering HELP to carers of patients with HF is feasible and has the potential to improve carer preparedness, emotional wellbeing, and make them feel empowered in their caring role.

The team will now test replication of HELP in a real-world setting, in line with UK Medical Research Council guidance on developing and evaluating complex interventions. This will inform the large-scale, roll-out of the intervention.

They will do this by implementing and evaluating the HELP programme, with delivery by healthcare professionals to 180 patients across three collaborating sites within the UK. The project will involve the professional production of programme materials and standardised content for delivery by healthcare professionals across the sites. The project will also include training of staff in the delivery of HELP content and effective facilitation of supportive discussion between participants.

The HELP programme itself will consist of an information booklet and 6 online educational support sessions delivered weekly by SHFNs.

The carers targeted will be those who require additional support (caring for patients who had a clinical complication in the past 6 months despite optimal medication). These carers will be recruited via clinical teams through a range of channels including both online advertisements and patient appointments.

The project will generate knowledge about the real-world implementation and impact of a novel, support programme for carers of patients with HF (see evaluation below for further details).

Evaluation methodology

The project will include a mixed-method evaluation of the real-world implementation and impact of HELP for carers of patients with HF in the UK, with three work packages:

Work Package 1: What are the service-level facilitators and barriers to the implementation of HELP?
Work Package 2: What are the real-world patient and carer outcomes?
Work Package 3: What is the estimated economic cost of implementing HELP in the UK?

The completion of these work packages will be driven by four key assessments:

1) Implementation fidelity (what was implemented & how closely this reflected what was intended)
2) Contextual factors (barriers to and facilitators of implementation)
3) Carer and patient-related outcomes (e.g., hospital admissions, GP visits, QoL, carer burden, and carer preparedness)
4) Cost of HELP implementation

This evidence will be gathered by a variety of methods including interviews and questionnaires as well as economic assessments of time costs and expenditure

incurred. The data will be collected at various points during the project's lifetime and analysed by the project's research team.

Scalability

Complex interventions may require adaptation as they are transferred to the real-world setting, with a degree of flexibility improving pragmatic effectiveness. Therefore, prior to large-scale implementation, it is vital to have a clear understanding of the active components of the HELP programme and it is important to determine how closely delivery follows what is intended.

The findings will be disseminated via academic journals/conferences and across the project team's established networks with healthcare professionals, professional organisations, medical charities across the four nations, innovation networks, and policy makers/commissioners across the UK. These dissemination activities will report the capacity and requirements for large-scale, regional implementation of HELP, leading to embedding in routine clinical practice for carers of patients with HF.

Title: Little Hearts at Home - Parent and Carer Portal

Lead Applicant: Jemma Blake - Alder Hey Hospital

Value: £129,804.36	**Duration**: 12 months

Summary:

Little Hearts at Home® (LHAH) is a paediatric first, life enhancing, clinically validated remote patient collaboration (RPC) platform for complex cardiac patients. The system provides babies born with severe heart defects, such as single ventricle anatomy, with cross-organisational RPC, connecting patient, parents, community care providers, critical care teams, and clinical staff. It has been proven to reduce calls to specialist nursing teams by 80%, a reduction in emergency admissions to Alder Hey by 50% and reduced time in hospital for families. The platform has also reduced outpatient appointments, whilst allowing families to spend more time at home, decreasing anxiety and increasing quality of life, through data driven personalised care.

This project aims to further develop the Little Hearts at Home platform so that it can be used by both carers and healthcare professionals alike. This is to enable the positive results from two previous development stages to reach wider geographical areas and an increased number of families, reducing health inequalities in areas that do not have appropriate community services for the families of this patient cohort. It proposes to achieve this by developing the portal that will enable parents and carers to enter data of their children.

LHAH was co-developed with clinical founders in response to the need for improved at-home monitoring and collaboration of vulnerable paediatric patients. LHAH enables robust digital monitoring, automated real-time recording, reporting and statistical display of patient's status in graphical and numerical data, as well as providing chronological trends, automated alerts, whilst reducing administrative burden. This transforms existing post-operative pathways from a reactive 'no news is good news' approach to a proactive and preventative model of care.

Unmet need:

Approximately 1:1,000 babies are born with severe congenital heart defects, for example missing a pumping chamber or main artery. It is estimated that this equates to over 6000 high risk babies born in the UK every year. These children can survive into adulthood with the support of multiple stages of surgery. Initial surgery is carried out within the first week of life. This surgery,

whilst having some of the highest mortality rates, and prolonged hospital stays, sees as many as 70-80% of babies surviving until the next stage of surgery, usually required within the next 4-6 months. UK national audit data for congenital heart disease shows that 3,500-4,000 procedures are carried out annually in infants.

The sudden infant death rate between the first and second stage of surgery is saddeningly high (c16%) but evidence shows that community surveillance for warning risk factors can enable prompt referral for early intervention to prevent loss of life. Ongoing monitoring of new-borns discharged into the community is imperative prior to second surgery.

In addition to the risk there are also significant financial costs to both parents and the NHS. Patients and their families could spend 6-9 months in hospital at the beginning of their life, which can see families incur costs in loss of income, travel to and from hospital and increased childcare costs for other siblings. Current systems do not adequately address the issue of community surveillance, as clinical teams do not always get adequate patient data, creating distress for patients and families through frequent and costly outpatient visits and emergency admissions.

Whilst the LHAH platform has gone a long way to address this challenge by connecting patients, families, hospital staff (doctors, nurses) and community care providers in a single environment, evaluation of the previous programme phases have noted the depth of community support required to support these complex patients is not consistently present across the whole of the UK or in many other countries, especially across Europe. Evaluation of the latest expansion testing identified that to address this, the platform would benefit from additional capabilities, which would help to avoid further health inequalities.

Proposal

The team propose to build on the work following two prior stages of development which have evaluated positively:

- An 8-month pilot of LHAH carried out in 2021 which aimed to test the safety, efficacy, and acceptability of the system. 33 severe congenital heart defect patients across the NW CHD were introduced to the system over a phased period. This demonstrated the safety and effectiveness of the system, during which there were 0 mortalities, 45 automatic alerts due to breach of patient parameters and 5 urgent admissions prompted by breech of parameters. Additionally, it demonstrated increased patient and carer satisfaction, improved clinical confidence in home monitoring and numerous admission avoidances.
- Phase two scaling support for the platform, which involved developing bespoke software to enable scaling and testing the platform to children

at Alder Hey and under the care of other trusts and in other speciality areas.

The project is now going to develop the platform further to address the findings and feedback identified during the second phase, most notably that not every region had the same community nursing support as the Northwest. This is a particular issue for families living significant distances from specialist centres. Feedback suggests the platform would have further reach potential if parents and carers could use the platform for logging parameters such as weight, saturation levels, general observations and developmental milestones, for their clinical teams to review and advise.

This project aims to develop the LHAH platform to make it usable for families and caregivers to interact with the system and provide clinical teams with the necessary information for the safe care and wellbeing of the infants within their care.

To test and scale this 'Parent and Carer Portal' as safely as possible, the team intend to deliver a proof of concept, by rolling the portal out alongside community nursing teams and use both community and specialist nursing teams to educate parents on how to record certain data points and input them into the tool.

Once this has been validated it will be possible to offer the service to other regions and settings, safe in the knowledge that it has been robustly tested within the participating sites.

Design and development will capture the views of families and carers as well as clinicians. Families and carers will be asked questions on how to best design the platform, so they feel comfortable using it.

Expansion:

If successful with the provision of the 'Parent and Carer Portal' for LHAH, the team propose to utilise several methods to facilitate the scaling up and national, and international implementation of the project:

The existing interest, both nationally and internationally, will be leveraged and the team will look to promote through their own national and international networks.

In support of this, a commercialisation strategy is currently being drafted, market tested and refined.

The platform has been repeatedly promoted during the last 6 months at an array of conferences including the World Hospital Congress in Lisbon and will continue to be promoted at various conferences e.g. the BCCA.

Finally, the programme team are working closely with a diverse network of innovation and commercial consultants to support a wider expansion and adoption plans for the platform.

Evaluation methodology

The team will undertake a mixed methods approach to evaluating the project. It will focus on health outcomes, carer and clinician experience, and patient data reliability.

The project aims to measure specific outcomes that directly result from using the platform. Key areas of evaluation include:

- **Clinical Outcomes -** Reduction in mortality or morbidity, improved post operative recovery, decrease in unnecessary readmissions, and decreased length of stay in hospital.

Approach – The team are currently conducting a health economics evaluation for every patient who has been monitored on to the platform. Evaluation criteria include:

- Demographics such as Sex, Ethnicity, DOB, DOD, Postcode etc.
- Hospital Visits – LHAH visits vs ED elective and emergency visits/ admissions.
- Equitable Healthcare Access Postcode deprivation deciles to quantify the level of socioeconomic deprivation in a specific geographic area, travel and time/distance and cost to AH Level 1 Heart Centre so we identify health disparities and the need for resource allocation.

The platform allows clinical teams to analyse the data and identify what would have happened pre LHAH compared with what did happen because of utilisation of the platform. E.g. Opportunities for early escalation, preventing need for unnecessary acute admissions and pre-emptive admissions to avoid patient deterioration. This data is then analysed by the Cardiac Teams, Data Science Teams and Research Teams.

- **Patient and Family Satisfaction -** Regular feedback will be encouraged to gauge satisfaction levels with the collaboration platform, communication, and centered care coordination.

Approach - In-depth interviews with carers, co-creation workshops and surveys (before and after developing the solution proof of concept).

- **Organisation Outcomes** - Reduced hospital readmissions, fewer emergency visits, improved care continuity and cost savings.

Approach - Hospital data analysis- via clinical teams, with support from Alder Hey's in-house Business Intelligence and Finance teams.

- **Access and Equity-** Improving access of care for underserved or remote populations.

Approach - LHAH Team with support from Alder Hey's in-house Innovation Data Science Team will be able to use tools to identify health disparities and the need for resource allocation.

- **Technology Useability -** Assess user engagement and feedback from healthcare professionals to ensure the platform is easy to use and efficient.

Approach - Data maintenance and regular feedback will be carried out by the Project Lead, Specialist Nursing team, Cardiology Consultant and reported back to developers in an agile way of working.

Scalability

If the 'Parent and Carer Portal' for LHAH proves successful, the team will utilise several methods to facilitate the scaling up and national, and international, implementation of the project.

There is already national and international interest in the platform following presentations at various conferences and symposiums. The team intend to build on this by showcasing the platform and the project through their pre-existing networks including the Children's Health Alliance and NHS England, whilst developing a commercial strategy to allow other organisations to licence the Platform for their own use.

Title: A software-based tool for starting and uptitrating medications for patients with heart failure and reduced ejection fraction

Lead Applicant: Michael Kuehl - University Hospital Coventry & Warwickshire

Value: £229,765.40	**Duration**: 18 months

Summary:

This programme aims to improve the up-titration of evidence-based heart drug therapies for patients with heart failure and reduced ejection fraction (HFrEF) using a software based decision tool accessible to healthcare professionals.

Unmet need:

Heart Failure (HF) affects approximately 900,000 of the UK population. Heart failure with reduced ejection fraction (HFrEF) makes up 50-70% of total HF cases. The management of these focuses predominantly on four medication groups as advised by NICE guidance. However, patients often fail to reach dose optimization for these medications due to a range of factors including patient tolerance and access to specialist care.

Longer up-titration timelines lead to poorer the outcomes, whilst rapid up-titration of medications has been shown to reduce symptoms, improve quality of life, and reduce the risk of 180-day all-cause death or heart failure readmission compared with usual care.

Healthcare professionals from an array of settings should be involved in the care of patients with heart failure, and should be involved in establishing and up-titrating medications. However, scoping by the team indicates that non-specialists, such as General Medicine secondary care doctors, community pharmacists or General Practitioners, are hesitant to achieve target doses of the four main heart failure medications. In some areas there are no established heart failure services to support this up-titration.

Recommendations have been made for a personalized approach to up-titration considering an individual's physiology and symptomology. Wider, the NHS is welcoming a more personalized model of care, providing out-of-hospital care where possible, as evidenced in the NHS Long Term Plan.

Proposal

The team have developed a prototype decision-support tool that supports healthcare professionals (HCPs) to initiate patients on medications and up-titrate these medications weekly within a maximum time of eight weeks. This tool is based on the medical therapy algorithm for patients with HFrEF.

The functionality is designed to monitor physiological measurements such as blood pressure, heart rate and kidney function as well clinical symptoms, such as dizziness. It will then use current and previous data to recommend starting appropriate drug therapy and dosage over a target duration of 8 weeks. In-built safety features will recommend a consultant review rather than further up-titration where appropriate. Reported side effects will also trigger a consultant review and interrupt the up-titration.

The aim is to implement a test phase of a prototype of the software decision tool, progressing to a minimal viable product (MVP) and finally, to develop a patient facing app.

The project will utilise experienced heart failure clinicians to rate the software's decision output in hypothetical situations and use this to refine the decision-making algorithm as well as validation using retrospective data.

The team will involve patients throughout the project and development process, considering their past experience, views on the software to be developed and their thoughts on the layout and design of the patient facing product. There will also be patient representation on the steering committee to incorporate the views on further development of this technology, especially to incorporate better communication between patients and the HCPs, which will remain a key component of the pathway the software will support.

Evaluation methodology

The evaluation proposes to use a mixed methods approach to analyse the project outcomes and data. This will include assessor appraisal of the algorithm's decisions on up-titration, particularly in areas of patient safety.

The evaluation will also capture user experience of the platform, including patient experience.

The evaluation will further focus on user feedback and HCP decisions around patient management linked to the tool's use. Various approaches will be used including data analysis, feedback questionnaires and focus groups.

Scalability

If the development proves successful, the team proposes a project to look to further feasibility testing of the platform in clinical settings, obtaining both patient and staff feedback. The outputs of this will feed into a larger multi-centre randomized trial, to build evidence for expansion throughout the NHS.

Title: Multicentre Atrial fibrillation Virtual ward Implementation Across NHS Hospital Sites (MAVIA NHS)

Lead Applicant: Andre Ng - University of Leicester

Value: £311,925.44	**Duration**: 24 months

Summary:

Atrial Fibrillation (AF) is the commonest heart rhythm disturbance in clinical practice where the patient's heart beats irregularly and could be excessively fast, causing symptoms of palpitation, chest pain and breathlessness needing urgent hospital admission. The team at Glenfield Hospital, University Hospitals of Leicester NHS Trust wish to test a previously evaluated innovative pathway to manage patients presenting with newly diagnosed AF in a virtual ward environment. The project seeks to test the pathway across different geographical locations and patient populations to assess how it could be applied in an array of clinical settings.

Unmet need:

Atrial fibrillation (AF) is the most common cardiac arrhythmia seen in clinical practice. The British Heart Foundation estimates that 1.5 million people in the UK have AF - a 50% increase over the past decade. The prevalence of AF rises sharply with increasing age, with 1 in 10 people over 70 years old having AF.

Researchers estimate the direct costs of AF, as a percentage of the NHS budget were between £1.435b (0.91%) to £2.548b (1.62%) in 2020. It's estimated that by 2024 these costs will increase to between £3.851b (1.35%) to £12.143b (4.27%). Nearly 60% of these direct AF costs are driven by inpatient hospital admissions.

Under standard care, patients presenting to emergency departments (ED) with "fast AF" (i.e. AF with fast heart rates) are admitted to hospital to achieve control of their arrhythmia. The observation and treatment period in the hospital may range from hours to days. Admission thresholds vary with different entry points for acute patients presenting with "fast AF", across District General Hospitals (DGHs) and Tertiary Centres. Acute AF patients may present to ED, be referred by primary care to medical, geriatric or cardiac services at hospital sites with and without specialist AF services.

The Leicester AF virtual ward established in 2022 has shown that patients who are deemed medically stable can be treated at home safely and effectively utilising a telemedicine approach. Following this there has been considerable national interest in using a virtual ward model to manage this patient group, with several enquiries on the workflow, infrastructure, safety outcomes and a growing appetite to establish a working group for national development.

Virtual wards however remain diverse, inconsistent, with different nuances, patient populations, multiple referral pathways and incoherent methods for data collection. This in turn makes the evidence generalisability and future upscaling of virtual wards challenging despite the promising initial outcomes of the current models (Chapell P,et al. The Health Foundation,2024). Furthermore, national virtual ward programmes are mainly focused on frailty, heart failure, acute respiratory tract infections, with no well-

established acute arrhythmia monitoring models due to, again, the paucity of evidence for safety and efficiency. An evidence base across multiple settings therefore needs to be established to inform a safe expansion of this model for patients with AF.

Proposal

The main aim of this project is to evaluate the further implementation of virtual wards for acute AF across different hospital sites to generate a blueprint and inform upscaling and wider NHS adoption. This is to build on the model and evidence from the initial pilot phase.

During the pilot phase, the AF Virtual Ward pilot was established at Glenfield Hospital, Leicester with pilot funding from local Clinical Commissioning Group (CCG). The virtual ward admitted haemodynamically stable patients with fast AF within two categories:

Step Up patients – patients presenting to the hospital ED directly onboarded to the virtual ward instead of hospitalisation
Step across patients – patients admitted to hospital to facilitate early discharge to continue their acute care via the virtual ward

Eligible patients were admitted to the virtual ward and treated at home. This was achieved through:
i) a multidisciplinary team
ii) digital equipment (single lead digital ECG, Bluetooth integrated blood pressure machine and pulse oximeter),
iii) smartphone app with daily tasks assigned to patients and an online symptom questionnaire,
iv) online platform with twice daily virtual ward rounds
v) e-pharmacy.

406 patients have been treated to date by the virtual ward in Leicester

The pilot phase was supported both logistically and financially by a number of partners including a local CCG, a Digital Healthcare Partnership Award from NHS England's Transformation Directorate as well as evaluation funding from the Health Innovation East Midlands

The project will now undertake early expansion testing and evaluation of the VW concept in selected sites that are currently delivering an acute AF virtual ward which is already well received by patients and have no early adverse safety signals. This is to reduce the amount of time typically involved in setting up the service, so that the project can focus on gathering evidence around the delivery in a variety of hospital settings. The aim is to onboard 300 patients in the following trusts:

- Glenfield Hospital, Leicester (tertiary centre)
- Chelsea & Westminster, London (DGH)
- University Hospitals Dorset NHS Foundation Trust, Dorset, (DGH)
- Chesterfield Royal Hospital NHS Foundation Trust, (DGH with tertiary centre links)

The project will work closely with patients and carers who will feedback and inform the ongoing development of the virtual ward model across the participating sites, refining the offering and addressing any issues.

Additionally, the project will look at broader issues such as integration of the ward data into electronic patient records as well as examine other factors such as workflows in different centres to develop a model that can be applicable regardless of the entry points of patients in the various settings.

Evaluation methodology

The project team will commission an independent evaluation across the 4 sites using a mixed methods approach. The project proposes to explore and analyse health economics to assess safety, efficacy and cost-effectiveness of AF virtual wards and benefit to patients, clinicians and the NHS.

Data capture will take place across the 4 sites, and the evaluation will examine quantitative data, including admission and outcome data as well as length of stay. This will be compared with a matched cohort of patients who are not admitted to the virtual ward.

The project will also include qualitative interviews as part of its evaluation undertaken at different points of the delivery phase which will then undergo thematic analysis.

Scalability

Should the project evaluate successfully, the outcomes of this project will be shared through a dedicated website and published in peer-reviewed journals as a reference for implementation, as well as national and international conferences. This will be communicated to all the previous centres who expressed interest in developing virtual wards for AF. This in line with the project aim to develop a blueprint of AF virtual wards that can be implemented in a variety of settings, including those with no specialist arrhythmia service.

The national Getting-It-Right-First-Time (GIRFT) programme is developing guidance for virtual wards implementation. The project aims to provide a full report to GIRFT on the multisite implementation, to establish a national guidance in implementing acute AF digital pathways.

The 4-centre committee will continue to provide a reference to support virtual wards set up for AF. Advice will be given on funding resources either through local Integrated Care Boards, Networks, Trusts or NHS England.

The next round of the Healthcare Innovation Fund opens for applications early in March 2025. Please look at the website for further details. BHF Healthcare Innovation Fund