BHF Healthcare Innovation Fund Awards Confirmed September 2024

British Heart Foundation

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.

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: 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 September 2024. Please look at the website for further details. BHF Healthcare Innovation Fund