Innovate UK

Results of Competition: Digital Health Technology Catalyst Round 3: Collaborative R&D

Competition Code: 1809_CRD_HEAL_DHTC_R3

Total available funding is £8,458,551 million

Note: These proposals have succeeded in the assessment stage of this competition. All are subject to grant offer and conditions being met.

Participant organisation names	Project title	Proposed project costs	Proposed project grant
SPECTRA ANALYTICS LIMITED	PATCHS (Patient Automated Triage and Clinical Hub Scheduling)	£600,661	£420,463
Manchester Health and Care Commissioning		£0	£0
NHS Salford Clinical Commissioning Group		£0	£0
The University of Manchester		£388,713	£388,713

Note: you can see all Innovate UK-funded projects here: https://www.gov.uk/government/publications/innovate-uk-funded-projects
Use the Competition Code given above to search for this competition's results

Funders Panel Date: 17/01/2019

Project description - provided by applicants
Primary care is under significant pressure as increasing demand for appointments - rising population, people living longer with more complex co-morbidities - is coupled with a staff hiring/retention crisis. The implementation of effective triage procedures - directing patients to the most appropriate form of care be that A&E, GP/Nurse Appointment, Pharmacy or Self-care - could be a solution. It is estimated that 27% of GP appointments are potentially avoidable, costing the NHS more than £1bn per year. This proposal is to support the funding of real-world trials to evaluate an Artificial Intelligence based triage tool, PATCHS, to support GP practices in managing patient demand. PATCHS has been developed by Spectra Analytics and the University of Manchester.

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UFONIA LIMITED	Autonomous Voice Conversations to Monitor Health & Deliver Virtual Clinical Follow-up	£582,085	£407,460
BUCKINGHAMSHIRE HEALTHCARE PROJECTS LIMITED		£78,770	£78,770
MY CLINICAL OUTCOMES LTD		£148,127	£103,689
Oxford AHSN / Oxford University Hospitals NHS Foundation Trust		£34,451	£34,451
OXFORD UNIVERSITY INNOVATION LIMITED		£24,925	£24,925
STFC - Laboratories		£17,500	£17,500

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Project description - provided by applicants
This project will introduce automation of clinical follow-up to enable proactive and timely access to healthcare services for patients, whilst optimising professionals' workload so they can deliver the best, most efficient care. The lead applicant, _Ufonia_, is a highly innovative digital health platform based on artificial intelligence technologies that can provide autonomous, voice-based conversation with patients in order to assess their health status. This application builds on a successful Innovate UK Feasibility award made to Ufonia and which met its milestones of technical feasibility and user acceptance of the voice-based platform. A technical partner, _My Clinical Outcomes_ (MCO), is being introduced in this application. MCO is an established web-platform that allows patients and their clinicians to remotely capture clinically-validated and patient-specific outcome measures. This helps both patients and clinicians to monitor disease progression and understand the benefits or otherwise of treatment, clinicians to make better individual clinical decisions and clinicians and managers to ensure high quality care for all patients. In development since 2011, MCO is currently in routine use in over 70 NHS and private hospitals The collaboration will leverage the MCO platform to register, record, share and present information captured through Ufonia, and will introduce open standards for the exchange of information with Ufonia and electronic health records. The solution being developed will be applicable and scalable to most healthcare conditions and pathways. The focus of the first deployment will be to optimise the management of patients requiring cataract surgery, because of the scale of escalating demand for cataract surgery, meaning there is an urgent need to make care pathways as effective and efficient as possible. Buckinghamshire Healthcare NHS Trust (BHT), will pilot the first clinical use of the technology. The project is further supported by Oxford AHSN who will provide health economic evaluation and business development (including the Bucks Health and Social Care Ventures Accelerator), the Science and Technology Facilities Council's Hartree Centre who have worked with IBM Watson to support Ufonia's AI development to date, and Oxford University Innovation's Clinical Outcomes Group, who bring academic and business development expertise to the application, licensing and development of patient reported outcome measures.

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APPT-HEALTH LTD	Transforming the commissioning and delivery of NHS Health Checks, enabled by accessible digital technology	£281,120	£185,539
London Borough of Barking & Dagenham		£142,759	£142,759
TOGETHER FIRST LIMITED		£0	£0

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Project description - provided by applicants
Appt (a digital health start-up), the London Borough of Barking and Dagenham and Together First (the federation of all GP surgeries in Barking and Dagenham) have partnered to complete a collaborative research and development project that will transform the way that NHS Health Checks are commissioned and delivered. This project will make accessing the appointments that identify thousands of cases of cardiovascular disease, kidney disease and many more chronic or long term conditions much easier for patients - leading to improvements across the system.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
ASEPTIKA LIMITED	Asthma+me SMART: Development of an AI-supported clinical decision support system for children with moderate-to-severe asthma treated in specialist paediatric clinics.	£348,450	£243,915
Sheffield Childrens NHS Foundation Trust		£149,350	£149,350

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Project description - provided by applicants
Asthma affects 1.1 million UK children costing more than £58m per annum. Aseptika's cloud-based technology supporting disease management (www.activ8rlives.com) is ready to be developed as a clinical healthcare management device. Our previous SBRI/Innovate UK projects shows that paediatric asthma patients, once referred to the specialist clinic, tend to remain within the clinic re-call system. Very large numbers of paediatric patients are therefore attending specialist clinics for short duration recall visits. Using our Asthma+me SMART system with our proprietary connected devices and artificial intelligence integrated system, we can support earlier discharge from the clinic while providing patient-centred management of asthma. The system, remotely linked to the specialist clinic and employing AI-based disease status monitoring and decision support, will significantly impact clinical care within the NHS. We will develop an Artificial Intelligence-based asthma monitoring system that will be embedded into our Asthma+me SMART phone App. The system will monitor patient asthma status and through monitoring the data being collected each day, will be able to identify when there is a risk of moving from well to less-well controlled situations and alert to asthma attacks. The App will provide a range of automated support to the patient and also send clinical disease status reports to the clinician identifying data of clinical interest for patient risk stratification. To achieve our objectives we will design, build and validate our AI system by collecting asthma patient data from the Sheffield Childrens' Hospital clinic. These data will be used to train our system to recognise patterns of well and poorly controlled asthma. The outcome of this project will be the Asthma+me SMART that will be ready for regulatory approvals. The Asthma+me SMART solution will be a highly innovative and interactive system that will allow enhanced disease management by the patient, family and clinician, increased remote self-management of asthma while providing comfort that the asthma clinic is aware of the patient disease status. Our Asthma+me SMART system will positively impact the NHS specialist clinic work flows by automating repetitive tasks, encouraging parents to undertake more of the workload, decrease the numbers of follow-up appointments, reduce unscheduled hospital admissions and A&E attendance. For children with moderate-to-severe asthma, this will reduce referral times. For the NHS, this will reduce service utilisation and costs. Social benefits are: reduction in lost school days for affected children, fewer days taken off from work by parents and associated travel costs of attending clinics.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
SNOOZEAL LIMITED	Connected and intelligent device for personalised diagnostic, treatment and management of sleep breathing disorders. SnooZeal-Connect	£373,638	£261,547
Loughborough University		£167,107	£167,107

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Project description - provided by applicants
Obstructive Sleep Apnoea is a condition where the muscles and soft tissues in the throat relax and collapse sufficiently to cause a total blockage of the airway for 10 seconds or more during sleep. OSA is a potentially deadly condition in extreme cases but for moderate OSA patients, fatigue from regularly disturbed sleep can impact heavily on quality of life. If left untreated, the condition increases the risks of high blood pressure, coronary heart disease, stroke and diabetes. Current treatment requires the continual use of airway obstruction preventative devices worn whilst sleeping. They do not offer any improvement in the underlying cause and are therefore required for nocturnal use for the rest of the person's life. OSA affects approximately 1.5mn people within the UK and despite the market size for sleep apnoea devices being $4.4Bn in 2017, there remains no product that can treat the condition with only surgery as a last resort in severe cases with no guarantee of success. Snoozeal have developed a device which fits onto the tongue to deliver a daily 20min treatment regime which changes the physiology of the contracting muscle at the rear of the tongue through mild electric pulses, or neuromodulation. Increasing the tongue tone stops it collapsing backwards and blocking the airway, providing a long-term cure. This project will further develop the Snoozeal device into a connected intelligent platform "SnooZeal-Connect" which will collect biosensor information from the device during treatment. Machine-learning and AI based methods will classify this data to determine the level of sleep apnoea and provide personalised treatment regimes. SnooZeal-Connect will facilitate low-cost convenient intervention at home and close the health and well-being gap for millions of sufferers. It will also reduce the burden on health services by reducing the direct cost of treating severe sleep apnoea, as well as the cost of treating the long-term health impacts from OSA.

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Participant organisation names	Project title	Proposed project costs	Proposed project grant
HEALUM LTD	Enhancing Type 2 Diabetes treatment through peer-learning AI: Creating a support system for healthcare professionals in primary care to source and share optimal self-care interventions and best practice in order to improve care and efficiency	£702,048	£456,331
VERNOVA HEALTHCARE COMMUNITY INTEREST COMPANY		£79,772	£79,772

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Project description - provided by applicants

NEED: The management of Type2 Diabetes costs the NHS £8.8bn per year with patients estimated to account for 15-25% of all appointments at a local surgery level.

The 'General Practice Forward View' identifies that all patients with long-term conditions should have a personalised plan of care that includes self-care, social prescribing and active signposting as part of its 10 high impact actions within 5 years.

Innovations such as Artificial Intelligence (AI) can play a key role in this - however at present there is no market-ready AI-system to assist Healthcare Professionals (HCP) to do this effectively within their time pressures, in part due to the difficulties associated with deriving, machine taught (machine learning), clinically-safe recommendations from the huge amounts of patient data available to digital health companies.

APPROACH: The project brings together Healum Ltd (digital health platform developer), Vernova CIC Foundation (NHS), Manchester University (Subcontractor) to develop a peer2peer Learning AI and AI platform to support the self-management of T2D patients through personalised plans of care, support, behaviour change and education.

Working with 11 GP Practices and with SBRI support (Project Number:8625456) we have already established feasibility of approach, developed an a prototype collaborative self-care platform and innovative peer-learning algorithm.

FOCUS: The project's focuses on the refinement of peer2peer algorithms and development of AI, machine learning (ML) algorthims, SnoMed code integration, content classifier and collective intelligence recommendation engine as well as aligning and evaluating the platform in the treatment of Type2 Diabetes (T2D).

By harnessing the collective peer2peer intelligence of HCP inputting into the software, combined with aggregate anonymised clinical audit data,we are able to reduce the critical mass of data inputs required to train ML algorithms and provide automatic clinical recommendations with a greater level of data confidence.

IMPACT: The platform will be integrated with and make use of new SnoMed codes and historical Read codes to act as a classifier - supporting the recommendation of the right content, service and plan to the right patient at the right time - and trialled with 21 GP practices during the project to to form a peer2peer community for providing personalised plans of care, support, behaviour change and education to patients with or at risk of T2D.

By improving the management of T2D care workload, we estimate potential for cost saving per practice per annum of £11,304, increasing to £61,254 by Y5 once reductions in microvascular complications are factored in.

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DIRECTED SYSTEMS LIMITED	BP Assist: Clinical Decision Support to Help Reduce Anaesthetists Prevent Low Blood Pressure Complications During Major Surgery	£502,178	£351,525
University Hospitals Birmingham NHS Foundation Trust		£221,096	£221,096

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Project description - provided by applicants
Periods of low blood pressure during surgery are common. When low blood pressure is experienced during surgery, blood supply to vital organs is reduced and can result in damage, causing long-term complications, disability and mortality. It is becoming widely accepted that even short periods of low blood pressure during surgery can be damaging and many published papers where low pressure during surgery have been studied, confirm that this is the case. Current technologies available are not seen as providing the appropriate information, or accurate enough information to give the anaesthetist a clear picture of how their patient is doing. Our project will develop an innovative digital health technology product that will assist anaesthetists in making decisions about patient care in the operating theatre during high risk surgery. Our project is focused on reducing the incidence of low blood pressure events by keeping anaesthetists better informed, enabling them to make better, faster decisions. We will produce a product that helps reduce complications, improves patient outcomes and reduces length of stay. The project will deliver a product that has been clinically tested, CE Marked and is ready to sell into the NHS market.

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PROXIMIE LIMITED	Proximie Live Plus	£539,520	£377,664
Cardiff and Vale University Health Board		£201,764	£201,764

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Project description - provided by applicants
Proximie will develop an innovative and easy to deploy remote real time AR collaboration and assessment platform for use during bowel cancer screening colonoscopies. The Proximie system will use Artificial Intelligence and Machine Learning (AI and ML) to assess polyps found during colonoscopies. Use of the system will significantly reduce NHS costs, whilst improving patient experience and patient outcomes. It will enable earlier detection and diagnosis of bowel cancers and significantly improve use of staff time resources.

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MACHINE MEDICINE TECHNOLOGIES LIMITED	KELVIN: Computer Vision Based Biomarkers of Motor Dysfunction in Parkinson's Disease	£608,534	£425,974
University College London		£248,487	£248,487

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Project description - provided by applicants
Diseases of the CNS (Central Nervous System) often affect mobility and behaviour. However, historically it has been extremely difficult to measure mobility and behaviour objectively. Instead, researchers have relied upon subjective and unreliable measures such as patient questionnaires and clinical scores. Not only do these tools yield poor quality data, but they are labour intensive, time consuming and expensive, and negatively impact on clinical trials in CNS disease by making them 30% more expensive and 50% more likely to fail than in other categories (e.g. cardiovascular). This has meant that many drug companies have shunned drug development for CNS disease, despite the fact that CNS disease is responsible for the largest burden of disease of any disease category. Machine Medicine Technologies (MMT) is developing KELVIN, a video and computer vision analytics platform that is adapting the latest developments in AI to perform precise and objective measurement of mobility and movement in Parkinson's disease (PD). In collaboration with PD specialists at UCL/UCLH, through which they have access to large video datasets of PD patients, they are adapting and extending the latest computer vision and AI techniques to this clinical application. Through prospective video capture of PD patients they are furthermore providing clinical validation of the technology and optimising the video capture. The technology they are building can be applied to multiple realms beyond PD and constitutes a strong foundation on which they aim to become the definitive medical video and computer vision platform, supporting a raft of other technologies such as medical robotics.

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GENERIC ROBOTICS LIMITED	HAPTEX - Using Haptics & Virtual Reality to Improve Objectivity and Validity of Medical Training & Examinations	£528,314	£369,820
King's College London		£210,760	£210,760

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Project description - provided by applicants
Over the next two years the UK has committed to training an extra 1500 medical students, this will bring the total to almost 7500 students per year. It is essential to ensure the competencies of a newly qualified doctor. The concept of 'Black Wednesday' in August refers to the day when a new cohort of junior doctors arrive on the wards. Ensuring the competency of newly qualified doctors improves patient outcomes and reduces harm (improving quality of life). Assessment of competency lacks standardisation across medical schools although projects are starting to address this. The UK medical licensing exam will introduce a common written content examination across medical schools in the next five years. In Parallel to this the general medical council has introduced a list of core clinical competencies for newly qualified doctors. However, there is no standardised national assessment. Numerous additional challenges in assessing clinical skills exist including: ethical (not using patients); mannequin based assessment lacks realism and authenticity; assessment stress is rising resulting in severe mental health implications; objectivity in assessment of clinical skills is hard to standardise with technical failure of equipment and the subjective nature of assessment gives rise to unconscious bias. In recent years rapid development of VR and related technologies have given rise to many new opportunities for medical education. Despite being demonstrably effective since the early 00's, current technologies for medical training are highly specific to a particular clinical skill or discipline. Generic Robotics (GR) have developed a hardware and software simulation platform leveraging VR and Haptics (Touch Feedback) which is the world's first multi-purpose clinical simulator (SimuTouch(r)). A universal platform brings many advantages and changes the way training institutions can invest in and deploy simulation in their curricula. The next frontier for computer simulation is assessment, there is opportunity to address many of the challenges already highlighted but, uniquely, through the SimuTouch(r) platform, there is additionally the opportunity to unify training with assessment bringing even wider efficiency improvements, cost saving and standardization. GR will collaborate closely with expert medical educators at King's College London. This project will begin with a discovery phase using the General Medical Council outcomes for graduates' core medical skills list as the starting point to identify areas for technological exploitation. Approximately 5 skills will be selected for development, split between simpler, VR tasks and more complex Haptic tasks which will then be validated in a mock OSCE.

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PERSPECTUM DIAGNOSTICS LTD	Reduction of treatment costs and improved risk-stratification for diabetes patients in primary care: multi-organ MRI technology powered by artificial intelligence.	£472,449	£283,469
IWGC LIMITED		£47,310	£33,117
Oxford University Hospitals NHS Foundation Trust		£149,594	£149,594
Royal Free London NHS Foundation Trust		£163,920	£163,920
University of Liverpool		£165,167	£165,167

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Project description - provided by applicants
There has been a surge in incidence of the metabolic syndrome, a cluster of conditions including obesity, increased blood pressure and Type 2 diabetes (T2D), which increase the risk of fatty liver disease, steatohepatitis, heart disease and stroke. Multiple interacting organs are involved, primarily the pancreas, liver, spleen, kidneys and heart. Though T2D occurs when the pancreas doesn't work properly, concentrating on a single organ (e.g. pancreas) to diagnose T2D, or to assess the risk of it developing, is insufficient because all of the organs interact as a complex system, and so not only do each contribute to the diagnosis, but so does their combination. Most diabetes cases are detected using circulating (blood, urine) biomarkers (e.g. creatinine, aspartate transaminase, HbA1c). However, these are not sufficiently organ-specific and would benefit from complementary imaging, in particular MRI with its excellent soft-tissue contrast. Once detected and diagnosed, T2D is typically treated with the drug Metformin. This has transformed diabetes care; but it has limitations. New drugs overcome many of these limitations, including the glucagon-like peptide (GLP-1) receptor agonist and immunotherapies. Unfortunately, these cost at least ten times more than Metformin, so prescribing to everyone with diabetes poses a major problem for the NHS. This proposal aims to develop a method to stratify those patients for whom Metformin is expected to be inadequate and who should be prescribed more advanced, more expensive therapies. The technique will be based on Perspectum's Liver_Multiscan_. Perspectum has developed a quantitative MRI method to detect and stage early liver disease. As well, it has pilot data demonstrating its utility in other organs, for example: its technology can be used to estimate portal hypertension from the spleen; that it can detect and measure pancreatitis and fatty pancreas; and can characterise the tissue of the kidneys. Furthermore, Perspectum's founders worked originally in heart MRI imaging. This proposal will extend Liver_Multiscan_ to the other organs and vessels -- pancreas, kidney, spleen, aorta -- involved in the metabolic syndrome. The technical developments by Perspectum will be complemented by the accumulation and analysis of clinical data, both circulating biomarkers and imaging, at three diverse endocrinology centres (Liverpool, Oxford, London). There will be strong patient and clinician involvement. The enhanced multi-organ product will be commercialised by Perspectum. The data produced by the project will be made available to researchers throughout the UK who are working to advance our understanding of T2D and the metabolic syndrome.

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OPUS VISION LTD.	Transforming deteriorating patient care with a digital and sustainable rapid response system developed in the open	£468,000	£327,600
Cheshire and Wirral Partnership NHS Foundation Trust		£77,284	£77,284
Coventry University		£110,722	£110,722
OPENUK		£59,400	£59,400
South London and Maudsley NHS Foundation Trust		£42,192	£42,192
THE APPERTA FOUNDATION C.I.C.		£174,018	£174,018

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Project description - provided by applicants
This project seeks to research and implement a new proof-of-concept open standard digitally-enabled electronic observation (eObs) solution for deteriorating patient care. It will address a major unmet need in the NHS where a significant proportion of patients still experience suboptimal care leading to adverse clinical outcomes such as unplanned ICU admissions, emergency surgery, cardiac arrest and death. An estimated 7% of in-hospital deaths are preventable. (_NCEPOD Emergency Admissions_). Core reasons behind poor care of deteriorating patients can be linked to current ineffective paper-based (and digital) systems of observation and management of patients leading to lack of recognition of deteriorating conditions. Incumbent, proprietary digital systems lack interoperability and deliver very low value with unsustainable high costs, plus barriers-to-iteration and evolution required for utility needed to deliver improved outcomes and to advance clinical progress. Our vision is to transform the care process digitally and also to overcome the barriers the NHS faces over proprietary IT systems that cannot be easily or cost-effectively iterated to meet clinician requirements and best practice operating procedures. We will deliver this by innovating the care process informatics design using an approach commonly used in translational medicine. With Coventry University's help, we will analyse current practice at two NHS Trusts (South London and Maudsley, Cheshire and Wirral Partnership), design an optimal approach and trial it with healthcare practitioners in a simulated NHS hospital environment at Coventry University (the first major project for CU at the most advanced simulation lab in UK); and once proven, trial it for real with our two NHS Trust partners. Governance, safety and standards will be assured through working with Apperta and Open UK. Success with our project will bring measurable improved patient outcomes due to a better eObs patient observation system that has wide-reaching outcomes from mental health to productivity, and reduced need for further clinical intervention. Immediate benefits will include reduced staff time and reduced human error compared with manual administration. Adopting an open source and standards approach will eliminate prohibitive annual software licensing and adaptation costs while delivering a flexible public asset that can readily be adapted to individual NHS Trust needs. Our approach is uniquely consistent with secritary of state for health Matt Hancock's vision for Digital Transformation (October 2018) for the NHS and will serve as a vehicle to transform market access for SME's to grow the UK digital healthcare industry through the innovative use of digital technologies.

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ODIN MEDICAL LIMITED	CADDIE - Computer Aided Detection and Diagnosis for Intelligent Endoscopy	£469,600	£328,720
University College London		£256,263	£256,263

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Project description - provided by applicants
Colorectal cancer (CRC) is a worldwide disease with 1.3m new cases and 0.7m related deaths reported each year and estimated global economic impact approaching £100 Billion per year. In the UK, CRC is the second most common cause of cancer related deaths, 41k new incidents and over 16k related deaths are reported each year. 230k people are living in the UK with CRC. Colonoscopy is an important tool for the identification and removal of pre-cancerous and cancerous polyps. However, even with direct inspection of the mucosa, it is highly operator dependent and studies show significant miss rate for polyps and cancers. Furthermore, when abnormal lesions are identified in vivo they are often poorly characterised/diagnosed despite the development of advanced imaging modalities. Computer Aided Detection and Diagnosis for Intelligent Endoscopy (CADDIE) will disrupt gastroenterology by using artificial intelligence to analyse colonoscopy video images in real-time. CADDIE will automatically detect and analyse cancerous and pre-cancerous polyps with the goal of better earlier detection and diagnosis of cancer leading to better patient outcomes.

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Innovate UK

Results of Competition: Digital Health Technology Catalyst Round 3: Collaborative R&D

Competition Code: 1809_CRD_HEAL_DHTC_R3

Total available funding is £8,458,551 million

Note: These proposals have succeeded in the assessment stage of this competition. All are subject to grant offer and conditions being met.

Participant organisation names	Project title	Proposed project costs	Proposed project grant
RESCON LTD	Maternity Connect	£422,699	£295,889
Cheshire and Merseyside Women's and Children's Services		£313,835	£313,835
Mersey Care NHS Foundation Trust		£107,979	£107,979
TELEFONICA UK LIMITED		£0	£0

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Project description - provided by applicants
Maternity Connect will replace contemporary paper-based maternity records with a connected digital person-centred pregnancy record and service. Maternity Connect will focus on improving connectivity amongst maternity relevant health systems to improve service efficiency and clinical outcomes. Maternity Connect will build on UK SME Rescon's (project lead) Lincus Maternity digital personal health record (PHR) and management tools to develop, test, iterate and evaluate four top level innovations to primarily decrease costs associated with delivering maternity care. Maternity Connect will co-create this service utilising the transformative work already completed with the Improving Me, Women's and Children's Services of the Cheshire and Merseyside Sustainability and Transformation Partnership. Maternity Connect has the following objectives: * To improve maternity health outcomes and decrease load on pressured health delivery resources using the Cheshire and Merseyside region (ImprovingMe) as the clinical development and delivery partner. * To develop a commercial go to market service delivery model utilising best in class innovations that will fulfil the clinical objectives above whilst providing a sustainable business model for the industrial and NHS partners The innovations are: 1.) The ongoing stakeholder led development of a best in class intelligent digital maternity personal health record (PHR), Lincus Maternity 2.) Connectivity, interoperability and integration * Transformation of Lincus Maternity into an NHS Digital defined Open Platform based on HL7 FHIR, SNOMED-CT, IHE-XDS and openEHR standards * Integration with GP, hospital, mental health, social care and community systems utilising AWS cloud services and leveraging the Global Digital Exemplar interoperability activities within Cheshire and Merseyside * Implementing the recently published NHS Digital Maternity PHR standards and utilising OpenEHR maternity archetypes for data handling * Developing maternity clinician portals including offline app capability 3.) Business Model: * Testing three different business delivery models including co-development of a new all-inclusive digital services business model fronted by Telefonica/O2 UK that brings together digital tools, devices and data packages for NHS and social care customers, directed in this instance at midwives delivering care. 4.) Evaluation: * Quantifying "digital dosage" utilising digital engagement from service users, service providers and communications that will allow for digital

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dosage/response calculations from a complete health economic approach
* Integrating Care Quality Commission and Quality of Life surveys into Lincus Maternity and service delivery as part of routine clinical maternity practice.
* Evaluating the impact of the three business models above being: standalone digital interventions; digital interventions with full training and support; and the integrated digital intervention, support, device and data service package.

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