Stroke and Technology

Competition for development funding

NHS England
NHS Improvement
SBRI Healthcare

June 2021

SBRI HEALTHCARE

The AHSN Network

Stroke Association

NHS

Contents

Executive Summary

The challenges in stroke care are well documented not just in the NHS but globally. Despite many attempts to tackle these challenges, the pressures on healthcare systems continue to grow due to multiple factors. Service activity data and outcomes and research findings show specific issues that need to be addressed. These include: lack of pre-hospital diagnosis and efficient access to treatment; challenges delivering evidenced-based rehabilitation interventions; and a strong need to support and monitor stroke survivors following hospital discharge through rehabilitation to specialist follow-up to maximise independence and minimise secondary consequences of disability.

There are changes occurring from the work done through the National Stroke Programme, which has been developed jointly by NHS England and the Stroke Association, to help deliver better prevention, treatment and care for people who have a stroke and meets the ambitions set out in the NHS Long Term Plan. However, there still remains room for improvement in stroke care.

This competition seeks to address two primary issues, taking into account the systemic complexity and recognising some of the key influences on care delivery. The requirement is to find innovative solutions that will tackle challenges associated with:

1. Pre-hospital diagnosis

2. Rehabilitation

3. Life after stroke

Applicants are asked to consider the impact of their innovation on the whole system and to be aware of the competitive environment, even considering working together with other companies and organisations to bring forward solutions that can make a real difference. Applicants are further asked to consider the impact of their innovation in addressing and/or alleviating variations currently experienced in stroke care, for example through addressing inequality in access to care and geographic disparities.

The COVID-19 emergency has forced changes in healthcare and applicants should consider that the baseline they need to innovate from may be different from that in January 2020. This competition is also open to supporting the further development and evaluation of technologies already introduced during this crisis.

Stroke and Technology

The global challenge

On a global level, stroke is one of the commonest causes of death. In 2019, there were 6.6 million deaths attributable to cerebrovascular disease worldwide, and 101.5 million cases of stroke were recorded[1]. 87% of the stroke related death occur in low-income and middle-income countries[2] with the highest rates of mortality occurring in Eastern Europe, Central and Southeast Asia, and Oceania[1]. In addition stroke results in significant number of patients suffering from moderate or severe disabilities. Often this disability is complex as it results from deficits in two or more functions e.g. visual and movement and speech and emotion. This means that people are made dependent on others for daily activities and creates a significant economic burden both directly and indirectly. Affordable technology could result in significant cost savings as well as improve quality of life for patients and families.

In addition to the high incidence of stroke, healthcare systems and patients have had to deal with an additional challenge since the start of the COVID-19 pandemic, which has affected healthcare systems due to the strain on personnel and resources available. Data from around the world shows a decline of 11.5% of stroke admissions in health centres between March to June 2020[3]. Although the causes for this decline are not definitively established, one possibility could be that fear of COVID-19 exposure has led to patients with milder symptoms avoiding presenting themselves for care. Another possibility is that in some countries hospitals have been strained to the extent that they have been unable to provide urgent care to patients needing it. In response, new ways of providing care have been quickly introduced which now need further development and evaluation such as telerehabilitation, whilst other innovations, such as rapid portable diagnostics, would help with efficient and safe movement of patients to the optimal treatment location when stroke is suspected,

Despite significant progress globally in prevention, treatment and rehabilitation of stroke, there is still great capacity for further improvements. Stroke care can still benefit from new technologies and solutions that support the population, clinicians and healthcare systems to reduce the challenges presented and generate better care outcomes.

1. https://www.heart.org/-/media/phd-files-2/science-news/2/2021-heart-and-stroke-stat-update/2021_stat_update_factsheet_global_burden_of_disease.pdf?la=en
2. https://www.thelancet.com/action/showPdf?pii=S2214-109X%2820%2930520-9
3. https://www.medpagetoday.com/meetingcoverage/aan/92147

Stroke in the UK: Key statistics

There are more than **100,000 strokes** in the UK each year. That is around **one stroke every five minutes**

A **third** of stroke survivors experience depression after having a **stroke**

Almost **two thirds** of stroke survivors leave hospital with a disability

Every two seconds, someone in the world will have a stroke

4th

Stroke is the **fourth biggest killer in the** in the UK. Fourth in England and Wales, and the third biggest killer in Scotland and Northern Ireland

People of working age are **two** to **three times** more likely to be **unemployed** eight years after their stroke

The cost of stroke to society is around **£26 billion** a year

There are over **1.2 million stroke survivors** in the UK

More than **400** children have a **stroke** every year in the UK

Stroke is the 4th largest cause of death in the UK[4]. Annually there are over 100,000 strokes and around 30,000 stroke deaths[5]. Stroke is also the major cause of acquired disability in adults, with over 1.2 million stroke survivors living with disabilities in the UK, and requiring support to carry out daily activities[4]. The economic impact of this is vast, burdening health care services as well as other sectors in society. Costs of stroke have been recently estimated at around £26 billion annually[6].

Stroke prevalence differs according to age, sex, occupation, ethnic groups and localities. For example, statistics indicate that deaths from stroke were highest in Scotland, followed by the North of England, Wales and Northern Ireland, and lowest in the South of England. Higher mortality was observed in urban areas compared to rural areas[7]. With regards to age, the trend in the last 30 years has been a decline in number of cases in under 65's, but only in more affluent levels in society. In areas with lower economic status in England and Wales, mortality rates for under 65's were found to be 3.5 times higher for men, and 2.5 times higher for women compared to the general population rates[7].

The development of services and introduction of new technologies will particularly benefit those groups at higher risk of stroke and poor outcomes.

4. https://www.stroke.org.uk/system/files/sotn_2018.pdf
5. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/678444/Stroke_incidence_briefing_document_2018.pdf
6. https://www.stroke.org.uk/sites/default/files/costs_of_stroke_in_the_uk_summary_report_0.pdf
7. https://www.healthknowledge.org.uk/sites/default/files/documents/teaching/teachingpha/Strokeworkbook.pdf

NHS Strategy - The NHS Long Term Plan Targets[8]

The NHS Long Term Plan (LTP) has been set to improve the quality of its service and care of stroke patients and to reduce the loss of independent lives to stroke by early identification of at risk patients, and the provision of support to patients to help them manage their condition.

It aims to make specialist care and treatments available to more patients in a more timely and efficient manner, and further enhance the delivery of rehabilitation to improve their recovery. Integrated Stroke Delivery Networks have been implemented and are the key delivery vehicle for transforming stroke care including greater specialisation in stroke services.

The priorities identified in the NHS LTP vision are to:

- Prevent stroke by identifying and supporting people with atrial fibrillation, high blood pressure and high cholesterol, all of which increase the risk.
- Make sure more patients get the best treatment by improving rapid access to appropriate brain imaging, thrombolytic (clot-busting) drugs and thrombectomy (clot extraction) treatment, and train more NHS consultants to be interventional neuroradiologists. Also, by improving the ability to deliver rehabilitation interventions recommended in clinical guidelines. Increase availability and quality of integrated community stroke rehabilitation services, working with Stroke Association and other partners, so that more stroke patients can leave hospitals earlier and receive tailored and personalised care to facilitate a good recovery at home.
- Create new 24/7 integrated stroke care pathways across the country to make sure that patients receive high quality care and treatment sooner

NHS England and NHS Improvement: health inequalities policy statement[9]

To address health inequalities NHSEI have looked at developing policies that promote equality. The main goals outlined in the policy are:

- Eliminate discrimination, harassment and victimisation, to advance equality of opportunity, and to foster good relations between people who share a relevant protected characteristic (as cited under the Equality Act 2010) and those who do not share it; and
- Reduce inequalities between patients in access to, and outcomes from healthcare services and to ensure services are provided in an integrated way where this might reduce health inequalities.

To support the realisation of its goals, NHS England is developing (in phases) the Menu, which is a menu of evidence-based interventions for addressing health inequalities, with Public Health England (PHE) and community and local government groups. The Menu provides a catalogue of interventions that local healthcare systems and commissioners, working with partners across the system, can draw on to take effective action at neighbourhood, place and system-level to reduce health inequalities.

8. https://www.longtermplan.nhs.uk/areas-of-work/stroke/
9. https://www.england.nhs.uk/ltphimenu/definitions-for-health-inequalities/

What can be done to alleviate challenges?[10]

The challenges of dealing with stroke stem from the fact that it is a medical emergency requiring rapid diagnosis and hyperacute treatment followed by complex long term consequences that need to be tackled at different levels and at different times after onset, often for many years. The challenges start from looking at what can be done to prevent it, accurate and rapid diagnosis, the kind of care that can be provided at the onset, delivery of the best rehabilitation interventions for individuals, and long term care - both health and social. This requires a targeted and integrated approach, replacement of some of the current practices and redesigning some of the structures and processes of the NHS. Implementation of some changes had begun, partly as a result of COVID-19, and emerging technologies are being looked at as potential enhancements, complementary or replacements to current practice. However many changes are in the first stages of development and have yet to be evaluated for their potential to reduce stroke-related disability and/or service efficiency.

Emerging technologies include:

- Advances in genetics and molecular biology have helped us achieve some understanding of the mechanisms underlying stroke that have the potential over time to develop more targeted therapies and responsive biomarkers. However, these have not led to a major clinical impact yet.
- The application of communication technology to stroke care has resulted in telemedicine, telerehabilitation and remote communication networks. These have the potential to maximise multidisciplinary team working across the pathway and scale up the coverage of high quality stroke care to remote locations. This includes ambulances, and enabling clinician-patient and peer-peer support between stroke survivors receiving stroke services in their own homes..
- Production of virtual reality, robotic and app-based devices that have potential to augment therapist-delivered rehabilitation interventions, motivate people to participate in high-dose repetitive therapy and provide feedback on performance and progress.
- Advances in imaging technology, including artificial intelligence applications, have the potential to improve diagnosis, prognosis, and personalised treatment and prevention.
- The covid-19 pandemic has brought telehealth to the fore and appeared to be feasible and safe yet the development and spread of this technology requires robust evaluation.

10. Stroke pathway – Evidence Base Commissioning. An Evidence Review for NHS England and NHS Improvement

The Categories

Under the overall theme of Stroke and Technology, three categories have been identified *via* consultation with clinicians and other stakeholders working in provision of care across the spectrum.

Applicants are expected to respond to one of the three categories:

1) Pre-hospital diagnosis
2) Rehabilitation
3) Life after stroke

Those submitting applications are also asked to consider:

- How will the proposed solution impact on the care system and how will the system need to be changed (including people, processes and culture) in order to deliver system-wide benefits?
- How will you ensure that the innovation will be acceptable to patients (and their families and wider support network) and to health and social care workers? How could these groups be involved in the design of a solution and its development?
- How will you ensure that the innovation is affordable to the NHS and wider system such as Integrated Care Systems (ICSs) both immediately and throughout the life of the product? What evidence, both health economics and delivery of true impact will the NHS and wider system require before the technology can be adopted?
- How will you ensure that the innovation enhances equity of access (e.g. takes account of underserved ethnic or economic groups) and helps the NHS towards its target to reach net zero carbon?

Particular emphasis will be placed on how the technology/solution will address any challenges associated with health inequalities, such as demographic and geographic disparities, and it is expected that applicants provide details on how they will address these e.g. provide details on the care pathway the intervention will affect and how it can improve this.

Category 1: Pre-hospital diagnosis

Background

95% of people have their onset of stroke outside of hospital[10]. Prompt diagnosis and emergency treatment of stroke can reduce the risk of death and disability. Most people respond to stroke symptoms by calling 999. As such, there is a huge dependence on ambulance services to identify suspected stroke. However, as many conditions can produce similar symptoms, while stroke has a hugely varied clinical presentation, diagnostic accuracy in first responders is limited – at least 30% of suspected stroke cases will turn out to have a diagnosis other than a stroke following hospital assessment[10].

10. Stroke pathway – Evidence Base Commissioning. An Evidence Review for NHS England and NHS Improvement

Challenges

Potential solutions to this challenge include strategies that support:

1. Improving the diagnosis of stroke through innovative technologies (e.g. biomarker testing, video triage, diagnostic algorithms) in ambulance settings to maximise the proportion of acute stroke patients correctly diagnosed and taken directly to a specialist stroke centre for timely expert care and minimising or reducing the number of stroke mimics entering the stroke pathway.
2. Providing timely and accurate identification of stroke due to large vessel occlusion and those patients likely to be eligible for thrombolysis/thrombectomy treatment.
3. Improving remote solutions, such as video triage/telehealth, to improve connectivity and access to appropriate healthcare professionals across the whole care pathway in a timely manner.
4. Leveraging the power of artificial intelligence in combining comprehensive information from early assessments (clinical information, neuroimaging or fluid biomarkers, patient electronic records, paramedics, carers etc.) to aid prognosis and personalised treatment decisions.
5. Ensuring that patients are correctly identified for optimal preventive treatments that reduce the risk of another stroke when they are discharged from hospital.

The following “what if’s” are some examples of scenarios that have the potential to improve pre-hospital diagnosis of stroke. The statements are intended as examples only.

What if the number of unnecessary attendances at stroke centres could be reduced by 25%?

What if we can combine data from multiple sources using AI technologies to aid decision making?

What if we can improve communication across the care pathway to make better use of resources that are available?

What if we develop point-of-care tests to allow earlier diagnosis of patients outside of hospitals?

What if patients with large vessel occlusions can be appropriately recognised and redirected to thrombectomy centres more efficiently?

What if we develop remote solutions to provide better access to diagnosis?

Category 2: Rehabilitation

Background

Less than 50% of the rehabilitation recommended by national guidelines is actually provided to stroke survivors, with least being delivered following hospital discharge[10]. This is despite the evidence from studies of stroke, that home-based rehabilitation early after stroke reduces disability and that improvement can continue after statutory rehabilitation has ended. Extending provision of rehabilitation interventions can lead to a significant improvement in quality of life.

There is a need for improvement in the delivery of high-intensity rehabilitation, secondary prevention, and follow-up care to improve cognitive, physical and emotional function, reduce the risk of further stroke and prevalence of secondary complications. Stroke survivors experience a wide range of different levels of disability and each have individual circumstances. The kind of specialist support needed will differ from patient to patient and needs to be personalised. Inputs need to address one or more areas including: lifestyle changes, mobility difficulties, vision deficit, speech problems, cognitive challenges and emotional disruption.

Challenges

Potential solutions to this challenge include strategies that:

1. Augment delivery of rehabilitation interventions and provide integrated feedback about recovery to patients using apps/digital tools and link these with multidisciplinary teams and patient records.
    - Patient rehabilitation progress and feedback appropriately recorded on Electronic Patient Records
    - Patients aware of their progress and provided with personalised feedback and peer to peer support
2. Address a wide spectrum of rehabilitation needs in both delivery of interventions, provision of care and ability of stroke survivors and therapists to use the technology in non-NHS settings.
3. Improve the stroke rehabilitation care pathway and address any inefficiencies of health systems, for example communications between multidisciplinary teams and the patients / carers.
4. Integrate easily into NHS frameworks and structures and community care settings.

Category 3: Life after stroke

Background

Survivors of stroke and their families have to deal with the long-term consequences of stroke which limit their activities and participation in everyday life. Long-term needs can relate to physical, emotional and cognitive impairments. Required support identified by stroke survivors include mobility aids, home adaptations, housing, financial support, information and transport[10]. Despite guideline recommendations, long-term stroke management has been a neglected area in both clinical service development and research. Supported self-care and management programmes and regular follow-ups (e.g. six month reviews) have been implemented in some areas to support stroke survivors and more research is required to optimise these approaches.

Challenges

Potential solutions to this challenge include strategies that:

1. Provide stroke survivors and their families with the information they need, when they need it, about the stroke and their care
2. Provide better opportunities for communication between clinicians, stroke patients and their families throughout the stroke care pathway
3. Develop and evaluate technological approaches to augment supported self-care and management programmes designed for stroke survivors
4. Provide patient-centric monitoring tools to follow stages in recovery, promote self-management and identify unmet needs Efficient follow-up interventions and tools provided
    - Improved monitoring efficiency between therapy or follow-up sessions
    - Improved collection of validated patient reported outcome measures

The following “what if’s” are some examples of scenarios that have the potential to help meet unmet needs in the rehabilitation and life after stroke challenges. The statements are intended as examples only.

What if we can monitor patients in an efficient and timely manner?

What if we can evaluate the impact of technologies on the outcomes of stroke survivors and collect longitudinal data?

What if we can improve communication across community multidisciplinary teams while keeping solutions patient centric?

What if stroke survivors can get the amount of therapy they need using virtual solutions?

What if we can make sure stroke survivors have the information they need about their stroke and care when they need it across the care pathway?

Useful Information for Applicants

Innovations on the radar

Given the importance and long term nature of this challenge, there are many products already in the market or in later development. It is important that potential applications for this competition carefully consider the competitive landscape.

It may even be appropriate to consider partnering with another solution provider to generate something even more compelling that addresses the challenge systematically.

The list below illustrates some examples of innovations that have been funded by National programmes with the potential for addressing emergency care issues (it is not intended to be an exhaustive):

- The NIHR funds large numbers of studies and people to develop evidence to support effective changes of practice. Examples include: Sheffield Teaching Hospitals NHS Foundation Trust looking at a novel therapy (SHAPES) for relaxing tight arm muscles after stroke; Earswitch Ltd developing Earswitch, a sensor that responds to movement of the eardrum inside someone's ear to assist those who have suffered from brainstem strokes; and Imperial College London developing a rehabilitation device and gaming software for population-level physical disability training, GripAble. Previously funded projects also include SMARTchip, a biosensor to detect the occurrence of a stroke by identifying the level of purines in the blood, developed by University Hospitals Coventry and Warwickshire NHS Trust; and an innovative MRI coil for improved stroke diagnosis developed by PulseTeq Limited.
- The NHS Innovation Accelerator include technologies like FibriCheck, the first medically certified app (CE Class IIA, FDA approved) capable of preventing strokes by enabling early detection of heart rhythm disorders, with a focus on atrial fibrillation (AF), using a smartphone or smartwatch.
- The NIHR in collaboration with NHSX and the Accelerated Access Collaborative funds promising AI based technologies including e-Stroke Suite, a set of tools that uses AI methods to interpret acute stroke brain scans to help decision making, developed by Brainomix Ltd.

Technologies excluded from this competition

There are a number of technologies or types of solution which are already available, or will not make a significant impact on the challenges addressed in this brief. These are listed below. Any technologies that negatively impact staff workloads and require high upfront capital investment by clinical services will also be excluded.

- Digital technologies that will not easily integrate or communicate with NHS/community setting systems.
- Technologies that lack sufficient evidence of user acceptability, usability and validity. Strong value proposition should be presented for robotics technologies for example.
- Technologies that do not comply with GDPR policies.
- Mobile stroke units.

Additional Considerations

Given the rural nature of many places with the largest need, an over-reliance on home and community interventions needing to be permanently online should be considered (Wi-Fi and phone signals in rural locations may be weak or unreliable).

For any digital intervention, the NICE Digital Health Technology Framework should be consulted and your application should evidence your plan to meet the appropriate evidence guidelines. This comprised both clinical effectiveness and economic evaluation with a particular focus on patient outcomes and use within the NHS.

Evidence that the NHSX Digital Technology Assessment Criteria (DTAC) has been considered should be demonstrated in your proposal.

SBRI Healthcare Programme

A new national Small Business Research Initiative (SBRI) Healthcare competition is being launched by NHS England and NHS Improvement in partnership with the Academic Health Science Networks (AHSNs) to identify innovative new products and services. The projects will be selected primarily on their potential value to the health service and social care system and on the improved outcomes delivered for those in receipt of care.

The competition is open to single companies or organisations from the private, public and third sectors, including charities. The competition runs in two phases (subject to availability of budget in 2022/23):

- Phase 1 is intended to show the technical feasibility of the proposed concept. The development contracts placed will be for a maximum of 6 months and up to £100,000 **(inc. VAT)** per project
- Phase 2 contracts are intended to develop and evaluate prototypes or demonstration units from the more promising technologies in Phase 1. Only those projects that have completed Phase 1 successfully will be eligible for Phase 2.

Developments will be 100% funded and suppliers for each project will be selected by an open competition process and retain the intellectual property rights (IPR) generated from the project, with certain rights of use retained by the NHS.

The competition opens on **13 July 2021**. The deadline for applications is **1pm, 24 August 2021.**

Application process

This competition is part of the Small Business Research Initiative (SBRI) programme which aims to bring novel solutions to Government departments' issues by engaging with innovative companies that would not be reached in other ways:

- It enables Government departments and public sector agencies to procure new technologies faster and with managed risk;
- It provides vital funding for a critical stage of technology development through demonstration and trial – especially for early-stage companies.

The SBRI scheme is particularly suited to small and medium-sized businesses, as the contracts are of relatively small value and operate on short timescales for Government departments.

It is an opportunity for new companies to engage a public sector customer pre-procurement. The intellectual property rights are retained by the company, with certain rights of use retained by the NHS and Department of Health. The application process is managed on behalf of NHS England and NHS Improvement by LGC Group. All applications should be made using the application portal which can be accessed through the Research Management System. Applicants are invited to consult the Invitation to Tender and the Applicant and All documents are available on the to help prepare your proposal.SBRI Healthcare website to help prepare your proposal.

A briefing event for businesses interested in finding out more about these competitions will be held on 17 June 2021. An additional webinar event will be organised to respond to potential applicant's questions. Please check the SBRI Healthcare website for confirmation of dates, information on how to register and details of the challenges that will be presented.

Please complete your application using the online portal and submit all relevant forms by **1pm, Tuesday 24 August 2021**

Key dates

Briefing event	17 June 2021
Competition launch	13 July 2021
Deadline for applications	24 August 2021 (1:00pm)
Assessment	September 2021
Selection Panels	October 2021
Contracts awarded	November 2021

More information

For more information on this competition, visit: https://sbrihealthcare.co.uk/

For any enquiries e-mail: sbri@LGCGroup.com

For more information about the SBRI programme, visit:

https://www.gov.uk/government/collections/sbri-the-small-business-research-initiative

SBRI HEALTHCARE

The AHSN Network

Stroke Association

NHS