

**CENTRE FOR
CHILD
HEALTH
TECHNOLOGY**

THE SUMMARY

The Centre for Child Health Technology (CCHT) will bring together experts in health, academia and industry to develop cutting edge technologies that will deliver the world's most advanced healthcare for children.

The Centre, located at Sheffield Olympic Legacy Park (Sheffield OLP), will:

- Stimulate technical innovation with fast-track routes to market;
- Attract inward investment, create jobs and develop new companies to grow the Northern Powerhouse economy following Brexit;
- Reduce the costs to the NHS through the coordinated dissemination of best practice and deliver early intervention to improve child and, subsequently, adult patient outcomes later in life.



THE STRATEGIC CASE

THE NEED

Imagine a new wave of technology development that could:

- Prevent deaths in children;
- Prevent complications that arise from pre-term birth and childhood disease;
- Reduce hospital appointments and admissions to allow children with long-term conditions to go to school more often;

Detect mental health issues in childhood to support early intervention, preventing mental health illness in adulthood;

- Support self-care and independence for millions of children with a disability;
- Support healthy behaviours early in life to prevent adult disease.

Early intervention using new, innovative, technological solutions, has the potential to greatly improve the health of children as they mature, whilst demonstrating significant savings in the NHS. Long-term conditions in childhood, including asthma, diabetes, epilepsy, neurodisability and mental health disorders, affect millions of children and costs the NHS billions of pounds annually. Developing new technology to improve perinatal and pre-term health is required to ensure the most advanced neonatal care that will prevent long term complications and disability.

The number of children affected by long-term conditions and ill-health provides a compelling argument supporting the need to focus on children, to ensure that conditions are managed into adulthood, health-related management and behaviour is embedded early, and childhood deaths are prevented. Evidence supporting the need for such a focus includes:

- 75% of adult mental health problems begin before age 18. The NHS England Five Year Forward View cites the need to address mental health conditions in children and young people¹;
- 0.8 million children aged 0–18 in the UK are disabled, accounting for 6% of all children;
- Asthma is the most commonly diagnosed long-term condition in children affecting 1.1 million children (1 in 11). The UK has one of the highest prevalence rates of asthma in children worldwide and has the highest emergency admission and death rates in Europe with over 1,000 deaths per year resulting from asthma;
- Whilst rare diseases are 'rare' when taken in isolation, collectively they are common. 1 in 17 people will be affected by a rare disease (approximately 3.5 million people in the UK), of which 75% percent are children;
- Epilepsy is twice as common in children as in adults (7 per 1,000 in children under the age of 16 years);
- The leading causes of death in children aged 1 to 9 years in the UK include neurological and developmental conditions, congenital anomalies, cancer, injuries and complications of pre-term birth. With advanced technology many of these deaths are preventable;
- Long-term costs of childhood obesity are estimated at £588–686 million. By 11 years old 1 in 5 children are obese with over 40% of children being overweight in the most deprived areas of the country. The NHS is spending £10 billion a year on diabetes, predominantly as a co-morbidity of obesity;
- Public sector annual costs of pre-term birth up to age 18 are estimated at £1.24 billion, and total societal costs, at £2.48 billion (including parental costs and lost productivity).

Technologies are now emerging that have the ability to effectively manage children with long-term conditions without the need for admission to hospital. Self-care and remote management allows better societal and educational opportunities. A drive to establish new-technologies to promote healthy lifestyles and positive health-related behaviour in childhood could radically change the health of our aging population and, in-turn, reduce massively escalating health costs.

A radical drive to develop these technologies, in collaboration with patients and families, is required to overcome the fragmented and localised approach that has previously stifled the development of child health technology. Repurposing of adult health technologies to support children in the 21st century alone is no longer acceptable. In the U.S., the FDA's 7-year-old grant programme has issued \$11 million in its first four years and has given a boost to more than 243 paediatric medical device projects, the majority of which have not been brought to market. Future UK and global healthcare is dependent on developing the best and most advanced technologies for children and young people. The Centre for Child Health Technology will bring together experts from the NHS, Academia and Industry to radically improve children's healthcare through cutting-edge technology.

THE BENEFITS

The benefits of enabling new technologies and treatments are:

- Accelerating the development and adoption of new health technology products and software applications specifically designed for children and young people;
- Preventing unnecessary admission to hospital, establishing new healthcare delivery models in the home, primary and community care;
- Helping children with acute and long-term conditions effectively communicate their needs;
- Preventing early death and health complications in childhood.

THE COMMERCIAL CASE

Sheffield Children's Hospital NHS Foundation Trust will be responsible for design and procurement, and operations management of the facility.

The CCHT will apply a proven business model replicated from the Advanced Manufacturing Research Centre in Sheffield. This will see:

- CCHT partnering with private sector commercial expertise;
- Private sector partners will pay an annual fee to cluster around and work within the CCHT;
- Revenue will come from private sector investors in collaborative research programmes, grants, educational programmes and conferences, access to in-house test-bed facilities, and NHS revenue for treatment transferred from Sheffield Children's NHS Foundation Trust.

Discussions have already commenced with interested private sector companies, including IBM, Microsoft and Philips.

THE ECONOMIC CASE

CCHT has the potential to bring substantial economic benefits and to unlock and catalyse the wider Sheffield Olympic Legacy Park (Sheffield OLP) opportunity – which together with the Orthopaedic and Rehabilitation Research and Innovation Centre (ORRIC) will act as a catalyst for:

- 109,520 sqm of new employment floor space;
- 104 Full Time Equivalent (FTE) jobs within CCHT
- 3,485 gross Full Time Equivalent (FTE) jobs by 2027 on the Sheffield Olympic Legacy Park;
- 318 higher value professional FTE jobs;
- 1,000 construction-related job years;
- £1.7bn in GVA benefits to the economy by 2042 from ORRIC and CCHT through a mix of new employment and innovation impacts.

The focus on medical innovations at Sheffield OLP, delivered as part of a wider Advanced Manufacturing and Innovation District (AMID) Medical Innovation Campus, will support new high-value professional job opportunities within the Sheffield City Region labour market. The delivery of modern, fit-for-purpose business accommodation on the remainder of the OLP will encourage modern business practices and support a wide range of new professional service job opportunities.

The CCHT and ORRIC proposals therefore have the potential to bring an excellent return on the investment. It is estimated that for £1 of public investment this will generate around £14.50 towards the economy by 2042.

DELIVERING THE GOVERNMENT'S POLICY AGENDA

CCHT is focused specifically on addressing key areas of Government policy:

- Improving NHS efficiency and tackling the budget deficit;
- Delivering on the Industrial Strategy²;
- Accelerating the development and adoption of technologies in the NHS (Accelerated Access Review)
- Building on and enhancing the Northern Powerhouse to help rebalance the UK economy;

The Industrial Strategy for Life Sciences made reference to the North of England's strength in the life sciences research and development, through to health innovation and new medicines manufacturing.

The CCHT will deliver on many of the specific recommendations in Sir John Bell's report to government, including:

- Reinforcing the UK science offer through further improving clinical trial capabilities building upon the work undertaken as part of the National TITCH (Technology Innovation Transforming Child Health) Network and the NIHR Medical Technology Co-operative Devices for Dignity;
- Promoting further collaboration with Sheffield Hallam University and the adjoining Advanced Wellbeing Research Centre and the University of Sheffield with the Medical Advanced Manufacturing Research Centre;
- Delivering NHS collaboration with the private sector and the Universities;
- Unlocking the value of clinical data through continued development with existing partners including Microsoft and IBM;

- Developing a skills base with the adjacent University Technical College to support a new labour force able to capitalise on the opportunities provided by 21st century innovation in health;
- A membership programme for SMEs to utilise business incubator space in the CCHT with access to expertise in the Centre, in turn promoting UK MedTech Sector Growth.

DRIVING THE NORTHERN POWERHOUSE AND POST-BREXIT GROWTH

The Northern Powerhouse Independent Economic Review (NPIER) and the Powerhouse 2050 report identified Health Innovation as a cross-cutting and underpinning Northern strength that links to the North's excellence in research, applied science, digital, and its advanced manufacturing and materials base.

Sheffield has a strong medical technology cluster with the Medical Advanced Manufacturing Research Centre and the government-funded Advanced Wellbeing Research Centre on the adjoining plot on Sheffield Olympic Legacy Park.

CCHT will build on these earlier investments, adopting the same business model of collaboration between research advisory groups and the subsequent sharing of knowledge within the sector.

THE LOCATION

CCHT will collocate the following areas of research and networks that support the development of health technology for children and young people:

- The National TITCH (Technology Innovation Transforming Child Health) Network hosting partners that include all the Specialist Children's Hospital Trusts in the UK;
- The National Institute of Health Research (NIHR) MedTech and In-vitro diagnostic Cooperative (MIC), namely, NIHR CYP-Tech (Children and Young People Technology) which will support the development, adoption and diffusion of child health technology in 7 theme areas (respiratory and sleep disorders, ventilation in children, paediatric cancer, rare diseases, paediatric surgical technologies, epilepsy movement and muscle disorders, and transition);
- NIHR Devices4Dignity MedTech Cooperative (NIHR D4D) that will support the development of technology in specific disease areas across the lifecourse starting in childhood;
- NIHR i4i (invention for innovation) project teams for the development of technology relating to respiratory disorders in children;
- Collaborative academic groups from Sheffield Hallam University and the University of Sheffield;
- Collaboration between TITCH and the Yorkshire and Humber Academic Health Science Network.

OLYMPIC LEGACY DRIVING INNOVATION

Sheffield Olympic Legacy Park is a unique collaboration of Sheffield City Council, Sheffield Teaching Hospitals NHS Foundation Trust, Sheffield Hallam University and the British Olympic Association delivering improvements in public health as a tangible legacy of the London 2012 Olympic Games. Sheffield is the first city in the world to be associated with an Olympic association delivering legacy for the Olympics for the benefit of the general public.

CCHT will be located on Sheffield Olympic Legacy Park, adjoining the Advanced Wellbeing Research Centre (AWRC), a specialist facility led by Sheffield Hallam University to research best practice in sports and exercise medicine and its translation into better healthcare for the wider population.

Facilities in the Advanced Wellbeing Research Centre will be shared with the CCHT and research programmes coordinated to ensure that best value is achieved and knowledge shared between the two Centres.

Sheffield Olympic Legacy Park is an emerging world-class cluster of institutions focused on improving health and wellbeing, including the Advanced Wellbeing Research Centre, and is backed by Sheffield Hallam University. Nearby are the UK Catapult Centre, based around the Advanced Manufacturing Research Centre – which includes major research and development facilities for Boeing, Rolls-Royce and McLaren – and the Medical Advanced Manufacturing Research Centre. All of these facilities sit within the Advanced Manufacturing Innovation District and build on the specialist expertise of the University of Sheffield and Sheffield Hallam University.

Over 1.8m people live in Sheffield City Region (SCR), making it one of the UK's major urban areas. The age and ethnic profiles of SCR is consistent with national profiles, providing a strong base to test out innovations which could be rolled out more widely.

CCHT will be colocated with the Oasis Academy School and The University Technical College providing unrivalled opportunities to work closely with children and young people.

THE FACILITY

CCHT will be a Centre designed to bring together leading academics, clinicians, designers and engineers directly with patients and their families. The Centre will develop and design the next generation in technologies and treatments in real world environments to transform child health and will include:



- **An Ideation Space** to support user-centred design and co-worker networking;
 - **A Child Health Media Centre and Exhibition Centre** that will use technologies to educate children through play to modify health behaviour;
 - **Novel Clinical Space** to encourage and enable families to discuss and explore concepts with clinicians from the Sheffield Children's Hospital and Community Child Health, whilst providing the opportunity to address conventional health needs. The model approach will be the 'Paediatric Consultation of the Future';
 - **Meeting, Seminar Rooms and Conference space** to provide educational sessions, seminars, workshops and to support the UK Child Health Technology Conference;
 - **Open Plan Design and Invention Space** to create prototypes and develop diagnostic technologies;
 - **Therapy and Rehabilitation Space** providing children and young people with a long-term opportunity to access novel technologies and treatments to support rehabilitation and respite;
 - **Living Lab and Test Bed Facilities** to evaluate technologies in real world settings such as a lounge, child's bedroom and a hospital ward to support active testing and simulation;
- Thermal Imaging Suite** Sheffield hosts one of the largest research groups in the field of diagnostic thermal imaging in child health. A temperature and humidity controlled thermal imaging suite will support expansion of this research programme;
- **Digital Innovation Space** to develop immersive virtual and augmented reality for surgical support and diagnostics;
 - **Laboratory Space** to support the development and manufacturing of prototypes;
 - **State of the art office facilities** – providing a dynamic and active working environment for businesses, academics and clinical staff.

