

Research & Innovation Strategy 2023-2028



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PART OF
RESEARCH**





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1. Executive Summary

The overall purpose of Sheffield Children's is to "provide a healthier future for children and young people." There are three aims that support us in doing this, which are laid out in the Trust's strategy Caring Together:

- Outstanding Care
- Brilliant Place to Work
- Leader in Child Health

In 2022 the Trust published a Clinical Strategy and in 2023 is supporting these with a number of enabling and guiding strategies (including estates, digital, education and training and workforce) which lay out how we will achieve these three aims over the next five years. One of these enabling strategies, and key to the Trust's aim to become a Leader in Child Health, is the Research and Innovation Strategy.

We are guided by our We CARE values: Compassion, Accountability, Respect and Excellence. This is how we do things at Sheffield Children's.

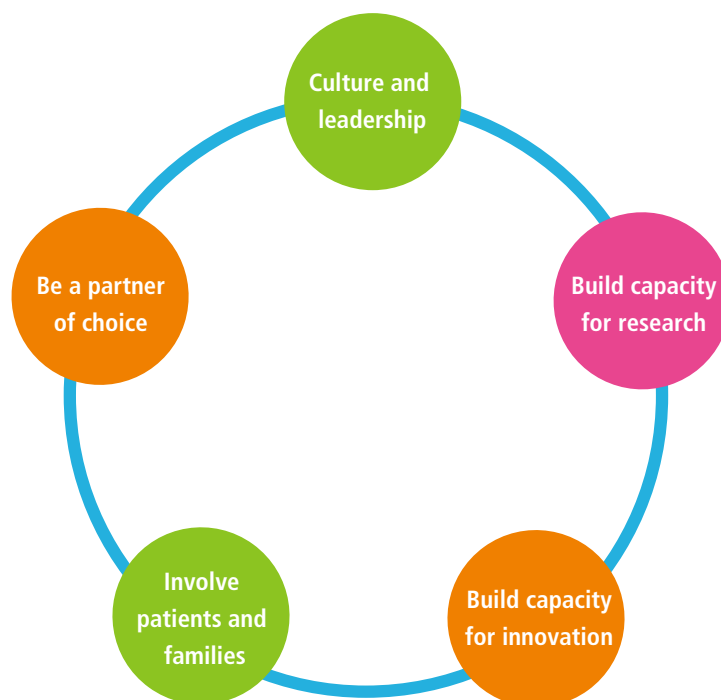
International evidence shows that being excellent at research and innovation goes hand in hand with providing the best healthcare outcomes for patients. Patients and their families know that a hospital which excels at research, and where the latest innovations are available, are those where they will receive the most cutting-edge care and the best outcomes.

Sheffield Children's already has world-class researchers and leads on world-class research. In 2021-22 the Trust hosted 370 different research studies across a wide range of clinical areas, involving nearly 1600 patients¹, as well as being a national leader in innovation as the host of the National Institute of Health and Care Research (NIHR) Children and Young People MedTech Cooperative.

The Research and Innovation Strategy lays out how the Trust will build on these foundations, to become one of the leading hospitals nationally and internationally for paediatric innovation and research.

Strategic aims

The Research and Innovation Strategy addresses five key areas, which were identified by our patients and their families, colleagues and partners as being the areas of key challenges.



¹ Boaz A, Hanney S, Jones T, et al. Does the engagement of clinicians and organisations in research improve healthcare performance: a three-stage review. *BMJ Open* 2015;5: e009415. doi:10.1136/bmjopen-2015-009415.

Van't Hoff and Selvaratnam, *Recognising Research, How Research Improves Patient Care*. The Royal College of Physicians, 2018. <https://www.rcplondon.ac.uk/news/recognising-research-how-research-improves-patient-care#:~:text=Historically%2C%20it%20has%20been%20difficult,hospitals%20have%20better%20patient%20outcomes.>

• **Culture and leadership:** We will strengthen the culture of the organisation, so that research and innovation run through its DNA. To do this we will:

- o make changes to our governance and how research is prioritised and led at Board level;
- o embed research into the performance management of the organisation;
- o build our communications and marketing strategies to celebrate the research that we already do and make research and innovation a core part of our brand.

• **Build capacity for research:** We will increase the volume of research that we do and the variety of studies. We will:

- o support more early phase and experimental research, and increase the total number of research studies we do each year to at least 400;
- o increase the number of researchers who have funded time in the organisation, both at senior levels and by creating a pipeline of junior researchers doing PhDs and Clinical Research Fellowships;
- o increase the number of nurses, health visitors, school nurses, clinical scientists and Allied Health Professionals who can participate in, lead or deliver research at all levels;
- o increase the diversity of our research workforce and research participants as part of a strategy to support equality, diversity and inclusion.

We will do this by:

- o building a number of new funded Research Teams, including at least one in a new area which is a priority both for the NIHR and the Trust such as health inequalities, mental health or community services;
 - o continuing to support existing teams;
 - o working with less research active Care Groups to increase their research portfolio;
 - o putting in place a mentoring system to support and engage staff;
 - o developing the Trust's infrastructure to support research.
- **Build capacity for innovation:** We will:
- o build the National Centre for Child Health Technology (NCCHT) aiming to be a global leader in child health technology;
 - o develop the approach and infrastructure to

support innovation and technology adoption within the Trust, ensuring that the Trust benefits from the work being done within the NCCHT;

- o develop the culture of the Trust to become open to innovation and technology adoption to advance patient care and improve our systems;
- o work with other Trusts nationally and collaborate with organisations nationally and internationally, through our work at the NCCHT, and our bid to host one of the NIHR Children & Young People HealthTech Research Centres (NIHR CYP HRC).

• **Involving patients and families:** We will engage with and involve our patients in developing and participating in research studies, innovation and technology development and adoption, to ensure that what is developed meets their needs and priorities. In particular we will:

- o support more researchers to engage with patients, training them and providing the necessary resources to support patient and public involvement and engagement (PPIE);
- o increase the total number of patients and healthy volunteers participating in research at the Trust;
- o double the proportion of participants on our studies who come from communities who have been under-represented and seldom-heard in research.

• **Being a partner of choice:** We will engage with our stakeholders to build strategic alliances around research and innovation. In particular, we will:

- o work closely with the University of Sheffield and Sheffield Hallam University, building a network of the full range of researchers and academics, innovators and other cross-sector professionals across Sheffield who are working to advance paediatrics and child health;
- o engage and collaborate with commercial research partners and research funders to ensure that we understand and meet their priorities;
- o via the NCCHT we will bring together investors, companies, data specialists, academics, innovators and other cross-sector professionals from across the world to tackle the major problems facing the NHS.

Objectives:

To track our progress against the actions above, we will monitor five targets for Research and Innovation at Board level.

By the end of 2027-28, we will:

1) Broaden access to research across our patient population:

- Double the proportion of participants in studies who come from groups who are under-represented in research, and who experience greater health inequalities.

2) Increase the volume of research that we do:

- Increase the number of studies run in the Trust each year to 400 by the end of year 5.

3) Grow our number of researchers:

- Double the number of posts that are jointly hosted between the Trust and one of our local universities;
- Treble the number of nurses, Allied Health Professionals, Clinical Scientists, and/or Health Visitors and School Nurses who can act² as Principal Investigators or Chief Investigators in research studies;
- Increase the total number of clinicians in the Trust who can act² as Chief Investigators by a third, across all staff groups.

4) Increase the amount of funding that we generate:

- Work with the Children's Hospital Charity to significantly increase the level of funding that they provide for research and innovation;
- Increase our research income (from commercial and non commercial studies combined), from a baseline of £850k by 5% in year 1; 10% in year 2, 12.5% in year 3, rising to between 15-20% in years 4 and 5;
- Increase the number of NIHR fellowships we apply for annually and double the number of grant applications submitted to the NIHR and leading medical research charities;
- Double the number of active NIHR awards led from the Trust, and seek to increase the number of awards, including from leading medical research charities, of over >£500,000.

5) Increase the number of innovation programmes that the Trust is running:

- Work with the National Centre for Child Health Technology to trial or embed 30% of their developed technologies within the Trust during the first five years of operation.

² Defined as someone who is currently acting as a PI / CI (as applicable) or has done so in the past.

2. Background

2.1. Why do research and innovation matter?

International evidence shows that being excellent at research and innovation goes hand in hand with providing the best healthcare outcomes for children and young people¹. Patients and families know that when they attend a hospital that leads in research and innovation, they will receive the highest quality of care, they will have access to the most advanced approaches to therapy, medicines and surgical technologies and well-founded evidence-based methods of care. Research-active Trusts are able to attract and retain the highest quality of staff, and research and innovation can generate income for the Trust.

Together, research and innovation help to shape the culture within an organisation, with its focus on excellence and delivering better care for patients. Sheffield Children's colleagues who have helped to develop this strategy have talked about their research being their contribution not just to their own patients, but to the future of the care of children everywhere.

For all of these reasons, research and innovation are core to Sheffield Children's five-year Clinical Strategy. This strategy defines how we will build on our research and innovation development, culture and outputs to support our ambition to be a centre of excellence and one of the best children's hospitals in the world.

2.2. Our vision

Over the next five years, we will grow research and innovation at Sheffield Children's to put it amongst the top centres for paediatric research globally. We will give more of our patients access to the most cutting edge therapies and the best quality of care – in particular, ensuring that children from disadvantaged backgrounds have the same access to research as the most affluent. The research done at Sheffield Children's will improve healthcare for children in South Yorkshire, across the NHS and across the world.

We will prioritise research and increase the number of our colleagues who are able to take part and lead in research, building career paths

for our own colleagues and attracting talented people from elsewhere to work with us.

Our patients and their families will have the assurance that comes from knowing they are being treated in an organisation which provides the best and most advanced healthcare for babies, children and young people in the world.

We will also become one of the leading centres for healthcare innovation and digital and technology development in paediatrics and child health in the UK and internationally. We will build the National Centre for Child Health Technology as a centre bringing together researchers, SMEs and multinational companies, healthcare professionals, children, young people, families and funders to solve the big problems facing healthcare today. And we will build our capacity to engage with innovation as a Trust, so that we not only solve problems ourselves, but become skilled at bringing in innovative solutions from elsewhere to benefit our patients, families and staff.

Defining research and innovation

Research and innovation are closely linked to each other and often overlap.

For the purposes of this strategy, however, we define research as being work to understand the underlying causes of an issue, and often (though not always) to develop a new solution (such as a new drug), or rigorously test whether a solution works.

Innovation is also about developing new solutions to a problem, but is often more focused on using new technologies or new ways of designing services.

Research is often slower, following experimental protocols and very tightly controlled processes to answer a question systematically, whilst innovation is often quicker and focused on iterating a creative solution until it works.

Research does not necessarily result in new technologies but one would argue that research is the product of innovation.

¹ Boaz A, Hanney S, Jones T, et al. Does the engagement of clinicians and organisations in research improve healthcare performance: a three-stage review. *BMJ Open* 2015;5: e009415. doi:10.1136/bmjopen-2015-009415.

Van't Hoff and Selvaratnam, Recognising Research, How Research Improves Patient Care. The Royal College of Physicians, 2018. <https://www.rcplondon.ac.uk/news/recognising-research-how-research-improves-patient-care#:~:text=Historically%2C%20it%20has%20been%20difficult,hospitals%20have%20better%20patient%20outcomes.>

2.3. How we developed the Research and Innovation Strategy

The R&I Strategy has been shaped by input from hundreds of colleagues, patients and stakeholders, ensuring that we take a collective approach to the development and delivery of research and innovation:

- **Patients and families:** We have drawn on the views of our patients and families, as well as engaging with people in communities who are under-represented and seldom heard in research;
- **Current, former and potential researchers:** We have held a series of workshops across Sheffield Children's with people who have conducted research in the Trust, or are interested in doing so;
- **Other colleagues within Sheffield Children's:** We have met with key teams such as the R&I team, finance, communications, the Children's Hospital Charity, and colleagues who are leading on the overall Clinical Strategy and its other supporting strategies;
- **Talked to over 200 colleagues and partners** attending Clinical Strategy workshops and the October 2022 Caring Together summit regarding what matters for research and innovation;
- **Colleagues in South Yorkshire:** We have engaged with the South Yorkshire Integrated Care Board, the Yorkshire and Humber Academic Health Science Network and the NIHR Yorkshire and Humber Clinical Research Network;
- **External research and innovation organisations:** We have met with the NIHR Children and Young People MedTech Co-operative, the University of Sheffield and Sheffield Hallam University, and with R&I leads from other major children's hospitals in England;
- **Funders:** We have spoken to commercial funders, and to the National Institute for Health and Care Research (NIHR), about their priorities.

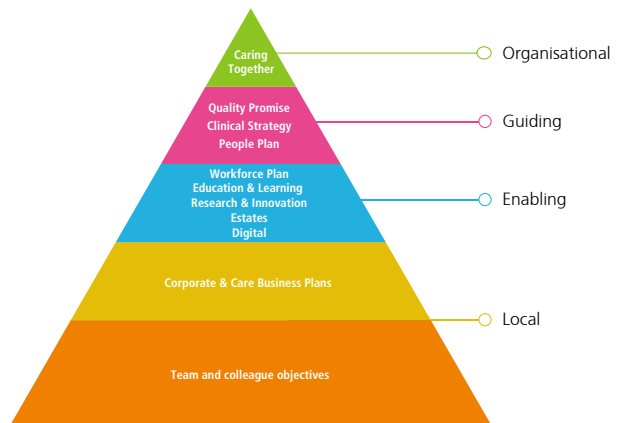
The views of all of these groups have helped to shape the R&I Strategy.

2.4. Strategic Alignment

The Trust's overarching strategy Caring Together sets the organisation's overall purpose of "providing a healthier future for children and young people". Research and innovation is one of our 'enabling strategies' which helps deliver these aims. The strategy responds directly to the requirements set out by our three 'guiding strategies': our Quality Promise, the Clinical Strategy and the People Plan. Together, we will deliver an aligned, coherent, and strategic approach:

Guiding strategies

The Research and Innovation Strategy aligns to the three 'guiding strategies' in the following ways:



Our Quality Promise

The evidence base demonstrates that excellence in research and innovation helps to deliver improved quality with better health outcomes for children and young people. In this way, our Research and Innovation Strategy directly helps deliver our Quality Promise. Our strategy will contribute to the safety and learning culture we aim to develop.

Clinical Strategy

The Research and Innovation Strategy supports the five themes of the Clinical Strategy in the following ways:

- **Centre of Excellence:** Through building our reputation for national and international cutting edge research and technology;
- **Care where needed:** Aligning our research in areas of high disease prevalence, and supporting the Trust's work on health inequalities, and innovations that support delivery of care outside traditional hospital settings;
- **Integrated care:** Research and technology development focussing on the 'whole child' interfacing physical, mental and social health;
- **Health Inequalities and inclusion:** Ensuring the involvement of individuals, groups and communities that experience health inequalities in research and technology development and delivery;
- **Healthy lives:** Leading on research and developing technologies to support prevention and early intervention.

People Plan

The Research and Innovation Strategy is directly aligned with the People Plan and its four themes:

- **Belonging to the NHS:** The Workforce Plan will respond to the Research and Innovation Strategy directly through the development of a more diverse set of researchers, across our professional groups;
- **Growing for the future:** This strategy sets out our plans to recruit, retain and develop researchers. An excellent research and innovation environment will attract talent;
- **Looking after our people:** Our strategy sets out how we will support people to become researchers, alongside fostering a culture of curiosity, research and innovation;
- **New ways of working and delivery of care:** Research will contribute to the future of medicine, whilst earlier adoption of innovations will bring improvements to care.

Enabling strategies

We are closely linked to the other supporting strategies, which have been developed through a collective approach, enabling an aligned portfolio of strategies with their inter-dependence and timescales planned in concert:

- **Digital:** The Digital Strategy lays out how the Trust will deliver its digital capacity over the coming years, including how we will engage with the cutting edge of digital technologies;
- **Education and Training:** The strategy will define how we will support and develop our colleagues, including how we will develop research skills across the organisation;
- **Workforce plan:** The Workforce Plan will define how many staff we need, how we will develop new roles, and how we will recruit the workforce we need. This is a key enabler for freeing up colleagues to have enough time to undertake research and technology development;
- **Estates:** The Estates Strategy lays out the main changes and developments that will be needed to the Trust's estate, including such areas as the Education Centre which will be important to developing the future of research skills.

3. Context and Challenges

3.1. Current context: the national strategic context

The national context

The Clinical Strategy and its supporting strategies are launching in 2023-24 at a challenging time. 328,000 children and young people live in South Yorkshire, and even prior to the Covid-19 pandemic we had some of the highest deprivation rates, highest health inequalities and worst health outcomes in the country.

The Covid-19 pandemic has worsened this and driven up waiting lists for children across our services. We know the cost-of-living crisis is compounding the problem for our patients; anticipated reductions in national GDP and pressures on inflation are bringing further financial challenges for the NHS; and the climate crisis will increase pressures on our communities. All of these pressures will shape both where we focus our research and innovation, and the environment in which our research and innovation must be delivered.

The national workforce challenges are also stark: vacancies in the NHS and Social Care stand at over 10%. This represents significant challenges in freeing up staff to undertake research, but also underscores the need for innovations which can make working practices and healthcare delivery more efficient.

Relationships and partnerships

The Health and Social Care Act 2022 has redrawn relationships between NHS organisations and their partners, at local, regional and national level.

- At a local level, within South Yorkshire, the Integrated Care Board now holds statutory powers, and more priorities and funding flows will be set locally. This opens new opportunities to collaborate with our partners in the Acute Federation and the Mental Health Provider Collaborative. Other important partners are our local universities, the University of Sheffield and Sheffield Hallam University, as well as the organisations which they and others are establishing within the Olympic Legacy Park such as the Advanced Wellbeing Research Centre and the National Centre for Excellence in Food Engineering. There is an increasing focus on the civic institutions working together to support our local communities during the cost-of-living crisis;
- At a regional level, the Yorkshire and the Humber Academic Health Science Network is going through a period of change and are increasingly looking to support innovations in local and regional organisations. Their research and innovation priorities largely echo those of the NIHR Yorkshire and Humber Clinical Research Network. The NIHR recently published its priority areas for research coming out of the Covid-19 pandemic³. These priorities include some areas that Sheffield Children's is very active in, such as improving the lives of patients with long-term conditions, but also some areas of opportunity such as mental health and health inequalities which are clinical priorities for the Trust but are not currently represented in our research portfolio;
- At a national level we are currently leading and hosting the NIHR CYP MedTech Cooperative and will bid to continue to do this from 2024, to become one of the National NIHR HealthTech Research Centres. We also have the opportunity in 2026 to bid to become an NIHR badged and funded Clinical Research Facility. Sheffield Children's also plays a major role in the Children's Hospital Alliance, which brings together the largest paediatric centres in England and Wales to spread innovation and service transformation, opening up further opportunities for us to work jointly on R&I. We will continue to work collaboratively within the NIHR National Children's Specialty Group to support research that impacts significantly on the health and healthcare of children and young people, and that aims to address health inequalities and national challenges;
- At an international level changes in technology and in medical research offer us new opportunities to work together and tackle the challenges we face in children's health and healthcare. The wider regulatory environment is also changing: new laws in the United States mean that more pharmaceutical companies will be legally obliged to consider the impact of their products for children, opening up opportunities for the expansion of paediatric research trials in the UK, and there has been an explosion of research in areas such as paediatric oncology and infectious diseases which we are in a strong position to respond to. There has also been an increase in novel therapies and medicines including biologics (drugs manufactured in a living system) and Advanced Therapies Medicinal Products (ATMPs).

³ <https://www.nihr.ac.uk/about-us/our-key-priorities/>

Ammarah, Summayah and Ayaana

Testing new drugs for eczema

Sisters Ammarah, Summayah and Ayaana are regular visitors to the Clinical Research Facility at Sheffield Children's, because all three are taking part in a clinical study to test treatments for eczema.

Ammarah is receiving treatment for severe atopic dermatitis (more commonly known as eczema) which causes the skin to become itchy, dry, cracked and sore. Her sisters do not have the condition and so are not receiving the medication, but they volunteered to take part in the trial alongside Ammarah, to allow a comparison with the skin of children who do not have eczema.

All three girls are taking part in the PELISTAD trial, which is investigating the effect of the drug dupilumab on the skin barrier function for children aged 6 to 11 years old who have moderate to severe atopic dermatitis. Dupilumab has only been approved for this use in this age group since December 2021. Sheffield Children's was the first hospital in the world to recruit a patient to this trial.

During the study Ammarah had monthly injections of dupilumab while the Research team at Sheffield Children's monitored her response to the drug. All three sisters also come to the Clinical Research Facility for skin examinations as part of the study. These include measuring how well the skin is working as a barrier to water and collecting surface skin samples using sticky-tape discs, which are like Sellotape. Infrared light, like that found in television remotes, is also used to look at the structure of the skin and the shape of blood vessels.

Ammarah's mother Safia said: "It has made a huge difference to Ammarah's symptoms – she's become a much happier child."

The specialist facilities for eczema research at Sheffield Children's Clinical Research Facility are the only dedicated Paediatric Dermatology CCRF in the UK



3.2. Current context: research at Sheffield Children’s

Sheffield Children’s already has a strong performance in research to build on.

- Studies we are currently undertaking:** In 2021-22, Sheffield Children’s had 370 commercial and non-commercial studies active or in set-up at the Trust [Figure 1]. We are currently supporting commercial trials in the fields of Neurology, Rheumatology, Dermatology, Diabetes and Endocrinology, Metabolic Bone Disease, Oncology and Haematology, Ophthalmology, Allergy and Nutrition. We have the capabilities though the Clinical Research Facility to take on complex early-phase interventional trials at all phases, and the clinical and research staff to deliver this.
- Number of patients enrolled in research:** In 2021-22 we had 1579 patients enrolled in research. For the past few years we have been the best performing Trust in Yorkshire and the Humber for recruiting to time and on target for NIHR portfolio commercial children’s studies.
- Researchers:** We currently have 85 colleagues working as Principal or Chief Investigators, and five clinical academics who are employed by the University of Sheffield and hold posts within the Trust. Four members of staff hold honorary chairs at Sheffield Hallam and one at the University of Sheffield. Many more colleagues contribute to or are involved in research in some way.
- Research and innovation team:** There has been significant growth in the R&I team in the last decade, from 10 in 2012 to our current 40 colleagues in the research and innovation team, supporting research across the Trust. This includes R&I leadership, as well as nurses to support Clinical Trials, and funded posts in areas such as pharmacy which are essential to research.
- Research facility:** The Trust has a standalone Children’s Clinical Research Facility (CRF) which

has been recently refurbished. The CRF provides a dedicated space where patients can come to receive treatment or to be monitored while participating in clinical trials, including trials requiring an overnight stay. Within the CRF there is the UK’s first specialist Skin Barrier Clinical Research Facility, which supports complex children’s dermatology trials and biomarker development.

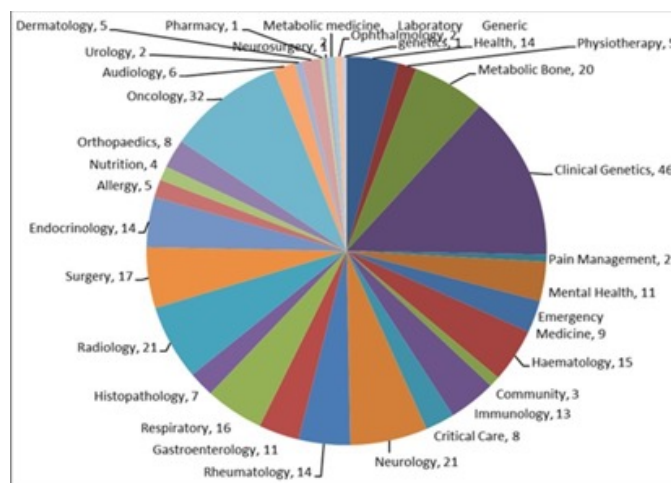
- Funding:** Our total research income in 2022-23 was just over £3m, with just over a third of this coming from commercial funding and just under a third from NIHR grants.

Table 1: funding for research at Sheffield Children’s 2021-23

Source	2021/22	2022/23
NIHR	202,622	951,179
CRN	606,805	690,899
RCF	£20k	£297k
Commercial	582,213	1,142,904
Non-commercial	384,293	220,367
TOTAL	1,803,139	3,025,348

- Governance:** The Clinical Director and Associate Director for Research and Innovation attend a variety of Boards and Committees and research and innovation follow the same governance processes as other clinical care groups.
- Patient satisfaction:** In our survey of research participants in 2021-22, 100% of our patients agreed that that their contribution was valued, that research staff had always treated them with courtesy and respect, and that they would consider taking part in research again. The main areas where we could improve are helping patients to prepare in advance of the study and keeping them updated about the outcomes of the study and its ultimate impact⁴.

Figure 1: studies undertaken across Sheffield Children’s in 2021-22



⁴ Sheffield Children’s Research Participant Satisfaction Survey 2021-22.

Henry and Rachel

Experimental diabetes drug trialled at Sheffield Children's

Henry was diagnosed with Type 1 diabetes when he was 10. Within a month of being diagnosed, his mother Rachel contacted Sheffield Children's and Henry was enrolled on a new research trial.

In August 2020, Henry started on the PROTECT trial, which uses the drug Teplizumab. Although many sites across the world have taken part in the trial only a few have been able to in the UK and Henry now travels up from London frequently for appointments.

The trial involved two courses of treatment in Sheffield with each lasting 12 consecutive days, six months apart. The drug is given intravenously, and participants are monitored closely. There are additional visits to hospital for the trial and tests including blood tests, questionnaires and 12/7 glucose monitoring.

Rachel said: "The trial is double blind, of course, so we have no way of knowing for sure that Henry has been receiving the drug. However, since Henry started the trial, we have seen an incredible impact on his life. Shortly after the first round of infusions, it became clear that Henry's blood sugar levels had dropped to a level where insulin was no longer required – even on an ad hoc basis.

"Henry hasn't had any insulin since August 2020 because the treatment has maintained whatever function he had – it's been remarkable. You can only imagine the impact this has had on Henry's physical and mental wellbeing – and the positive effect on our whole family's lifestyle."

Although patients are expected to require insulin in the future it's hoped that there are a number of short and long-term benefits to preserving what is known as the 'honeymoon period' – which is when the body is still able to produce some insulin.

Since first arriving at Sheffield Children's in August 2020, Henry and his family have got to know the team at the Clinical Research Facility (CRF).

Henry said: "They're very good – they really know what they're doing! They've made it easier for me to manage everything."

Rachel added: "They remember a lot of little details and try to keep things as relaxed as possible. Everyone goes above and beyond."



3.3. Current context: innovation

As a Trust we define innovation as the process of identifying challenges in healthcare and adopting or developing new solutions to these. Innovations may be new digital approaches, new medical devices, or changes to the way we deliver care. Within the Trust, a number of our researchers are developing innovations such as new medical devices or drugs, supported by the Research and Innovation team and the team leading the NIHR CYP MedTech Cooperative, while the Service Improvement team develops new approaches to how services are designed and integrated into clinical pathways, often by incorporating new technologies and digital innovations which have been developed elsewhere and are now trialled within the Trust.

Current innovation projects:

- **Digital innovations:** The digital team will increasingly be involved in digital innovation within the Trust. The Service Improvement team have also worked to support rollout of some cutting edge digital projects developed elsewhere, including rolling out an Artificial Intelligence programme which identifies children at risk of not being brought to their healthcare appointments;
- **Medical devices:** Several of the research projects across the Trust involve developing new medical devices, such as personalised masks for non-invasive ventilation produced using 3D printing, and VR headsets to support rehabilitation and procedural anxiety;
- **Service changes:** The Service Improvement team work with colleagues to identify challenges in the Trust, and develop new approaches to how care is delivered, such as the pioneering Direct Theatres model and the development of Rapid Lists.

Networks:

- Sheffield Children's hosts the NIHR Children and Young People MedTech Cooperative (NIHR CYP MedTech), which is one of 11 NIHR MedTech and In-vitro Diagnostic Cooperatives in the country. NIHR CYP MedTech is supported by our Clinical Director of Child Health Technology and Innovation and six full-time staff. The NIHR CYP MedTech Cooperative is key to the Trust's current approach of identifying unmet needs, developing proof of concept, and developing and evaluating new technologies;
- We host the National TITCH (Technology Innovation Transforming Child Health) Network. Through this and NIHR CYP MedTech we have relationships with other NIHR MICs, the AHSN Network, NHS England, multinational industry

partners and SMEs;

- The Trust's 0-19 Service hosts the regional Yorkshire & Humber (CRN) 0-19 Research Network & Research Champion Programme. The 0-19 Network aims to support and increase the participation and recruitment of children and families in public health research, with a focus on those underserved populations (research delivery); and to increase research engagement and capacity of public health professionals working with the 0-19 age group (research capacity building);
- We are a leading member of the Children's Hospital Alliance, which has been a route to introduce and fund innovation in the Trust over the last two years;
- We are a partner of the NIHR Great Ormond Street Hospital Biomedical Research Centre, through their Paediatric Excellence Initiative, supporting projects and doctorates in the field of Applied Child Health Informatics;
- We are a partner organisation within the NIHR Yorkshire and Humber Clinical Research Network. We lead on non-commercial and commercial research, with the aim of developing new therapies for children and young people;
- We are a strategic partner in the Yorkshire and Humber Academic Health Science Network (AHSN) with the collective ambition of developing novel approaches to healthcare delivery. Yorkshire & Humber AHSN is one of 15 AHSNs set up by NHS England to operate as the key innovation arm of the NHS acting as a bridge between health care providers, commissioners, academia and industry to build a pipeline of solutions for the NHS from research and product development through to implementation and commercialisation.

The National Centre for Child Health Technology:

The Trust has received national, regional and local funding to develop the National Centre for Child Health Technology on Sheffield's Olympic Legacy Park. The NCCHT will bring together industry, academia, clinicians, patients and their families to create high-value products at pace and create long-term sustainable change. It will develop technologies to address key national strategic priorities in child health including prevention and health inequalities, childhood obesity, child and adolescent mental health, cancer and cancer prevention, disabilities, disabilities, and long-term conditions. The NCCHT will position the Trust as a global leader in technology for paediatrics and child health. Construction of the new building is planned to begin in the autumn of 2023.

Brenda, Brandon and Leanne

Using robots to reduce anxiety for children at Sheffield Children's

The Trust is leading a pilot study investigating the use of social robots in hospitals.

Children who visit hospital can feel anxious, distressed, or worried, and previous studies have shown that social robots – ones that interact with humans through speech and movements – can help to reduce these feelings.

This study, which is a collaboration between Sheffield Children's, University of Sheffield, and Sheffield Hallam University, is being led by PhD student Brenda Littler from the University of Sheffield. The robots have been deployed in Medical Daycare, the Theatre Admissions Unit, Haematology and Oncology Unit, and Ward 3.

Brenda is exploring the types of interactions between social robots and patients aged five to 12, as well as the emotional impact of meeting the robots.

Ten-year-old Brandon visits Sheffield Children's every two weeks for treatment for his eczema which he has suffered with since the age of two. Brandon's appointments last four to five hours, but meeting the robots has made them much better.

He met Pepper, a tall humanoid robot, who can be programmed to move, talk, and dance, and MiRo, an animal-like robot who makes animal-like sounds and has sensory and motor abilities.

Brandon said: "Pepper is my favourite because it can play the saxophone and is really funny. I also liked MiRo's squishy ears!"

Brandon's mum, Leanne, said: "Taking part in research has been really interesting. Brandon absolutely loved meeting the robots at the appointments and even asked if he could take Pepper home with us! Pepper told Brandon a story, danced and followed him around which he thought was great.

"Brandon's eczema comes and goes, but it's been really bad for the past two years. I suffer with eczema myself and was treated at Sheffield Children's when I was little, which is why I wanted Brandon to be seen here. I can't fault any of the staff, they've been amazing."

Researcher Brenda, from the University of Sheffield's School of Health and Related Research (SchARR), said: "We're doing this study because we wanted to find a way to help reduce the anxiety and distress levels in children visiting hospital and help take their mind off everything that is going on. Some children who come into hospital might be with us for a number of hours, so being able to offer them something fun and new to entertain them and help their wellbeing is great. I am hoping the results of the study will help us understand how social robots can fit in a hospital and work alongside staff, and how we can go about introducing them in different settings."



3.4. Challenges and benchmarking

As part of developing the Research and Innovation Strategy, the Trust engaged with current, potential and former researchers across the Trust, as well as external stakeholders, to discuss the strengths and challenges of research and innovation within the Trust.

Challenges

Themes which came through strongly included:

- the need to strengthen leadership and governance around research;
- we tend to underplay our research: we need to promote the work we do much more widely;
- we need to prioritise research, particularly when allocating time for researchers and protecting it from the demands of clinical work;
- there can be a wariness of innovation and change; we need to embed innovation as a way of working and a Trust-wide culture;
- those children and families who take part in our research give excellent feedback, but some groups of children and families are under-represented, particularly those for whom English is not a first language;
- we have strong networks with some of our partners, but there are some missed opportunities particularly in working with our local university partners.

Benchmarking

We also undertook an exercise of benchmarking Sheffield Children’s against some of the other specialist children’s hospitals who are comparable to our organisation in England [Table 2]. In particular, we focused on the other two Trusts who are exclusively focused on children (Great Ormond Street and Alder Hey) as well as our closest neighbours in the North East.

We compared the scale of our research; the income for research and the approaches that the Trusts take to developing and supporting research.

Our main findings were that Sheffield Children’s volume of research is small by comparison with the other exclusively paediatric Trusts. We compare well on the actual number of studies we run, but we have smaller numbers of patients enrolled in research, and the overall amount of funding for research is lower, partly driven by the fact that we are not yet an accredited NIHR Clinical Research Facility (which brings annual funding to support research infrastructure) and partly by lower investment into research from a number of other sources.

All of these benchmarks demonstrate the potential for us to go further and to do better, as well as to work with other Trusts to expand our research and innovation footprint.

Table 2: research studies and income in paediatric Trusts 2021-22

	Alder Hey	Great Ormond Street	Leeds Children's Hospital	Sheffield Children's
Total clinical activity (EL and NEL)*	370795	354466	228912	303940
No of children in research studies**	12,319	2,630	917	1,579
No of research studies active or in set-up**	191	700	183	370
Total income for research £m**	5.79	23.80	1.13	3.03

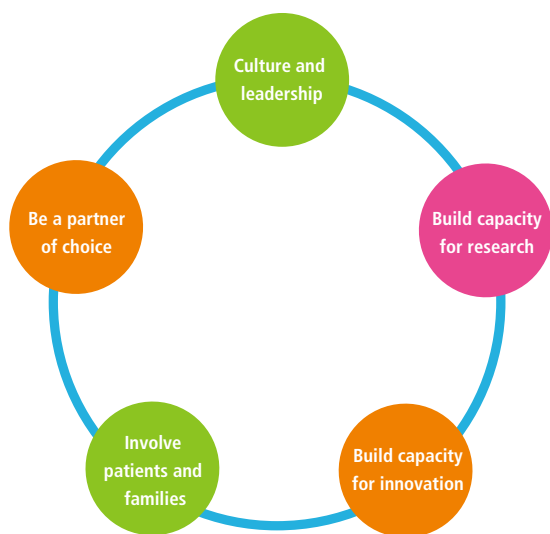
Sources:

*Health Episode Statistics data 2021-22

**All other data provided by the Trusts

4. Strategic Aims

Based on the challenges set out within this document, the Trust has developed strategic aims around the five major themes:



This section lays out what we want to achieve and defines how we will do this, the key deliverables and the milestones that will help us to get there.

4.1. Culture and leadership

Research and innovation will be part of the Trust’s DNA and will be embedded into how we assess our own progress as an organisation; we will celebrate research and innovation and the difference that they make to the lives of children and young people. Our colleagues, patients, families and caregivers will know that research and innovation are fundamental to the activity and identity of the Trust.

- **Culture and priority:** From 2023, R&I will be explicitly defined as one of the top priorities for the Trust. Research is implicitly one of the top three priorities, as part of being a Leader in Children’s Health. We will explicitly spell this out in the Trust’s strategic documents. We will focus support for research to build our existing areas of excellence, as well as building our research capacity in new areas.
- **Governance:** From 2023, research and innovation will be firmly embedded within the Governance and reporting structures of the Trust, from Board level downwards. Board oversight is key to ensuring that research is given the same status in the Trust’s policies as our performance on immediate operational priorities. The Board are currently discussing

how to ensure that there is a designated lead on all of the Enabling Strategies at Board level. We have also established an executive level Research and Innovation Strategy Board, and Care Groups Boards will report to the group on a six-monthly basis.

- **Leadership:** We will strengthen the leadership capacity for research and innovation within the Trust. We have already invested in an additional Clinical Director post for research, who will work with each of the Care Groups to develop a strategy on how that Care Group will increase research opportunities, in addition to a separate Clinical Director post for Child Health Technology and Innovation. These strategies will lay out how existing or new funding can be used to support researchers, with the aim of each Care Group beginning to generate research income where this is not already the case.
- **Key Performance Indicators (KPIs) for the Care Groups:** From 2023, research and innovation will be embedded within the performance structures of the Trust. We will develop a set of KPIs for the Care Groups around research and innovation and monitor performance against these. We will performance manage research so that funding is used to its fullest effect. We will invest in research, but in return we will expect that researchers will deliver outputs, and we will withdraw funding if it is not being used to benefit our patients and the Trust.
- **Identity, marketing and branding:** We will refresh our communications and marketing strategies so that research and innovation are at the heart of the Trust’s identity. We will actively celebrate the research that we already undertake, so that colleagues across the Trust, our external stakeholders, and patients and the public across South Yorkshire and more widely become aware of our reputation and track record in research.

4.2. Building capacity for research

By 2028 we will greatly strengthen Sheffield Children’s capacity to undertake research. We will grow our research workforce at all levels and build a structure of new research teams, supported by mentorship and training. We will use our resources strategically to support the areas which are priorities for the Trust as a whole, and to strengthen Sheffield Children’s as a brilliant place to work, and a leader in child health.

- **Capacity:** We will increase the volume of research that we do and the variety of studies. We will:
 - o support more early phase and experimental research, and
 - o increase the total number of research studies we do each year to at least 400 by the end of 2027-28.
- **Increasing funding: We will seek new sources of funding for research. We will:**
 - o **Work with the Charity** to significantly increase the level of funding that they provide for research and innovation;
 - o **Increase our research income** (from commercial and non-commercial studies combined), from a baseline of £850k by 5% in year 1; 10% in year 2, 12.5% in year 3, rising to between 15-20% in years 4 and 5;
 - o **Increase the number of NIHR fellowships** we apply for annually and double the number of grant applications submitted to the NIHR and leading medical research charities;
 - o **Double the number of active NIHR awards** led from the Trust, and seek to increase the number of awards of over £500,000, including from leading medical research charities.
- **Prioritising our funding: We will use the resource that we have to encourage the development of research in areas which are of the highest priority to the Trust.** This includes maximising the Trust's chances of becoming an NIHR-accredited Clinical Research Facility in the next NIHR-CRF funding round in 2026. Feedback from the NIHR suggests that in order to do this we need to:
 - o Develop more early-phase research, with a pipeline of colleagues able to undertake such research, rather than simply focusing on commercial studies;
 - o Invest in well-established areas of research that have a strong foundation in early-phase research;
 - o Raise the profile and reputation of the Trust around research;
 - o Explore closer working with Sheffield Teaching Hospitals to deliver the Trust's Clinical Strategy including the Centre of Excellence theme.
- **Workforce: We will increase the number of colleagues throughout the Trust who have the skills and the opportunity to undertake research. We will:**
 - o **Increase the number of researchers who have funded time in the organisation:**
 - at senior levels: we will increase the total number of clinicians in the Trust who can act² as Chief Investigators by a third, across all staff groups; and
 - by creating a pipeline of junior researchers doing PhDs and Clinical Research Fellowships;
 - o **Increase the number of Allied Health Professionals (AHPs), Nurses, Clinical Scientists, Health Visitors and School Nurses** who are able to lead, participate in or deliver research. In particular we will:
 - treble the number of colleagues in these roles who can act² as Chief Investigators or Principal Investigators;
 - encourage the development of nurse- and AHP-led research throughout the Trust, including recruiting a new Professorial nursing post, funded jointly with Sheffield Hallam University;
 - o **Increase the diversity of our research workforce**, by supporting colleagues from protected characteristics backgrounds and other minority groups to develop their research careers. This is important both in bringing a diversity of thought, and ensuring that a wide range of our patients can see themselves reflected within the research teams they are working with;
 - o **Develop a structured approach to mentoring research staff** throughout the Trust, beginning with the Research Teams;
 - o **Ensure that our recruitment processes include research**, and build career paths for our own staff within the Trust to develop their own research aspirations;
 - o **Work with the universities** to develop more honorary and jointly-hosted positions, in particular doubling the number of posts that are jointly hosted between the Trust and one of our local universities.
- **Research teams: To make these ambitions a reality, we will seek additional funding to set up new 'research teams' within the Trust.** We will run a competitive process to identify one or more 'Research Teams', which

² Defined as someone who is currently acting as a PI / CI (as applicable) or has done so in the past.



Sheffield Children's NHS
Bee
O'Shea
Research Nurse Manager

ALL I NEED IN LIFE



FOOD



SLEEP



WIFI

will be awarded up to £100,000 per year for up to five years, to develop research capabilities and capacity within the team. This funding will be conditional on the team:

- o Using part of it to develop junior researchers, Allied Health Professionals, Nurses, Clinical Scientists, Health Visitors and School Nurses, and/or Clinical Scientists, enabling them to participate in, lead or deliver research;
- o Delivering a pre-defined and tightly programme-managed set of research objectives;
- o Including a focus on recruiting patients from groups who are underrepresented in research
- o Aiming to become self-sustaining by the end of five years, by securing national research funding before this point;
- o At least one of the teams will be in a new area which is a priority both for the NIHR and the Trust such as health inequalities, mental health or community services.

The process for appointing Research Teams will be agreed in 2023/24 and the first round of applications will be run during that year.

- **Infrastructure to support research:** We will generate additional income, and pump-prime some posts, to provide support for research in certain key posts, including access to Statistician support, a dedicated Communications lead and increased support for writing grants. As the portfolio expands we will need to increase the governance support in place for research as well as delivery staff and support within Support Departments such as laboratories, pharmacy, radiology and IT.

4.3. Building capacity for innovation

We will become one of the foremost child health innovation organisations in the world, led by the National Centre for Child Health Technology, and we will become expert at embedding the innovations that we develop into our own practice as well as promoting them to other NHS providers.

- **National Centre for Child Health Technology:** **By autumn 2023, we will begin the physical work on building the National Centre for Child Health Technology.** The final business case will be completed in 2023 and we hope to begin development in autumn 2023. Alongside

building the structure, we will create the ways of working and the standard operating procedures that will enable us to embed the work of the NCCHT into the Trust.

- **Developing leadership for innovation: We will increase the Trust's leadership capacity** around technology and innovation. As well as creating the new post of Clinical Director of Child Health Technology and Innovation, we will bring in additional senior support to help us to develop our commercial strategy and build links to the technology sector.
- **Developing capacity for innovation: We will develop the research and infrastructure structures within the Trust** to create a dedicated innovation and technology capacity, in parallel with setting up the National Centre for Child Health Technology.
- **Embedding a culture of innovation within the Trust: We will develop the Trust's ability to adopt and deploy innovation** by addressing each of the key stages of innovation:
 - o **Identifying needs:** we will establish a series of regular 'roadshows' around the Trust, involving key discipline leads from Sheffield Hallam University and the University of Sheffield, to identify unmet needs around the Trust;
 - o **Supporting rollout of innovation:** until the new transformation and technology team is established, the Service Innovation team or the R&I Care Group, as appropriate, will continue to support the rollout of innovation within the Trust;
 - o **Supporting regulatory approval and commercialisation:** as part of the model of the NCCHT, we will recruit individuals with the expertise to take digital and technology products to market.
- **Partnerships: We will continue to develop partnerships around innovation,** to increase rollout of our own innovations and learning from other Trusts. We will bid to host the new NIHR Children and Young People HealthTech Research Centre during 2022-23. More generally we will work closely with partners in the Children's Hospital Alliance to ensure that our innovations and technologies benefit children across the country, and to learn from and adopt innovations developed by our research collaborators and Alliance partners.



4.4. Engaging with patients and families

We will strengthen our approach to engaging with patients, families and caregivers at every stage of research and innovation. In particular, we will increase the number of children who are able to participate in, and benefit from, research studies and new innovations. We will address the barriers faced by children from ethnic minority backgrounds and other groups who are underrepresented and seldom heard in research.

- **Developing research:** We will engage with and involve our patients in developing and participating in research studies, innovation and technology development and adoption, to ensure that what is developed meets their needs and priorities;
- **Patient and public engagement in research:** We will support our researchers to ensure that they build Patient and Public Involvement and Engagement (PPIE) into every stage of the research and technology development process, training them and helping them to access the necessary resources;
- **Raising awareness of research amongst children and young people:** We will engage with schools and community groups, particularly schools with a diverse population, to raise awareness of research amongst children and young people – not just as potential patients, but to raise understanding of clinical research and health technology development as a possible career;
- **Diversity:** We will double the proportion of children from under-represented groups who take part in research or who are involved in innovation and technology development, by the end of 2027-28. We will follow the principles of the Trust-wide involvement approach set out in our Quality Promise, building on the experience of involving communities that experience the greatest inequalities through creative approaches and links with voluntary and community organisations. We will begin by benchmarking and improving our data collection on the ethnic origin and socioeconomic breakdown of the patients who are involved in our research, so that we can understand the issues and track our progress. We will continue to work with our health inequalities leads to understand the barriers faced by patients from underrepresented and seldom-heard groups. We will work directly with our commercial partners, and with the NIHR Diversity group, to encourage working

with a wider group of patients, for example by removing criteria which require that patients and families must be able to read English;

- **Health inequalities:** We will build on our links with the universities to engage with research into health inequalities, the impacts of the cost-of-living crisis, and the ongoing legacy of Covid as it disproportionately affects children from our poorest communities. Areas of research such as dentistry, asthma and obesity are directly linked to deprivation, and we will contribute to understanding and tackling the impact on our poorest patients and their families;
- **Resources:** We will allocate resources to tackling barriers for patients from under-represented groups. We already dedicate part of the funding from the NIHR Yorkshire and Humber CRN to understanding and addressing the barriers that are faced by patients from under-represented and seldom-heard groups. As we understand more clearly what is needed, we will allocate some of our funding to developing the solutions. We will automatically include the costs of providing translators or translating written materials in the costs of any research project that we develop. In addition, any funding that is allocated by the Trust or the Charity, either for individual projects or research programmes, will be conditional on engaging with patients from under-represented groups.

4.5. Being a partner of choice

We will build our strategic links to further the Trust's strategic objectives. We will build strong relationships with universities, other NHS organisations, funding bodies, local, regional and national stakeholder organisations and the commercial sector so that we are the partner of choice when other organisations seek to collaborate.

- **Commercial and non-commercial partners:** We will promote Sheffield Children's internationally as a destination for research and technology development, working with partners including the NIHR Clinical Research Network and other NIHR Infrastructure, Yorkshire and Humber AHSN, Innovate UK, NHS England and industry. We will make ourselves more attractive as partners, by focusing on research areas which meet their priorities. We will capitalise on the new developments in Advanced Therapy Investigational Medicinal Products through our partnership with the University of Sheffield

Gene Therapy Innovation and Manufacturing Centre to create a pipeline of new therapies for children with complex and rare diseases, and be in a position to take forward work on advanced gene-directed therapies.

- **Relationship with the Universities:** Sheffield Children's researchers partner with universities across the world, and we will continue to develop these links through our grants and projects. As our most immediate neighbours, we will strengthen our relationships with the University of Sheffield and Sheffield Hallam University. We already work with individual teams and faculties; over the next few years we want to build these links to create a network across all the paediatric-related services across academia in Sheffield. We will increase the number of academic posts: we have already agreed to jointly fund a new Professorial Nursing post with Sheffield Hallam University.
- **Relationship with adult acute hospitals:** We will explore ways to work with adult Trusts, such as Sheffield Teaching Hospitals, to support research for all children and young people including adolescents who are shortly due to transition into adult services. This is a priority for pharmaceutical companies.
- **South Yorkshire:** We will strengthen our partnerships with other R&I organisations within our Integrated Care System (ICS), such as the Academic Health Sciences Network and

other research active trusts and will take a strong leadership role within South Yorkshire at spreading the benefits of innovation and research within our partner Trusts in the ICS. Our position as a specialist paediatric Trust gives us a unique opportunity to develop and pilot research and innovation, but also to support the rollout of these to our partner Trusts across our ICS.

- **National networks:** We will continue to play a leading role in networks of research and innovation.
 - o We will continue to drive technology development in child health by hosting the NIHR Children and Young People MedTech Cooperative and National TITCH Network;
 - o We will continue to strengthen our position as a leading children's healthcare organisation in research and innovation with the NIHR CRN Children's Specialty Group;
 - o We will bid to host the new £3m NIHR Children and Young People HealthTech Research Centre by leading a consortium of trusts to focus on child health technology development from March 2024;
 - o Lead and influence work with other children's hospitals around the country, establishing an innovation network across the CHA to develop research and innovation opportunities.



5. Key Targets

By doing the above, we will meet the following five targets for research and innovation. By the end of 2027-28, we will:

- 1 Broaden access to research from across our patient population:**
 - o Double the proportion of participants in studies who come from groups who are under-represented in research, and who experience greater health inequalities.
- 2 Increase the volume of research that we do:**
 - o Increase the number of studies run in the Trust each year to 400 by the end of year 5.
- 3 Grow our number of researchers:**
 - o Double the number of posts that are jointly hosted between the Trust and one of our local universities;
 - o Treble the number of nurses, Allied Health Professionals, Clinical Scientists, and/or Health Visitors and School Nurses who can act² as Principal Investigators or Chief Investigators in research studies;
 - o Increase the total number of clinicians in the Trust who can act as Chief Investigators by a third, across all staff groups.
- 4 Increase the amount of funding that we generate:**
 - o Work with the Charity to significantly increase the level of funding that they provide for research and innovation;
 - o Increase our research income (from commercial and non commercial studies combined), from a baseline of £850k by 5% in year 1; 10% in year 2, 12.5% in year 3, rising to between 15-20% in years 4 and 5;
 - o Increase the number of NIHR fellowships we apply for annually and double the number of grant applications submitted to the NIHR and leading medical research charities;
 - o Double the number of active NIHR awards led from the Trust, and seek to increase the number of awards, including from leading medical research charities, of over >£500,000.
- 5 Increase the number of innovation programmes that the Trust is running:**
 - o Work with the National Centre for Child Health Technology to trial or embed 30% of their developed technologies within the Trust during the first five years of operation.

² Defined as someone who is currently acting as a PI / CI (as applicable) or has done so in the past.

6. Approach to Delivery

The strategic objectives described above will be supported by a five-year programme of work.

The timelines for development of the Research and Innovation Strategy will be aligned with the other strategies across the Trust: for example, discussions around how research should be governed will be part of wider discussions of the Trust's governance to deliver the Clinical Strategy, and the development of marketing and communications for the organisation will be a wider theme across the future development of the Trust.

The proposals laid out above, and the actions and deliverables defined in this strategy, lay out an ambitious but achievable programme to develop and deliver research and innovation within the Trust over the next five years. At the five-year point we will review, but many of the areas such as building a cadre of new 'research teams' will require 10 years of sustained investment.

Our objectives will need to align with delivery of the Clinical Strategy and the other 'guiding and enabling strategies' being developed by the Trust.

7. Conclusion

Developing the research and innovation capacity of Sheffield Children's is core to improving health outcomes for our patients, attracting the best staff, and enhancing the international reputation of the Trust. We have a strong base to build on, but as we deliver the Clinical Strategy and all the other supporting strategies, we have the potential to go much further.

The scale of ambition laid out in the strategy will be a five, or even a 10-year journey. Some of the interventions, such as the National Centre for Child Health Technology will be game-changing; while others will be a matter of building our research teams and supporting our researchers one project at a time. Over the next five years, taken together, they will add up to major change for our patients, families and communities.

Ultimately we aim to provide the best and most advanced healthcare for children and young people, to improve their health and lives to give them the best opportunities in the future.



