Alder Hey cares for over 275,000 children and young people each year. We work on a world stage, and we are recognised and respected internationally. We are a designated major trauma centre and Centre of Excellence for muscular dystrophy, childhood lupus, arthritis, Behcet’s disease, cancer, spinal, heart and brain conditions, epilepsy, head and facial surgery.

The new Alder Hey in the Park is set to open a new hospital in 2015. Alder Hey in the Park will bring together excellent care, technology and design to provide the best possible healing environment for children and their families.

A new Research, Innovation and Education Centre will open alongside the new Alder Hey in the Park and will offer the potential to significantly upscale a culture of collaborative research, innovation and education to benefit children’s healthcare globally.

**The new Alder Hey in the Park**

Paediatric medicine development has too long lagged behind wider improvements in health, with a historically poor understanding worldwide of the differences required for paediatric care and the need for medicines developed specifically for use in children.

Alder Hey Children’s Hospital has developed an integrated programme of research, innovation and education, to enable the generation of new products, medicines and devices that are transforming the lives of children.

Over the last 100 years, the Trust has been a leader in children’s healthcare, from the early use of penicillin in children, to establishing the first neonatal surgery unit in the UK, introducing liquid glass to reduce infection and pioneering medical devices and splints now used worldwide.

**Alder Hey’s aim is simple: to improve healthcare for children throughout the world.**
Our Aim
This will be achieved through a multi-disciplinary, holistic approach to innovation, research and education.

Innovation
Every medical advance starts with an idea. An idea can be simple or complex but to exist it needs a spark and the right conditions to ignite. At Alder Hey, we are pioneering this process by working with families, academia and industry to create the UK’s premier children’s innovation system.

Research
Our integrated and proactive approach means that we have more children participating in clinical studies than any other UK children’s hospital, placing the Trust in the top 5% for research in England. In partnership with the University of Liverpool, we have made significant contributions to serious conditions, including helping develop the first drug licensed for use in children with arthritis in 50 years, tracking medicines in newborns, developing a point-of-care test for serious bacterial infections and the development and roll-out of a vaccine for Rotavirus.

Education
Alder Hey has a key role in educating the next generation of doctors and nurses in partnership with the University of Liverpool, Liverpool John Moores University and Edge Hill University. We are very aware of the need for paediatric education at all levels and in all environments. In 2012 we developed the first and only NQF-accredited Paediatric Healthcare Assistant qualification as a standardised development programme with a bespoke focus on caring for sick children. Alder Hey also partners with organisations around the world such as Kanti Children’s Hospital, where we are sharing and spreading the latest specialist techniques to help children in Nepal.

Alder Hey is achieving this on a scale not seen elsewhere in the UK and is sharing this learning and practice around the globe. In addition to our local and international academic partners, we host the National Coordinating Centre for the NIHR Clinical Research Network’s Children’s Theme and the Medicines for Children Clinical Trials Unit (covering 12 million patients across the NHS) with the University of Liverpool, and we work in partnership with hospitals from the Manchester Royal Children’s Hospital to the Queen Elizabeth Hospital in Malawi.
The Institute in the Park

The next step is to build an International Centre, which becomes the hub for research, innovation and education in child-centred care, to promote cross fertilisation of ideas and advance children’s healthcare.

To do this we need to build a new Institute as the ‘hub’ or hothouse for these ideas to be designed, developed and implemented across the local health economy and beyond.

• The new Institute building will be welcoming, recognisable, and will encourage public awareness of health research.

• The building will employ the latest green technology including air source heat pumps directly linked to the Aquifer and solar panels.

• The Institute buildings will stand out in Liverpool and use the profile of Alder Hey to bring economic and social benefits to Liverpool.

Co-locating innovation, research and education is essential for the success of the new Alder Hey. Innovation and research is informed by the issues faced by our clinicians every day, innovation requires thorough research to prove safety and efficacy, education informs clinicians of new, more effective treatments, and innovation can develop new ways to monitor the implementation and effectiveness of interventions, identifying new areas for research and further innovation. We are building a destination where this virtuous circle can have a step-change impact on the lives of children in Liverpool and throughout the world.

The Innovation Hub

The sister development to the Institute in the Park is the Innovation Hub. This will include an underground facility attached to the main hospital where clinicians and industries can come together and create new products and technologies.

Innovation at Alder Hey will be driven by a strategy of co-creation with large technology companies within the Innovation Hub. By leveraging their resources and product delivery mechanisms, we will accelerate innovation within the hospital and industry. The Hub will be the place where Sensor Hospital at Alder Hey is brought to life.

These interconnected developments will be housed in a new suite of buildings, of which the Institute in the Park Phase I is funded (£12.5m) and opens in September 2015. The Institute in the Park Phase II (£8m) and the Innovation Hub (£2m) require further funding.

Benefits

• We will create 300 new jobs, mainly highly skilled and requiring graduate entry, in education, research and product development.

• We will host 287 additional out of area students per year and 87 local children per week.

• We will improve the patient experience in Alder Hey Children’s Hospital by 25%.

• We will develop better, safer medicines for use for children with autoimmune and respiratory conditions, serious infections and cancer.

• We will develop paediatric training modules to be used in the UK and throughout the world.

• We will develop Alder Hey and Liverpool and a destination for healthcare innovation and technology.
Education and training courses at Alder Hey are very highly rated by medical students, doctors, nurses and a wide range of health and social care professionals from Merseyside and beyond.

Education is happening all around us at Alder Hey, both within the hospital site and within the Alder Hey community in Merseyside and abroad, through organisations such as our partners at Kanti Hospital in Nepal. With a high volume of staff giving and receiving education, we need to create an established base from which to deliver and expand our highly-rated education and training courses.

Alder Hey is the biggest secondary care provider in the North West and a major player nationally and internationally in paediatric healthcare. Our strong brand, achieved through our significant expertise in secondary and tertiary care and development of the NIHR and Medicines for Research Network, make us best placed to become the leader in developing and delivering new models of education in paediatric healthcare.

We will use the considerable potential that our new Institute offers, in conjunction with Alder Hey and The University of Liverpool’s clinical and research expertise, to create a hub for virtual and face to face education and training on local, national and international scales.

Local

On a community level, we want to understand better what we can do to stop children coming into hospital.

Through the simulation suites in our new Institute, we will work with school nurses to educate children in healthy behaviours and work closely with parents. The new facility will provide a purpose-built space in which to educate them in basic healthcare interventions, such as resuscitation.

Alder Hey will also work with the hospital innovation team and Edge Hill University to record and monitor patient outcomes, develop new outcome measures by working with parents and children and reduce admissions to hospital.

The Institute will also bring several thousand health professionals a year into the city for their education and employing more specialist research personnel, increasing graduate retention in the city and boosting the local economy.

National

The potential to grow our services as a world class education provider is huge and there is significant demand for our qualified senior clinical staff to deliver education and training to a wide range of healthcare professionals, including GPs, school nurses, health visitors and visiting overseas medical personnel.

We are also working to address the current need for more specialist and accredited paediatric-focused courses and qualifications, proven by our work in developing the only Healthcare Assistant qualification, and with future developments including paediatric modules and courses for nursing and primary care providers.
International

The Institute will enable Alder Hey to join a network of the leading children’s hospitals across the world, developing joint programmes of education through web seminars and hosting international meetings at the Institute in the Park. Alder Hey already has close healthcare, educational and research links to centres in many developing countries including Nepal, Malawi and Pakistan. We will build and provide access to a virtual learning platform to educate clinicians from overseas on paediatric issues. We will also use this new hub to attract international clinicians to the hospital to receive training. This strategy will bring considerable beneficial impacts for children’s health throughout the global health system.

Building on our experience in training and education we aim to widen our reach in both traditional areas and into new fields of endeavour.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Current</th>
<th>2018</th>
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</thead>
<tbody>
<tr>
<td>Numbers of education sessions per week</td>
<td>2,322</td>
<td>2,786</td>
</tr>
<tr>
<td>Numbers of students on site per week by discipline;</td>
<td>365</td>
<td>600</td>
</tr>
<tr>
<td>Number of BTEC classes per week</td>
<td>6</td>
<td>16</td>
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<tr>
<td>Number of BTEC students per week</td>
<td>87</td>
<td>170</td>
</tr>
<tr>
<td>Number of courses aimed at national/ international students per week</td>
<td>5</td>
<td>20</td>
</tr>
<tr>
<td>Numbers of out of area students attending the site per week</td>
<td>287</td>
<td>574</td>
</tr>
<tr>
<td>Numbers of staff involved in education directly</td>
<td>260</td>
<td>312</td>
</tr>
<tr>
<td>Numbers of staff involved in education indirectly</td>
<td>570</td>
<td>684</td>
</tr>
</tbody>
</table>

Our aims are:

- To improve the health of children in Merseyside through self-management and self-awareness of disease.
- To become the principal centre of training and development on paediatric issues for clinicians from abroad.
- To be a recognised centre of excellence for training of staff in patient-centred care, with a focus on innovation.
- To further develop our delivery against curricula across all groups in child care – professional and non-professional. This will support all those who work in the children’s health workforce with opportunities to develop and share their learning.
- To develop and deliver a programme for patients and their families to understand and manage their condition.
- To develop community staff in managing paediatric needs in the community setting.
- To be the hub of information for local schools and colleges around child public health, with a focus on inclusivity, career development and public health promotion.
- To continue work with partners in developing our international educational offering using collaborative working opportunities with Higher Education Institutions and other partners both nationally and internationally.
Our Vision

Our vision is that all children should have access to treatments that have been developed and tested for use with them in mind. It will take many years to achieve but as a leader in the field, we are confident that our approach will make a significant contribution to reaching this essential goal.

Unfortunately, many of the medicines used in the UK and internationally have not been developed specifically for this age group and have been extrapolated from adult dosages. The lack of age-appropriate formulations of medicines means that healthcare professionals are often required to manipulate dosage forms intended for adults so that the medicine can be given to a child.

Although the regulatory framework for medicines in children has improved, there is still the requirement to conduct clinical trials in children to test the safety and efficacy of new medicines, and we are left with the legacy of age-inappropriate medicines which we must continue to use in children.

There is an urgent need to ensure that medicines used in children and infants are assessed adequately. Alder Hey and the University of Liverpool have a strong focus on developing new medicines for children and babies and optimising the use of drugs which healthcare professionals are required to use in everyday practice.

Why Alder Hey?

Alder Hey leads work in the development of better medicines for children in the UK. It is currently the National Centre for Research into Medicines for Children and has research excellence in many important areas of child healthcare research.

Research into children’s healthcare is one of the key cross cutting themes for Liverpool Health Partners and the North West Coast Academic Health Science Network. The new Institute offers the potential to build on emerging areas of research excellence in children’s health and disease at Alder Hey and to make internationally recognised contributions to children’s health worldwide.
Alder Hey is a notable centre for children’s health research with a number of main elements:

- Centre of Excellence for Paediatric Research: Alder Hey investigators lead/collaborate in over 100 studies.

- Over the last ten years Alder Hey has recruited more patients into trials than any other specialist children’s NHS Trust and it is one of the top 5% of all NHS Trusts nationwide for research.

- The National Coordinating Centre for the National Institute for Health Research (NIHR) Clinical Research Network’s Children’s Speciality is based on the Alder Hey campus. In 2014/15 over 30,000 children and babies were recruited into studies overseen by this Speciality Group.

- NIHR Alder Hey Clinical Research Facility for Experimental Medicine: This facility improves the health and well-being of children by providing an internationally excellent children’s facility for conduct of experimental medicine studies. It aims to be an important “one-stop” resource for the pharmaceutical industry for the conduct of EM / early phase studies of novel agents.

- The Medicine for Children Clinical Trials Unit, working closely with the MRC North West Hub for Trials Methodology Research: supports all aspects of paediatric trial design and management as the UK’s only paediatric-specific Clinical Trials Unit.

Some of the key areas of specialism based around Alder Hey are:

- Paediatric Rheumatology: National leadership of the Clinical Studies Group leading a comprehensive programme of translational and early / late phase clinical trials, the UK’s only Centre of Excellence for Childhood Lupus and the UK Experimental Arthritis Treatment Centre for Children.

- Paediatric Respiratory: internationally recognised Regional Paediatric Cystic Fibrosis Centre, hosts the International Cystic Fibrosis Cochrane Review Group and has expertise in clinical trials, biomarkers and experimental medicine.

- Paediatric Infectious Diseases: improving diagnosis of serious bacterial infection, understanding mechanisms of disease to improve management of sepsis and biomarker discovery, the team have collaborations in Malawi and The Gambia.

- Paediatric Experimental Cancer Medicine Centre Network.

- Neonatology: working closely with colleagues at the Liverpool Women’s Hospital, experimental medicine and early phase trials including “first-in-human”.

- Arthritis Research UK Experimental Arthritis Treatment Centre for Children.

- Stem Cell work in Hirschprung Disease and Renal

- Internationally competitive strengths in Clinical Pharmacology including strong collaborative links with:
  - MRC Centre for Drug Safety Science: fundamental clinical and basic research into the causes, characteristics and consequences of adverse drug reactions in order to facilitate safer drug design and provide pharmacological rationale for the safer use of medicines in patients.
  - Wolfson Centre for Personalised Medicine is the only centre of its kind in the UK, where novel trial designs including experimental medicine studies are being used to develop strategies for stratifying medicines in all age groups
  - Clinical Academic Paediatric Pharmacology: one of the few national centres supporting a cadre of NIHR Academic Clinical Training posts of critical relevance the global pharmaceutical industry.
Expanding Research into Medicines

By continuing to develop new drugs trials and recruit children into these trials we will grow the research activity:

Growth In Research Income

Impact

Our new facilities will bring this expertise together under one roof, adjacent to the new Alder Hey, enabling us to work more directly with the 270,000 children treated annually at the hospital, for faster and more innovative bench-to-bedside-to-bench breakthroughs.

This world-class facility will provide significantly greater capacity to partner with a variety of children’s healthcare and research organisations throughout the UK and overseas. This in turn will help the partnership to secure NIHR Biomedical Research Unit status, essential to attracting significant international expertise and funding.

Our research aims are to:

• Develop more effective, safer and more appropriate medicines for children.

• Launch studies in Malawi addressing Malaria, Group B streptococcal and Influenza vaccines

• Develop and evaluate novel vaccines against remaining major global causes of paediatric illness and death, including malaria, group B streptococcal and influenza vaccines.

• Generate evidence to inform vaccine policy nationally and internationally to have a positive, life changing impact on children from the most resource deprived areas of the world.

• Translate knowledge gained through understanding the mechanism underlying the development of autoimmune conditions such as juvenile arthritis or lupus into new, safer, targeted therapies.

• Research to improve the lives of children with chronic conditions such as asthma.

• Use pharmacogenomics to identify children at risk of serious adverse drug reactions.

• Research alternatives to injectable medicines, a particular problem in small babies and children.

• Investigate the use of antiviral treatments for babies in intensive care with bronchiolitis.

• Tackle drug-resistance and relapse in paediatric brain tumours and neuroblastoma.

• Develop clear diagnostic methods for the early detection of sepsis in children by 2020.

• Research the evidence based usage of antibiotics in children and babies by 2022.
Ecosystem for health

New medical products and devices are often targeted at problems in the biggest markets such as adult cancer and geriatric conditions. While this is important, it creates a situation where paediatric innovation is often relegated to adapting these technologies for use in children, instead of our very unique problems dictating the direction of medical advancement. Our aim at Alder Hey is to break this model, putting children first and exponentially accelerating the creation of new therapies and devices with them in mind. To imagine how we can make our care better, kinder and easier, combined with an efficient system to make these dreams a reality.

Over the last 18 months we have instituted a radical program of innovation acceleration, creating a professionalized service of clinician innovators and drawing experience from national bodies, commercial partners, SME’s and academia to innovate at scale and pace.

The response so far has been staggering with multiple blue chip companies such as British Telecom, Sony, Panasonic and Karl Storz dedicating equipment, time, engineers, business support and imagination to create a thriving Innovation Hub on the Alder Hey site. By providing a fertile ground for these companies to co-create medical technologies, we have been able to institute multiple innovative programmes.

Case study for future investment

Medical sensors and the ability to intelligently analyse and display their outputs has the potential to revolutionize medical practice, allowing immediate response in fast-moving clinical scenarios, long term tracking, reduced discomfort and predictive modelling.
The possibilities of advanced health monitoring and metrics are limitless and a clear direction of travel for technology in general not just the healthcare sector.

Liverpool is an international centre of excellence in the design, research and manufacture of advanced sensor technology. To capitalise on this, the £15m Sensor City program was created through cooperation between Liverpool and John Moores University. A recent addition to the North West’s assets has been the UK’s most advanced high performance computing (HPC) facility at Sci-Tech Daresbury, providing cutting edge facilities to analyse large data sets.

Against this background, Alder Hey’s £237m health park is due for completion in Autumn 2015. Combining innovative architecture, state of the art clinical and data infrastructure, it has been identified as one of the top 100 world infrastructure projects. This makes it a desirable location for technology companies to pioneer new technological solutions in theatre design, patient experience and medical devices, giving children in Liverpool the latest advances and creating an environment in which new technologies can be developed ahead of future national and international roll-out. As part of this regeneration, an award winning innovation program is in place to accelerate public-private cooperation to produce new technologies at scale and pace.

**Proposition**

The alignment of these three world class facilities has the potential to create a health technology ecosystem capable of identifying, solving and commercialising clinical problems through advanced sensor technology and big data analysis. Only through close collaboration and leveraging of the respective strengths will the necessary scale and pace be generated to produce technologies that are first to market in a competitive world environment.

By carefully identifying clinical problems, assisted by our status as one of the we will target pinch points effectively. Once appropriate sensors have been prototyped we will use an accelerated program to guide the technology through regulatory and ethical requirements into a clinical environment. Leveraging the advanced data infrastructure at Alder Hey, the sensor programs will output data to Sci-Tech Daresbury for evaluation and analysis.

Resultant sensor packages will be quickly developed into products through the creation of dedicated teams to ensure IP protection, project management, certification and a clear path to market. This model will use local SMEs to create a product wrapped around the core sensor technology, computer models and clinical practice. The use of large blue chip companies to provide a clear path to market will accelerate this process and create strong ties between local SMEs and our larger partners.

The aim of this system is to identify existing and emerging problems quickly then solve them at scale and pace to ensure an effective product conveyor belt in the North West of England.

**Impact**

- Acceleration of new products into UK and world healthcare sectors (we aim to bring three new products to market per year within three years) to drive the UK contribution to medical devices, sensors and patient experience, revolutionising children’s healthcare.
- Major impact on children’s experience of healthcare, for example through avoidance of painful injections – our target is to increase children and parents experience by 25% within three years at Alder Hey Children’s Hospital and share our developments with hospitals around the world.
- Major impact on critical and life-saving technologies through sensors and data analysis – for example, one long-term aim is the development of a system to identify which children admitted to ICU wards are in most urgent need of care, potentially saving lives.
- Economic benefits to the UK through production line of breakthrough products will create and support 100 new high-skill jobs within three years, in blue-chip partners, higher education partners, Alder Hey itself, and local businesses and start-ups, with more than 15 current SME partnerships ongoing.
If you would like any more information about any of the details in this report, please contact:

By post: Alder Hey Children's NHS Foundation Trust, Eaton Road, Liverpool, L12 2AP
By telephone: 0151 228 4811
By email: communications@alderhey.nhs.uk

www.alderhey.nhs.uk