

Newcastle Academic Health Partners' Strategy

Background

The formation of **Newcastle Academic Health Partners (NAHP)** builds on the existing close partnership between the **Newcastle upon Tyne Hospitals NHS Foundation Trust (NuTH)**, the **Northumberland Tyne and Wear Mental Health Foundation Trust (NTW)** and the **Faculty of Medical Sciences at Newcastle University**. This partnership leads internationally competitive, patient-focused research from the North-East of England, driving innovation in regional healthcare, whilst providing national leadership for the largest single group of nationally commissioned NHS services. Our associated collaborative clinical and research network has clearly defined geographical boundaries, leading to a natural and close relationship with the other NHS Trusts and Universities in the North East and Cumbria – now formalised as the **Academic Health Sciences Network (AHSN) for the North East and North Cumbria (NENC)**.

Our existing areas of strength in research and patient care map directly to major health issues facing the UK population: **population ageing and long term conditions**, **brain and nervous system diseases**, **diseases in children and young people**, and **cancer**. The partnership is also distinctive for its strength of commitment to **train a healthcare workforce with the appropriate skills** to lead and deliver healthcare innovation.

Our Vision

Our vision is for all those who live in the North of England to enjoy the highest possible quality of life and experience of healthcare, with the region seen as a benchmark of quality in patient care, research and innovation, and education and training, nationally and beyond. Newcastle has a proud history of innovation in biomedical research, training and education in health and clinical care, and our vision is to use the development of NAHP as a catalyst to make us a world-leading integrated health-care centre (“The Mayo Clinic of the UK”).

Our Mission

Our mission is to generate significant health and wealth gain for the people of the North East by fully integrating, promoting and further developing our established and emerging strengths in patient care, medical research and innovation, and health education.

Specific objectives:

- **To continue to deliver advances in basic scientific research, principally across 4 medical themes in which our partners are internationally recognised for clinical excellence.** The themes comprise: **ageing and long-term conditions; the brain and nervous system; children and young people (CYP); and cancer**. Each is considered in more detail in the following section.
- **To optimise the clinical relevance of our research strengths in the Faculty of Medical Sciences by applying expertise in 5 core research domains**, consisting of: **genomics; diagnostics and precision medicine; novel therapeutics; lifestyle, digital and devices; and the interactions between mental and physical health**. Key features of each are discussed in the next section.
- **To translate our research advances into improved prevention and treatment strategies for patients, through provision of world-class clinical research facilities.**
- **To embed patient participation, involvement and engagement at the core of our strategy for clinical research.** We have an integrated university/NHS team devoted to patient and public involvement/engagement (PPI/E), with representation on national bodies committed to PPI/E such as INVOLVE.
- **To develop an innovative health education programme** that will attract the brightest and best to Newcastle, where they will benefit from innovative training programmes incorporating translational research, how to implement innovation in healthcare, and healthcare leadership. Training the workforce this way will ensure that benefits of our research are delivered to the widest possible patient base and are sustained.
- **To use the opportunity offered by the integrated NAHP model to address barriers to effective translational research delivery.** Research effectiveness in practice is frequently not limited by lack of innovative ideas or of research funding but by administrative process (in particular if not integrated across organisation boundaries) and key skill shortages around research delivery. The integrated operation model of NAHP, and our strong focus on training and training innovation, will allow us to address both of these key challenges.

In the **longer term** we will:

- **Deliver economic growth and long-term sustainability** by: (i) attracting patients from across the UK, Europe and throughout the world seeking the best medical care in areas where we will have specific expertise; and (ii) further developing our portfolio of industrial interaction by exploiting our national leadership in innovation related to an ageing population, our scientific expertise, our unique patient cohorts, and our clinical research platforms.
- **Develop the organisation through sustainable means.** Our focus on research and clinical innovation in areas that are highly attractive to funders, with a strengthening industrial interface, provide the opportunity for us to grow as an organisation. Our focus on internal development in both clinical and academic settings also provides growth opportunity. Such growth must always, however, be sustainable financially, and must not take priority over maintenance of our unique ethos and culture.

Initial medical themes

Our 4 priority areas reflect our world leading strengths in basic and translational science coupled with nationally leading clinical services.

(1): Ageing and long-term conditions

NAHP is internationally acknowledged as a centre of excellence for the study of ageing and age-related conditions, recognised recently by the award of the £20M **National Centre for Ageing Science and Innovation (NASI)** to Newcastle. NASI complements the **NIHR Biomedical Research Centre (BRC) in Ageing and Chronic Disease**, based in Newcastle, and the only NIHR BRC north of Cambridge. These prestigious national awards add to the established reach of the **Newcastle University Institute for Ageing**. Collectively, this infrastructure positions NAHP as the premier centre for the study of ageing in the UK. This in turn provides the ideal platform from which to improve not only the quality of life of healthy elderly people, but also the health and quality of life of patients with diseases that characteristically affect the elderly. NAHP has programmes of research across many such diseases, exemplified by three areas of particular strength - **liver disease, musculoskeletal disorders, and mitochondrial diseases**.

Chronic liver disease represents a major and growing challenge in our population and has a disproportionate impact on economically deprived regions such as the North-East. Recent research advances and growing interest from the pharmaceutical industry have the potential to deliver significant improvements in prevention and treatment in the near future. However, we currently lack the clinical systems to effectively implement approaches that stratify patients such that they receive the most appropriate, individualised treatments. The study of liver disease will incorporate two complementary areas of work designed to address this shortfall through the study of highly characterised patient cohorts in the North East. The first will explore novel approaches to blocking and reversing liver fibrosis (the key step preceding liver cirrhosis) and develop novel biomarkers to aid diagnosis and monitoring of therapy. The second will develop novel, systematic, patient-centred approaches to the delivery of stratified care in practice, thereby providing the framework to derive the greatest benefit from future therapies.

Chronic musculoskeletal disease is almost ubiquitous in our ageing population. We will continue to strengthen the unique interface between our acclaimed clinical service and our research Centre of Excellence (Newcastle leads the national **NOCRI Translational Research Partnership in Joint and Related Inflammatory Disease**). We have identified diagnostic and therapeutic biomarkers in rheumatoid arthritis (RA) and pioneered autologous tolerogenic dendritic cells as a therapy for refractory RA. We will work with our patient cohorts and industry partners to study biomarkers and novel therapeutic approaches in several rheumatological diseases. Our health education research has produced several internationally adopted tools. We will focus on barriers to research participation, involving patients, carers and non-academic staff.

Mitochondrial diseases are far less common, but NAHP leads the world in the study of these rare conditions. Importantly, mitochondrial dysfunction may contribute significantly to premature or accelerated ageing, and mitochondrial work in NAHP is likely to generate fundamental new insights into the ageing process in the next few years. NAHP is uniquely positioned to unlock the clinical potential of understanding mitochondrial biology in ageing and chronic disease, through the **Wellcome Trust Centre for Mitochondrial Research** and the **MRC Centre for Translational Research in Neuromuscular Disease**.

(2): Brain and nervous system

Our focus shall be **Lewy Body Dementias (LBD)**, comprising dementia with Lewy bodies and dementia associated with Parkinson's disease, a research area where we have led international diagnostic and therapeutic guidelines, and established large patient cohorts. NAHP's excellence in this field has been recognised in the form of an **NIHR Biomedical Research Unit (BRU) in Lewy Body Dementia**. The aims of the theme will be: to develop an integrated service and clinical pathway from primary to secondary care; to

reduce diagnostic delay; to evaluate and develop a range of technologies to achieve earlier and more accurate diagnosis; to improve patient management via novel pharmacological and non-pharmacological approaches developed in collaboration with the life sciences industry; and to pilot innovative educational methods to effect knowledge transfer about LBD to patients, carers, and primary and secondary care professionals, thereby empowering them to better understand these common and complex conditions.

While our international research excellence is in Lewy body dementia, we will also continue to actively engage with national dementia research initiatives and projects (which are primarily non-Lewy body), including the **(NIHR) Dementia Translational Research Collaboration (TRC)** which nationally unites the four NIHR Dementia Biomedical Research Units as well as six NIHR Biomedical Research Centres with dementia-related research themes. Furthermore, a PET-MRI facility dedicated to the study of dementia is under development in Newcastle, forming part of the **MRC Dementias Platform UK (DPUK)** (<http://www.mrc.ac.uk/research/facilities/dementias-platform-uk/>). Tangibles of our network activity include being an active node for the flagship DPUK Deep and Frequent Phenotyping feasibility study led by Oxford. Patients with other dementias will also be offered inclusion in studies whenever possible and will be guided to opportunities on the national portfolio through the NE & Cumbria LCRN and Joint Dementia Research.

In addition to dementia research, NAHP has a leading world position in the study of muscular dystrophies. This work also forms part of the **MRC Centre for Translational Research in Neuromuscular Disease**. Our partnership will enable comprehensive molecular diagnosis for patients with muscular dystrophies through the application of whole exome and whole genome sequencing. We shall also build a portfolio of educational materials and best clinical practice guidelines for use nationally and internationally, and develop and implement new treatments for muscular dystrophies through ongoing close collaboration with the life sciences industry.

(3): Children and young people (CYP):

NAHP has a vibrant research portfolio across a broad range of paediatric disciplines in one location, within the renowned **Great North Children's Hospital**. In addition to muscular dystrophies (considered in the theme above), Newcastle has particular expertise in paediatric oncology (embedded in the cancer theme below), autism, cerebral palsy, childhood renal disease, paediatric rheumatology and primary immunodeficiencies of childhood. Our aim is to improve diagnosis and therapy in children by building on our international track record in clinical research utilising well-annotated patient cohorts. As an exemplar, our translational research into paediatric immunodeficiencies is underpinned by programme grant funding from the Sir Jules Thorne Charitable Trust. Crucially, our research is embedded within an academically driven, nationally commissioned, NHS service. The aims of the CYP theme will be to develop new diagnostic tests and prognostic biomarkers for better therapy stratification, to identify and validate novel therapeutic targets and predictive biomarkers, and to develop novel therapies in collaboration with our industrial partners.

(4): Cancer:

Our aim is to improve the diagnosis and therapy of patients with cancer through well-characterised cohorts in the award-winning **Northern Centre for Cancer Care at the Freeman Hospital site** in partnership with the Faculty's **Northern Institute for Cancer Research (NICR)** which incorporates both a **Cancer Research UK (CRUK) Centre** and a **DH/CRUK Experimental Medicine Centre**. This partnership has already created the foundation for Newcastle's leadership of national and international collaborative networks. Our research is supported by programme grant funding from the European Research Council, CRUK and Leukaemia & Lymphoma Research. As with all other themes, our research is integrated within an academically driven NHS service incorporating an early phase clinical trials team that is part of the relevant UK and European networks. The aims of the theme will be to develop new diagnostic tests to identify and validate prognostic biomarkers for better therapy stratification, to identify and validate novel therapeutic targets and predictive biomarkers, and to develop novel therapies, by repurposing emerging or existing targeted therapies in collaboration with our industrial partners and through the Newcastle academic drug discovery programme.

Core domains of research expertise that will be applied to our 4 medical themes

(1): Genomics

In partnership with **NuTH's Clinical Genetics Service** the Faculty's **Institute of Genetic Medicine** is home to an **NHS England Genomics Medicine Centre** and the **MRC Newcastle University Single Cell Functional Genomics Unit (NUSCU)**. This latter facility offers cutting edge facilities for interrogation of the function of single cells from complex diseases such as those described above. State-of-the-art facilities also exist for whole genome sequencing and whole exome sequencing. Together, these platforms provide unique opportunities for understanding the fundamental biology of the diseases in our key themes, in turn yielding novel avenues for novel drug development.

(2): Diagnostics and Precision Medicine

NAHP is the only centre in the UK to host both an **MRC/EPSRC Molecular Pathology Node** and an **NIHR Diagnostic Evidence Co-operative (DEC)**. The combination provides unique opportunities for the integrated development, evaluation, and implementation into clinical practice, of diagnostic tests. This in turn provides academia and industry with a single infrastructure encompassing all aspects of diagnostics, placing NAHP at the forefront of the expanding diagnostics sector. The Node and the DEC already have a broad cohort of established commercial partners making use of NAHP's critical mass in diagnostics. NAHP is therefore ideally placed to develop and evaluate diagnostics for each of the themes described above, in collaboration with a range of commercial partners already engaged by the Node and the DEC. NAHP's excellence in genomics, diagnostics and precision medicine will facilitate detailed stratification of patients into cohorts most likely to benefit from emerging treatment modalities, outlined in the next two domains.

(3): Novel therapeutics

The Drug Discovery team in the **Northern Institute for Cancer Research (NICR)** has developed a novel class of anti-cancer drugs (PARP inhibitors). In conjunction with the **Northern Centre for Cancer Care** and commercial partners the team has implemented successful delivery of PARP inhibitors into cancer care. In light of this track record, in 2014, the collaboration received a £5M grant from ASTEX Pharmaceuticals – a global company with a European base in Cambridge - and, in 2015, a CRUK Programme Grant for further cancer drug discovery work. Newcastle also has a vibrant cellular therapy unit with an associated gene therapy facility. The **Institute of Transplantation** has an international reputation for conditioning of human organs traditionally considered unsuitable for transplantation, such that they may be successfully transplanted, thus expanding the notoriously limited pool of donor organs for use in the NHS. NAHP will consolidate and enrich these overlapping areas of new therapeutic development, simultaneously enhancing the North East's reputation for excellence and for providing the best and most modern treatments for patients.

(4): Lifestyle, devices and digital

All of our Disease Themes lend themselves to studying the health-related behaviour of large cohorts, with a view to implementing beneficial lifestyle change. Local expertise in the application of digital technology and devices to healthcare problems ensures that NAHP is ideally placed to maximise potential in these areas. In particular, the **MoveLab** at Newcastle University uses smart technologies to monitor patient behaviour, providing continuous interactive digital data that helps patients make informed adjustments in diet and exercise. Expertise in molecular and physiological biosensing in Newcastle has (a) informed the design of in situ microsensors that provide real-time detection of clinical parameters and convey these to distant hospital sites via the internet and (b) driven the development of microfluidic systems for incorporation in novel in vitro diagnostic platforms. The potential clinical effectiveness of lifestyle change is exemplified by work in Newcastle demonstrating unequivocally that targeted weight loss can reverse type II diabetes mellitus.

(5) Interactions between mental and physical health

NAHP benefits from NTW FT's rich experience in studying (a) the psychological impact of physical disease and unhealthy lifestyle, and (b) the physical and lifestyle consequences of psychiatric and psychological illness. These areas are notoriously understudied, and application of this expertise to our 4 major themes provides an unparalleled opportunity to explore new therapeutic strategies. NTW's existing expertise in changing professional behaviours in dementia and in long-term conditions such as diabetes will form a platform for expansion into areas where NAHP is uniquely placed to make breakthroughs. These include modifying the effects of cancer care on mental health, and developing ways of improving physical activity in patients with anxiety and depression.

Interaction of medical themes and research domains

<i>Research Domains</i>					
Medical Themes					<i>Genomics</i>
	Ageing and Long-term Conditions	Brain and Nervous System	Children and Young Persons		<i>Diagnostics & Precision Medicine</i>
				Cancer	<i>Novel Therapeutics</i>
					<i>Lifestyle, Devices & Digital</i>
					<i>Interaction between Mental & Physical Health</i>

World-class research facilities

Hosting the greatest number of national commissioned NHS services for any one Trust (in NuTH), NAHP will have the capability to translate new discoveries into practical actions and improvements for patients across the NHS and internationally. NuTH hosts a dedicated **Clinical Research Facility** for early phase clinical studies, as well as the **Sir Bobby Robson Cancer Trials Unit** for early phase cancer studies. In 2014-15, NuTH had more open NIHR portfolio studies than any other Trust in the country. NuTH hosts the NIHR LCRN; North East and North Cumbria.

NAHP's successes in translating basic science into effective clinical practice (in collaboration with industrial partners) will be rolled out across the **NENC AHSN** and throughout the North of England via our core membership of the **Northern Health Science Alliance (NHSA)**.

Education and Training

NAHP has a world class reputation in the area of education and training, ranging from education of undergraduate medical students through to high-level career development for clinical and academic leaders. We will build on existing strengths to develop a distinctive "Newcastle Model" for training which will further strengthen our training "brand" as well as further developing our own employees. We make significant contributions to training nationally (we provide the highest quality training for Academic Clinical Fellows and Lecturers, and our lead for clinical academic training. **David Jones**, was appointed **NIHR Dean for Faculty Trainees in 2015**) and regionally (we lead the NHSA training initiative). Our skills in developing multi-professional training have been recognised by us being one of four providers of training for Clinical Scientific Officers in the UK via the **Modernising Scientific Careers scheme**. Our aims are to develop and deliver programmes that ensure that staff have the skills to deliver the highest quality, evidence-based care for their patients and to deliver education and training materials that map to our clinical and research strengths. We wish to be at the cutting edge of new training opportunities and our national leadership contribution will play a key role in enabling us to achieve this.

Early deliverables of the NAHP

We have identified 5 specific deliverables that can only be achieved through the strong, unified leadership across the partnership that NAHP will provide. Each deliverable will result from integrating our clinical and academic resources, thus allowing NAHP to deliver outputs that are considerably "greater than the sum of the parts".

Specifically, we will deliver:

- 1) **Integrated biomedical data and tissue banks.** This will have two separate components:
 - a) **The seamless linking of our two Trust-based electronic patient records with laboratory data generated by the NAHP partners.** This will include deep phenotypic data collected through routine clinical episodes; the results of clinical investigations, pathology and treatments; and biochemical and genomic data generated within the academic environment. Ultimately this will provide a NAHP-wide integrated healthcare innovation informatics platform tailored for the healthcare needs of the regional population, and ripe for a deeper engagement with the life sciences industry.
 - b) **Streamlined biobanking of DNA, RNA and plasma/serum,** built around routine patient episodes linked to the integrated informatics platform achieved by **merging University biobanking facilities with recently configured pathology clinical services in both NHS Trusts.** This new infrastructure will provide a local hub, interfacing directly with UK Biocentre for longer term storage.
- 2) **An organisation where research is integral to all patient episodes.** All patients in both Trusts will be asked to provide generic consent for:
 - a) Their clinical records/results to be used for research.
 - b) Use of their tissue/DNA that is surplus to diagnostic requirements for research.
 - c) Permission to be contacted by research teams in the future (documented in the electronic patient record and with a strong emphasis on clinical trial recruitment).
- 3) **An increase in the proportion of academically-led disciplines (Academic Clinical Directorates) in our two Trusts.** By using our specific themes as exemplars and our exceptional translational infrastructure we will broaden the academic base of the Trusts by:
 - a) Increasing academic capacity in disciplines with a strong clinical base (e.g. cardiothoracic) including through recruitment and nurturing of the next generation of researchers.
 - b) “Pushing” more of our best basic science into the clinic (e.g. bacterial cell biology).
- 4) **The best integrated training in healthcare.** NAHP will lead the development and implementation of novel educational provision for the integrated training of NHS professionals including healthcare managers in addition to patients and the wider public. We will provide the best training nationally, attract the best trainees, and continue to provide national leadership in healthcare education. We anticipate our training models will be adopted globally.
- 5) **An increase in life sciences industry investment in NAHP.** Based on the recent £20 million award from the Treasury to construct a **National Centre for Ageing Sciences and Innovation,** we will contribute to regional and national economic development by establishing a **Business Science Park on the Campus for Ageing and Vitality.** Physically adjacent to our NIHR-funded Biomedical Research Building, this will link our internationally-leading basic science with the commercial sector, and catalyse the implementation of new treatments and devices. We will use the NAHP partners to test and deliver these new therapies in collaboration with the life sciences industry on the same site.

The organisational model and governance arrangements

The previous Newcastle Biomedicine Board will become the NAHP Executive Board with additional members as outlined below. A formal Memorandum of Understanding will be signed based on the current Terms of Reference: - “*To promote and maximise all joint ventures across each organisation including, but not limited to, business opportunities, research potential and undergraduate and postgraduate medical and dental education*”. The NAHP Board will report to both NHS FT Boards and the NU Faculty of Medical Sciences Executive Board. NAHP Board members sit on one or more of these three Boards.

The **Executive Board** will set the strategy for NAHP and be responsible for ensuring the integration across the entire centre. (1) The **NAHP Research and Innovation Hub** will bring together into a single structure and manage all of our clinical research platforms and facilities to enable an effective bench-to-bedside transition across our 4 principal themes and our 5 enabling domains. It will be overseen by the **Joint Research Executive.** (2) The **Health Informatics Group** will drive the development and implementation of an integrated health informatics system. (3) The **Joint Business Executive (JBE)** will develop potential commercial outputs from NAHP, identify and develop new patents, and facilitate collaboration and investment from the life sciences industry across NAHP. (4) The **Joint Education Executive** will be responsible for the development and delivery of multi-disciplinary training and education across the host organisations. (5) The **PPI/PPE Oversight Group** will ensure that patients and the public inform the strategy and shape priorities at the Executive and Group levels.