

**National Institute for Health Research / NHS England / Improvement
ACADEMIC HEALTH SCIENCE CENTRES**

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Institution Director	Professor David Burn
Director Institution	Newcastle University
AHSC Name	Newcastle Health Innovation Partners
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1. Details of the Partnership

Institutions

The Newcastle Upon Tyne Hospitals NHS Foundation Trust
Cumbria, Northumberland, Tyne and Wear NHS Foundation Trust
Newcastle University
Newcastle City Council
AHSN - North East and North Cumbria

Please provide details of the governance and leadership arrangements for the proposed AHSC including:

- Details of the organisational model including an organogram;
- Please describe the lines of accountability; how the partnership will demonstrate effective governance; and demonstrate meaningful patient and public involvement (PPI/E/P) in the delivery of the objectives of the proposed AHSC over the term of designation.

Our proposed AHSC, called **Newcastle Health Innovation Partners (NHIP)**, will deliver a step-change improvement in the health, wealth and wellbeing of a population of 3.2 million people in the North East of England and North Cumbria (NENC).

NHIP will comprise the following regional anchor organisations:

1. **Newcastle upon Tyne Hospitals NHS Foundation Trust (NUTH)**, one of the UK's largest Trusts, with an international reputation for pioneering healthcare (Chair, **Professor Sir John Burn***; Chief Executive Officer (CEO), **Dame Jackie Daniel***).
2. **Cumbria, Northumberland, Tyne and Wear NHS Foundation Trust (CNTW)** provides regional mental health services (CEO **John Lawlor OBE**).
3. **Newcastle University (NU)**, Vice-Chancellor **Professor Chris Day*** and, specifically, Faculty of Medical Sciences (FMS, Pro-Vice Chancellor, PVC, **Professor David Burn***).
4. **Newcastle City Council** (CEO, **Mrs Pat Ritchie**), has strong NHS and NU links via joint groups that address: (i) improving health and social care; (ii) driving improved wealth for all (ageing economy is a key focus).
5. **Academic Health Science Network-North East and North Cumbria (AHSN-NENC)**, works with NHS, Universities and life sciences industry to identify, evaluate, adopt and disseminate innovations for healthcare benefit (CEO **Dr Nicola Wesley***).

The health challenges faced by our region make an AHSC award essential to bring our population to levels of health enjoyed by the rest of the UK. NHIP will provide unique opportunities for academic and industrial advance in a partnership with an outstanding record of accomplishment in translation and implementation of innovation into practice, and a newly invigorated sense of common purpose amongst its partners, enabled by digital integration through a Global Digital Exemplar programme.

Our application represents a **new and bold venture, coming at a time when leadership of three partners has recently changed (asterisked above)**, catalysing exciting, major changes in organisational vision, strategy and structure.

The **NHIP Strategy Board** (organogram), chaired by AHSC Director (**D Burn**), will set direction, prioritise objectives and ensure delivery of AHSC outputs. Board membership will include NHS partner CEOs, Council Director of People Services, CEO of AHSN-NENC, NHIP Executive Group chairs (Research, Education, and People Planning), and NIHR Biomedical Research Centre (BRC) and Applied Research Collaboration (ARC) Directors.

NUTH and NU integration is assured with **Daniel (CEO NUTH)** a member of a restructured FMS Faculty Executive Board (reporting to University Executive Board) and **Burn (PVC FMS, NU)** assuming a Trust role for Research and Innovation.

NU, NUTH and CNTW will reconfigure an existing Joint Research Executive into a **Partnership Research and Innovation Delivery Executive** with wider representation, including **City Council** and strong enterprise development input. An external **Industry Advisory Panel** will inform this Executive. **Partnership Education** and **People Planning Executives** will oversee the strategic coordination and development of education and workforce planning, respectively.

Strong patient, public and carer involvement is coordinated through VOICE (Valuing Our Intellectual Capital and Experience), a sector-leading large citizen network supported by digital platforms for greater reach. Our Regional 'Creating Connections' PPE/I/P group coalesces NIHR infrastructure, health and social care with community and patient organisations. We will integrate group members within NHIP Executives.

NHIP Governance


The Newcastle upon Tyne Hospitals
NHS Foundation Trust

NUTH Trust Board


Cumbria, Northumberland, Tyne and Wear
NHS Foundation Trust

CNTW Trust Board


Newcastle University

Faculty Executive Board


Academic Health Science Network
North East and North Cumbria

AHSN-NENC Board


Newcastle City Council

Growth & Prosperity Group

Newcastle Health Innovation Partners (AHSC) Strategy Board

International Advisory Group

Partnership Research & Innovation Delivery Executive

Partnership Education & Training Executive

Partnership People Planning Executive

Industry Advisory Panel

PPE/I/P Group



embedded in each Executive

2. Excellence in research, patient care and health education

The Designation Committee will be provided with a range of published metrics which it will use to judge the partnership's excellence in research, health education and patient care.

If you believe that the metrics provided to the Designation Committee may not reflect the true status of your partnership's excellence in research, patient care and health education please provide additional information.

Research Excellence

- **NU was 4th in the UK for Research Intensity in Clinical Medicine (REF 2014).**
- Europe's **largest concentration of ageing-related interdisciplinary researchers** (>600 staff), lead **national centres of excellence in ageing research** (NIHR Biomedical Research Centre, Alzheimer's Society Dementia Care, NIHR School Public Health Research), co-lead a National Policy Research Unit for Older People and host National Innovation Centres in Ageing and Data.
- The **only partnership outside the "Golden Triangle" to have hosted an NIHR Biomedical Research Centre since 2007** and **top 10-ranked in MRC Translational Research report for "directed translational award funding" (2008-2018)**, with particular strengths in MRC Stratified Medicine Consortia.
- NUTH hosted **three of 24 European Reference Networks in Rare Disease** (liver disease, immune disorders, neuromuscular disease), the only NHS Trust to host more than one.
- NU host the **research lead for Public Health England's National Congenital Anomaly and Rare Diseases Registration Service.**
- CNTW host the **Regional NIHR Applied Research Collaboration.**

Education Excellence

- NU hold a **Gold Teaching Excellence Framework** award for consistent delivery of outstanding teaching and student outcomes.
- Our region ranks 1st in UK in 17 of 18 domains in the **GMC National Training Survey.**
- NU rank 1st in Russell group for Undergraduate **Dentistry** (NSS 2019), with 96% overall satisfaction in Postgraduate Programmes (PTES 2019).
- **Pharmacy** moved from Durham to Newcastle University in 2017. 2018/19 NSS results contributed to 4th place in Guardian League Table (Pharmacy and Pharmacology), with 92% overall course satisfaction.
- **Health professionals** studying our Postgraduate Clinical Research Programme report 100% overall satisfaction (PTES 2019).

NHIP is widely perceived to be UK-leading in clinical academic career development, evidenced by:

- Hosting the NIHR National Training Dean.
- The Newcastle model of cross-professional integration of training support through a Clinical Academic Office was adopted by the NIHR Academy.
- Developed the model, now used nationally, for Academic Clinical Fellows and Lecturers, creating the first UK Academic Foundation Programme.
- Hosting the developing NIHR Incubator in Clinical Education.
- A highly developed Non-Medical Allied Health Professional Research Development Programme; NUTH host two NIHR "70@70" research nurses.

Outstanding Patient Care

NUTH rated "Outstanding" by Care Quality Commission (CQC) in 2016 and 2019 (only NHS "Teaching Hospital" to receive this rating twice).

NUTH cultivates research excellence to drive improved care, evidenced by CQC report (2019):

- "Improvement methods and skills were available through the research and innovation hub and were available and used across the organisation. All staff we spoke with informed us they were empowered to

lead and deliver change. All innovation was celebrated.”

- “There was evidence in the departments of quality improvement and innovation to provide a better service to patients.”
- “Improvement initiatives were supported by experts in the field through the research and innovation hub, this ensured the quality of care was well understood.”

NUTH ranked 1st in the country for open NIHR portfolio research studies for seven successive years (2011-18).

CNTW rated “Outstanding” twice by CQC (2016 and 2018), ranked 3rd among Mental Health Trusts for patient recruitment to NIHR studies and 5th for volume of research studies (2018/19).

3. Track record of translating scientific advances into benefits for patients and the healthcare system

Please provide three examples from the past five years as evidence of the partnership’s track record of translating findings from research across a range of disciplines into benefits for patients and improved health outcomes and health care delivery.

Please also provide an outline of how the proposed AHSC would act as a system leader for innovation and good practice by supporting the development and early implementation of transformative technologies (e.g. genomics, informatics, artificial intelligence or cell and gene therapy) in the NHS.

Patient benefit resulting from our research:

1. Long-Term Conditions across the Lifecourse

Reversal of Type 2 Diabetes (T2DM): Approximately 2.5 million people have T2DM in the UK, and prevalence is rising with increasing obesity. Diabetes costs the NHS £10 billion per year (10% of budget), and the UK economy in excess of £23 billion. **Our research has shown that T2DM is not inevitably progressive and life-long, and has defined the aetiology.** In people who have had T2DM for up to 10 years, a very low calorie diet leading to major weight loss returns insulin secretion to normal in approximately 50%, which is then sustained during normal eating because of redistribution of harmful triglycerides away from pancreatic beta cells. A WHO Global Report (2016) and NHS Long-Term Plan (2019) cited this work. The NHS in England and Scotland are currently implementing this approach to manage **T2DM**.

We developed the first-in-class PARP inhibitor, Rucaparib (Rubraca), as a cross-Faculty/NHS multi-disciplinary programme, in collaboration with Cancer Research UK and Agouron Pharmaceuticals.

Ovarian cancer is the 5th most common cancer affecting women in the UK, with an annual incidence of ~5,500 in England and 5-year survival rate of only 46%. In the past 5 years, single agent Rucaparib has been developed for management of high grade serous ovarian cancers (HGSOC), including those with the germ-line BRCA mutations and a much wider patient HGSOC population with platinum sensitivity. **Rucaparib received FDA**

“Breakthrough” designation (first drug in class to receive this designation) in 2015 and accelerated approval from the FDA in 2016 for advanced BRCA-related ovarian cancer, based on data from NU-led clinical trials. The EC authorised Rubraca for maintenance treatment of relapsed ovarian cancer in 2019. Rubraca indications may extend to other cancers (e.g. prostate).

2. Stratified Medicine into Routine Practice in Rare Disease

Evaluating efficacy and implementing stratified medicine into practice is a challenge in rare disease. **Newcastle are pioneers in this area, exemplified by the UK-PBC programme in the rare autoimmune liver disease Primary Biliary Cholangitis (PBC).** With NIHR Rare Diseases and MRC Stratified Medicine funding, UK-PBC, which was created in and led from Newcastle, has recruited a national cohort of patients (over 8,000 of estimated 15,000 patients nationally) to identify disease strata and understand the mechanistic basis of disease endotypes.

This work has extended into clinical trials using methodologies developed by UK-PBC, supported by unique biological markers and clinical tools (e.g. the PBC-40, the first disease-specific PRO in liver disease) and the UK-PBC risk score (a dynamic predictive model) which have entered routine clinical use. **This approach has led to NICE and guideline-supported implementation of stratified therapy into practice.** Our approach has revolutionised treatment for patients and resulted in substantial industrial investment in research and manufacturing. It also provides a model suitable to transform care for all rare chronic diseases.

We will act as a system leader for innovation in:

1. Ground-Breaking Disease Insights and Enhancing Modern Diagnostics

We play a **leading role in the global Human Cell Atlas (HCA) initiative** through research incorporating cutting-edge single-cell genomics, proteomics and computation of complex data analysis (with NU School of Computing). These datasets are publically available through an interactive web-portal. The infrastructure established for the Development and Skin Cell Atlas in Newcastle has been deployed to study common developmental disorders (e.g. Trisomy 21) and inflammatory skin disorders (psoriasis and eczema) through collaboration with Wellcome Sanger Institute, Oxford University and industry partners. Our joint leadership of our MRC/EPSRC Molecular Pathology Node enables the application of such technologies to a range of well-curated disease cohorts, generating unique, pathogenesis-disruptive disease insights. The Node works with our NIHR *in vitro* Diagnostic Co-operative and industry, within a unique regional framework (**Diagnostics NE**) to develop and test novel diagnostics, paving the way for adoption by the NHS. We will leverage our expertise in these cutting-edge technologies and expand our research and infrastructure (including digital pathology), making NHIP a **leading research partner at a national level for large-scale, innovative molecular diagnostic and precision medicine studies.**

2. Advanced Therapeutics

a) We were one of the first centres worldwide to test tolerogenic cells in inflammatory arthritis, and limbal stem cells for severe corneal damage; and one of the first UK centres to deliver CAR-T cells for malignancy. We have expertise in monogenic immunodeficiencies, including administration of genetically-modified stem cell transplants. **We will lead in the discovery, manufacture and delivery of advanced therapies.** We will deliver genetically modified therapies to patients with a range of malignant, immuno-inflammatory and degenerative conditions. Via the **Northern Alliance Advanced Therapies Treatment Centre (NAATTC)**, we will invest in people and infrastructure to position NHIP as a UK leader in developing and delivering new cell therapies in partnership with life science companies. NAATTC is a consortium of 20 industry, NHS and academic organisations, led by NUTH and the Scottish National Blood Transfusion Service. One of only three national advanced therapies centres funded by Innovate UK and winner of Bionow 2019 Healthcare Project of the Year, **NAATTC will accelerate patient access to, and build systems for, the manufacture and delivery of innovative cell and gene therapies.** Building on the success of our stratified medicine programmes, and our links to life science companies, we will improve disease classification and integrate outcomes to deliver more personalised, innovative therapeutic approaches into clinical practice.

b) We are **global leaders in mitochondrial medicine**, with a renewed Wellcome Trust Centre, transforming scientific advances into treatments that restore mitochondrial health. We will expand **strong, strategic partnerships with public, private, and commercial stakeholders to lead and accelerate patient-centric drug discovery.** Mitochondrial dysfunction is implicated in the pathology of chronic metabolic diseases (including obesity, diabetes mellitus), ageing and many cancers. With industry, we will harness our expertise in the medical product life-cycle by developing high-throughput screening assays of chemical libraries to identify new small-mitochondria-targeting molecules to restore cellular mitochondrial dysfunction. We will devise innovative approaches to clinical trials, including novel adaptable trial designs; developing new wearable and immersive technologies and creating virtual controls that will deliver life-changing personalised therapies.

4. Strategic plan

In plain English present the specific vision and goals of the proposed AHSC

Further guidance on writing in plain English is available online at NIHR Make it clear

<http://www.invo.org.uk/makeitclear/>

Our vision is to improve the health of the population in the North East of England and North Cumbria. We need to do this because life expectancy in our region is two years lower than the rest of the country and premature death 20% higher. Poor health is commonplace, with men spending 20, and women 25 years of their life in poor health. We will deliver an improvement in healthcare through our ability to convert scientific discoveries into patient benefit, innovative capacity building and skills training in the healthcare workforce, and through our clinically outstanding NHS services. Strong industry interaction will underpin these healthcare improvements. We will lead the uptake of new products by the NHS by creating multi-partner test-beds focused upon real-world evaluation.

By improving our population's health, we will improve the regional economy. Because of poor health, there is a £4 per person-per-hour productivity gap between the North of England and the rest of the country. If this gap was closed by improving health, a recent Northern Health Science Alliance (NHSA) report suggests £13.2 billion could be added to the UK economy.

Our specific goals are:

1. **Scientific advancement:** we will discover new disease mechanisms, diagnostic tools and treatments in ageing, long-term and rare conditions where we have a track-record of excellence.
2. **Translation into healthcare:** we will "pull" new diagnostic and therapeutic advances from this discovery science into routine care, making a real difference to the NHS.
3. **Careers and skills training:** we will develop capacity and capability in the healthcare workforce through cutting-edge, research-led education, equipping the workforce of today for the health challenges of tomorrow.
4. **Economic impact:** we will contribute to economic growth by supporting industry to access the NHS whilst improving population health and thereby closing the productivity gap across the UK.

Please describe the partnership's approach to further aligning NHS organisation and university strategic objectives in order to harness and integrate world-class research, excellence in health education, and excellence in patient care over the 5 years of designation. Please describe how these strategic objectives will improve health and healthcare delivery.

This should include:

- A statement of the partnership's vision and purpose;
- Specific overall short (1-2 years), medium (2-3 years) and long term (4-5 years) objectives and deliverables for the AHSC;
- The proposed AHSC's strategy to contribute to the delivery of the goals of the Life Science Industrial Strategy;
- The proposed AHSC's strategy to support the delivery of the goals of the expanded Accelerated Access Collaborative including evidence of the partnership's capacity to carry out pragmatic (real world) testing in support of the aims of the expanded AAC;
- Evidence that the AHSC is nested within a local AHSN, emphasising the complimentary roles of AHSCs and AHSNs and provide evidence of appropriate co-working with other AHSNs and AHSCs nationally
- The partnership's strategy for maximising the impact of multi-disciplinary and multi-professional research and education across AHSC realising the full potential of talent from across the whole workforce including promotion of equality and diversity; and including details of how the multi-disciplinary and multi-professional approach will be used to deliver the aims and objectives of the proposed AHSC.

Introduction

Our vision is to be the most impactful AHSC in England over five years, through collective strengths in outstanding clinical services, translational research and educational excellence.

Our purpose is to improve the health, wealth and wellbeing of the North East of England and North Cumbria (NENC).

Five strategic enablers, representing **distinct and cohesive partnership strengths**, will act to convert excellence in research, education and clinical care into significant regional health, wealth and wellbeing benefits (Fig.1). **An AHSC award will generate significant added value, allowing NHIP to deploy these many assets to greatest effect.**

We will deliver our objectives in an environmentally responsible way. NU, NUTH (the first UK NHS Trust to do so) and Newcastle City Council each declared a climate emergency in 2019, aiming to become carbon neutral by 2040.

Fig.1 Strategic Enablers



Translational Research Excellence

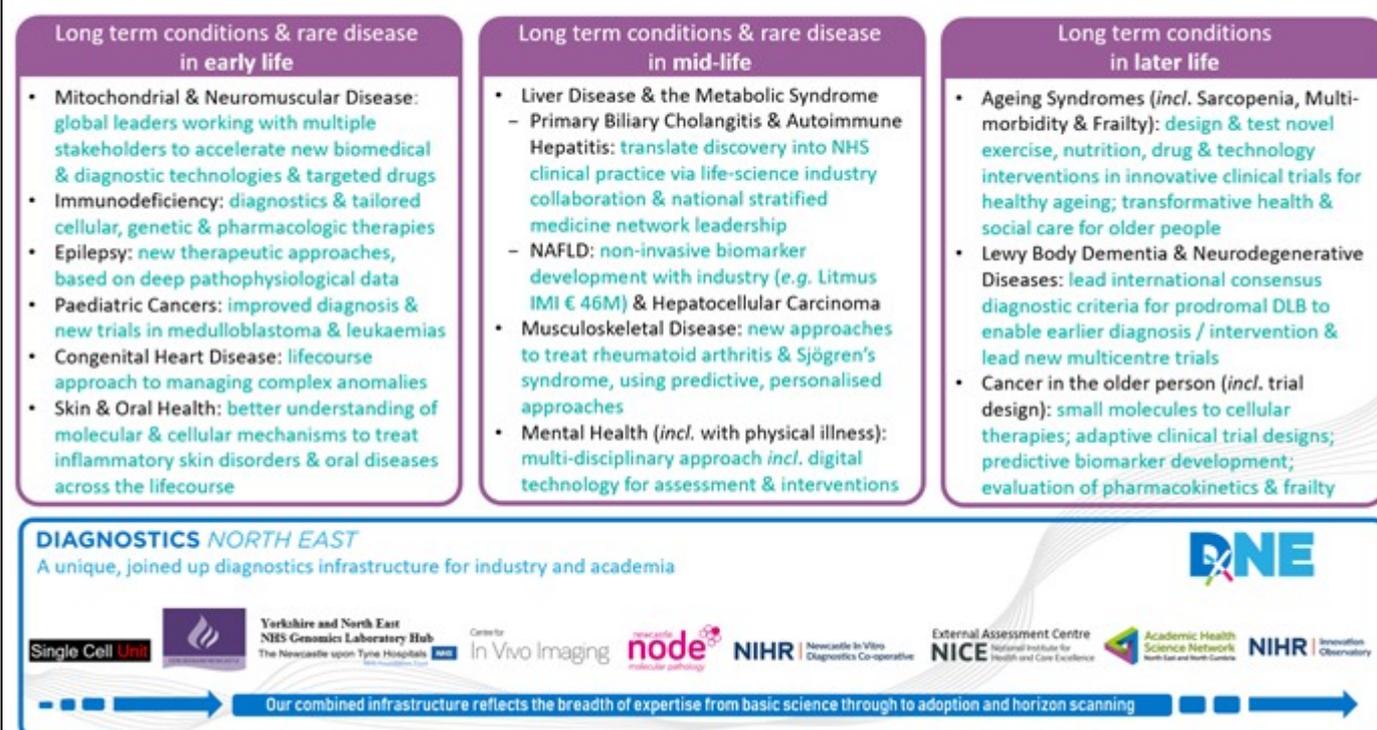
We will deliver meaningful health benefits, fuelled by carefully characterised patients and cohorts, interdisciplinary and multi-professional working, strong industry collaboration and innovative diagnostic and personalised, precision therapeutic approaches. This builds on our excellence in diagnostics and experimental medicine studies, where we leverage world-class academic insights and clinical services to provide an outstanding offer to the life science industry (e.g. leading national/international stratified medicine consortia and three IMI awards > €120M).

Our research strategy, informed by UKRI strategic priorities, NHS Long-Term and Interim People plans, and patient advocacy is to place our **NIHR Biomedical Research Centre (BRC) in Ageing and Long-Term Conditions at the core of the AHSC**. We lead the UK in translational ageing research, combining expertise in biology and epidemiology of ageing, experimental medicine and trials for older people. In addition to tackling “ageing syndromes” (**sarcopenia, frailty and multimorbidity**), we will **increase critical mass and overall impact through inclusion of additional NHIP strengths** and by taking a **lifecourse approach to ageing** (Fig.2).

We will provide **healthcare improvements and global leadership in rare disease areas of:** (i) Mitochondrial and neuromuscular disease; (ii) Paediatric immunodeficiency; (iii) Childhood cancers (medulloblastoma and leukaemias); (iv) Liver disease (primary biliary cholangitis and autoimmune hepatitis) (v) Primary Sjögren’s syndrome.

Diagnostics have shaped NHIP’s excellence in translational research and in improving patient care. This infrastructure, **Diagnostics North East (NE)**, is unrivalled in the UK (Fig.2). We have cellular and molecular platforms that enable high quality translation, including unique biobanks and evolving strengths in digital/computational pathology. Newcastle is the only UK centre to host a MRC/EPSC Pathology Node and NIHR *in vitro* Diagnostic Co-operative (MIC), one of four NICE External Assessment Centres, and the only NIHR Innovation Observatory.

Fig.2 Areas of Translational Research Focus Across the Lifecourse



Excellence in Education

We will deploy strengths in education to provide undergraduate (UG), postgraduate (PG) and life-long learning programmes that will equip our workforce to deliver future-facing health and social care.

NHIP will work with HEIs to **upskill our workforce in genomics, data analytics** (with the National Innovation Centre-Data) **and artificial intelligence**. PPE/I/P input will inform this curriculum development.

We will **expand our MBBS programmes to include a six-year academic-track course** and **revise UG curricula**, placing greater emphasis upon preventative health, common disease mechanisms, multimorbidity and new models of multi-professional care.

NU will work with Sunderland Medical School to develop capacity in academic General Practice and Psychiatry (specialties strongly represented in the Sunderland MBBS), sharing regionally-deployed resources and expertise.

The Clinical Research Network (CRN) and Health Education England have co-developed a **regional Non-Medical Allied Health Professional (NMAHP) clinical research strategy** to support career development and establish joint HEI/NHS NMAHP clinical academic posts. NHIP will work collaboratively to deliver this strategy.

We will co-create **training in biomedical engineering and computer science** with NU Faculty of Science, Agriculture and Engineering.

A **NU Centre of Research Excellence (NUCoRE) in Regulatory Science** will develop a cross-disciplinary Masters Programme (MSc).

Promoting, innovating and delivering meaningful equality and diversity is embedded within our organisational fabric, extending to all staff and student groups. Our EDI commitment includes all protected characteristic groups. FMS holds an Athena SWAN Silver award (2018). NUTH's EDI approach is a key strategic driver, delivered through the Flourish programme. NU is a Stonewall Global Equalities Champion (2016), member of the Business Disability Forum (2017), and has joined the Race Equality Charter. EDI leadership rests with Faculty PVC and CEOs.

Strategic Enablers

These collective partnership strengths are summarised in Fig.1 and below.

1. Consolidated and expanded partnerships, including:

- **North of Tyne Combined Authority (NTCA) to prioritise health and social care.**
- **Regional HEIs and Trusts** to develop training, and adoption and diffusion of new services and products.
- **Northern Health Science Alliance (NHSa)** to increase international investment in the North of England.

2. A highly developed multi-disciplinary and multi-professional approach

- **Inter-professional approaches** to UG and PG education, including pharmacy, dentistry and psychology.
- A new FMS structure (Fig.3) that promotes **multi-disciplinary working**; research themes span institutes with **multi-professional leadership** that includes NMAHPs.
- **Newcastle University Centres of Research Excellence (NUCoREs)** drive cross-Faculty, multi-disciplinary working.

3. Multi-partner test-beds for research, training and commercial innovation

- **Integrating research and service excellence with capital investment**
 - **Translational Ageing Research:** A centre to pull discovery science across the lifecourse into new “senolytic” treatments.
 - **Congenital Heart Disease:** Maximising value from a £40M NHS-E capital investment for paediatric heart surgery (NUTH undertook the UK’s first successful paediatric heart transplant).
 - **Oncology:** A NUTH-based Cancer Trials Centre, increasing research-led capacity and providing regional access to novel therapies.
 - **Inflammation Medicine:** A centre based around a multi-disciplinary and multi-professional approach to diagnostics, precision medicine and multimorbidity.
 - **Intermediate Physical Care Facilities:** Co-located with mental health services to drive research in diagnosis and treatment of mental illness associated with physical disease.
- **Centre for Training and Development in Robotic and Digital Surgery.** NUTH hosts the Royal College of Surgeons’ Robotic and Digital Surgery lead and is the largest UK centre for Robotic-Assisted Surgery training, delivering 300 training courses annually. We have strong relationships with robotic and digital platform companies and a powerful base in computational science and data (Turing Institute).
- **"Pathfinder Site" to support the Accelerated Access Collaborative (described below)**
- **Campus for Ageing and Vitality (CAV) to support economic growth (section 6)**

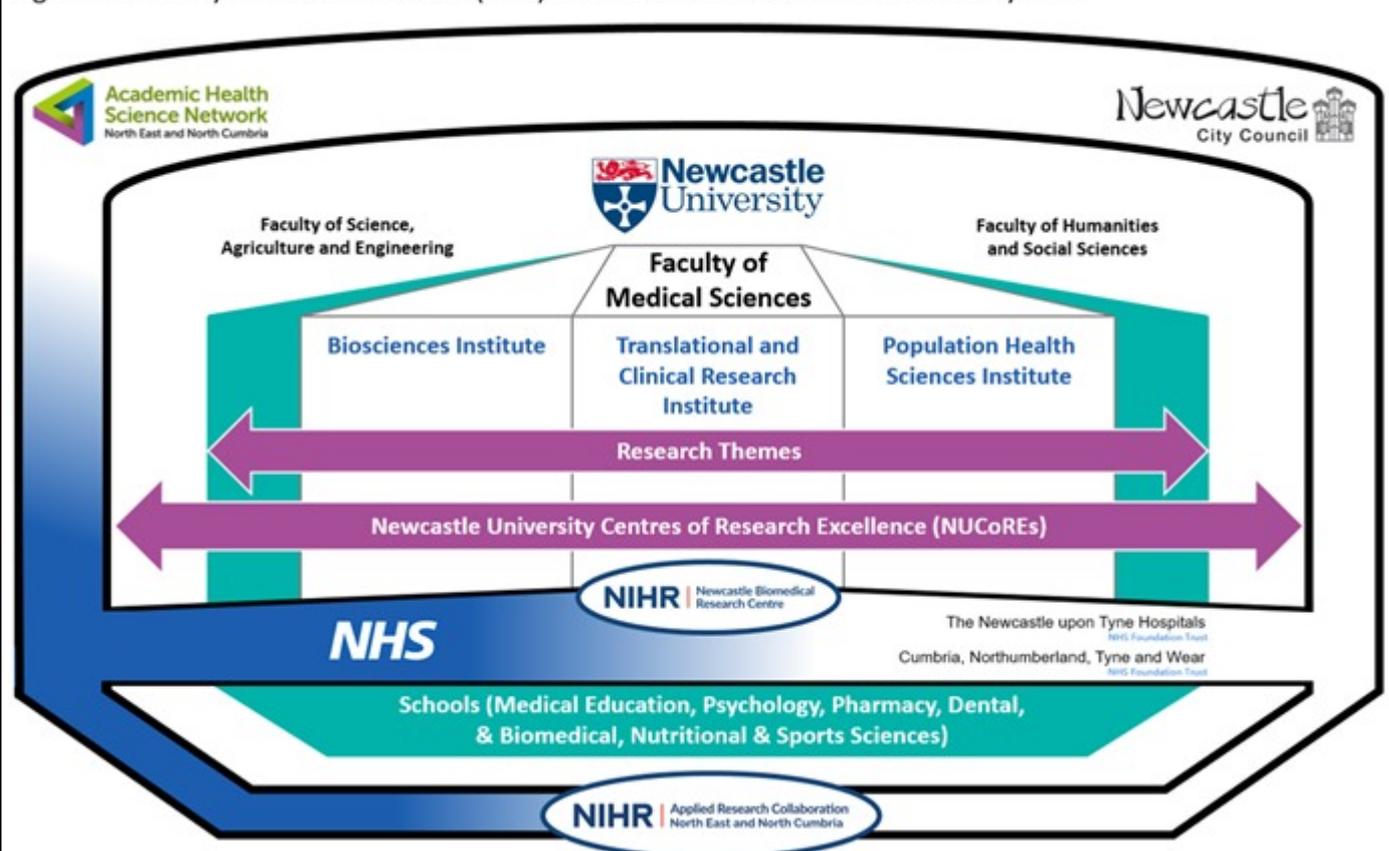
4. A place-based approach for rural and city populations

- **AHSN-NENC** and the **CNTW-hosted NIHR Applied Research Collaboration (ARC)-NENC** will, together, deliver evaluation, diffusion and implementation at scale in city and rural communities through extensive regional stakeholder inclusion.
- **ARC-NENC** includes in its seven themes: (i) Multimorbidity, ageing and frailty; (ii) Integrating physical, mental health and social care; (iii) Assistive technologies and data linkage. It leads nationally on tackling health inequalities.

5. Co-creation with policy-makers, including:

- **Local Authorities** e.g. via Healthier Lives NUCoRE to implement nationally-leading work on nutrition in schools and early-life obesity.
- **Regional NHS Integrated Care System**, creating research-informed “Better Care Loops” (section 7).
- Regulatory Authorities, via the Regulatory Science NUCoRE, advising on NHS approval processes for drugs and med-tech.
- **NTCA**, to drive inward investment into the region for care.

Fig.3 New Faculty of Medical Sciences (FMS) Structure within the wider AHSC Ecosystem

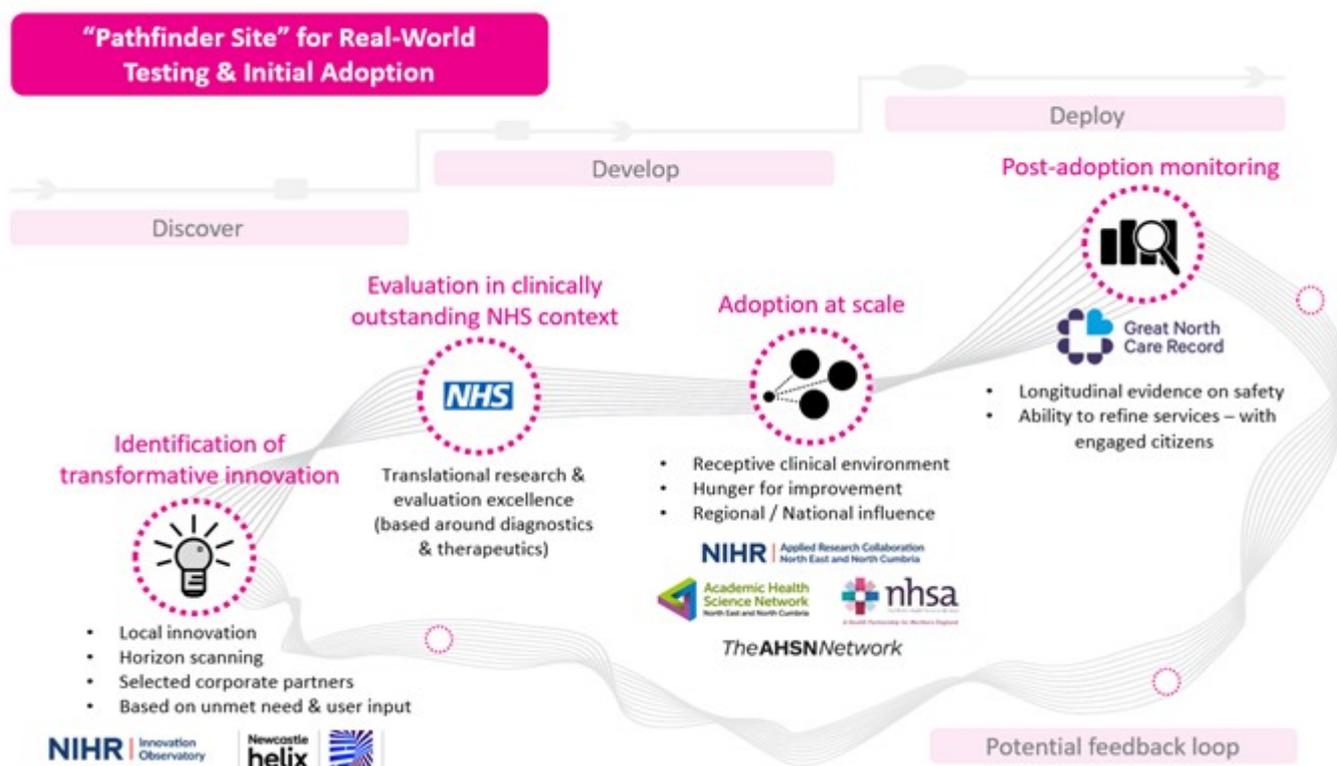


Supporting the Accelerated Access Collaborative (AAC) and Life Sciences Industrial Strategy (LSIS)

NHIP will support the AAC through:

1. **A Clear Single "Front Door"**: adopt the OMNIA platform (section 6) for bespoke support to innovators.
2. **Demand Signalling**: adopt the AHSN-NENC Innovation Exchange infrastructure.
3. **Single Horizon Scanning Approach**: using OMNIA (NHS-E horizon-scanning platform) and NIHR Innovation Observatory. VOICE will provide PPE/I/P input (section 2).
4. **Create a "Pathfinder Site"** (Fig.4): for real-world testing and early adoption in the NHS for physical and mental illness, incorporating: key opinion-leading clinicians within CQC-rated outstanding environments; expert academic provision in methodologies; regulatory science and **Diagnostics NE** (e.g. NIHR-MIC). This is founded upon a track-record of high uptake of healthcare innovation by NUTH, that is recognised by NHS-E.
5. **Adoption and Spread**: AHSN-NENC will disseminate across the AHSN Network. NHTA has a remit to support the LSIS, and can upscale to a 14 million population.

Fig.4 Pathfinder Site



We will deliver our **contribution to the LSIS** via:

1. A **"Pathfinder Site"**, described above.
2. **Diagnostics NE**, to innovate, develop and evaluate new diagnostics.
3. **Contributing to the Ageing Grand Challenge**, within a wider regional ecosystem (section 6).
4. **Advanced and precision therapies**, specifically, production and delivery of genetically-modified therapies for malignant, immuno-inflammatory and degenerative conditions (section 4).
5. **Integration with the Research England-funded NHA cluster** and commitment to working with any other AHSC in areas of complementary strength.

Specific overall objectives and deliverables for NHIP AHSC:

- **Short-term (1-2 years)**
 - Establish governance structure, committees and administrative office.
 - Operationalise "Pathfinder Site" structure.
 - Masters in Regulatory Science.
 - Establish Robotics Training Centre.
 - Senior appointments (congenital heart disease, hepatocellular cancer and oncology trials from a £2.2M donation).
 - Six early career appointments spanning NHS-academia and Industry via NU Academic Track scheme (£30M investment over five years).
 - Establish NUCoREs in Ageing, Rare Diseases and Biomedical Engineering.
- **Medium-term (2-3 years)**
 - Initiate capital projects (paediatric cardiothoracic surgery, "inflammation medicine", oncology).
 - UG curricula include greater technology-based focus and leadership development.

- Introduce 6-year academic track MBBS.
- Life-long learning modules in technology-related healthcare for a broad workforce.
- **Long-term (4-5 years)**
 - First intake for UG biomedical engineering.
 - Building for “Spectrum of Independence” test-bed on CAV and for Translational Ageing Centre (section 6).
 - Five new products delivered via NHIP within NHS/Social care establishments.
 - 50 new businesses engaged in long-term co-development, evaluation and market access.

5. Contribution to Economic Growth

Please provide details of the proposed AHSC’s strategy and ambition for contributing to economic growth through partnerships with commercial life science organisations including evidence that the proposed AHSC has clear routes to commercialisation of innovative technologies, and clear mechanisms to measure this contribution.

Contributing to the economic growth of NENC and the UK economy is a key goal of NHIP. We will play our full part in achieving the Government’s target of raising total research and development investment across the UK to 2.4% of GDP by 2027. Industrial research and development in the North East of England is low compared with the rest of the UK, which underscores the importance of NHIP engaging with industry nationally and internationally. Our focus will be primarily (but not exclusively) upon driving inward investment and growth via the Ageing Grand Challenge.

Our economic growth strategy is based upon:

1. Maximising opportunities with the Life Sciences Industry based on our Phase 2 trial strengths in translational research and unique diagnostics infrastructure (e.g. with ABHI, representing UK HealthTech industries, first UK Pfizer INSPIRE site).
2. Creating spin-out companies driven by innovative discovery science and NHS partnerships.
3. Utilising the extant, successful infrastructure and reputation of AHSN-NENC, the lead AHSN for economic growth, which delivers this activity on behalf of NHS-E and Office for Life Sciences.
4. An innovation campus, partnered with industry, that acts as a “living laboratory”.
5. Utilising the power of National Innovation Centres in Ageing (NIC-A) and Data (NIC-D), based in Newcastle, to maximise national and international connectivity.
6. Working in partnership with stakeholders to deliver the Local Industrial Strategy, which includes Healthy Ageing as a prominent strand.
7. Developing our workforce to strengthen life science partnerships.
8. Expanding our international reach to develop new commercial partnerships and attract inward investment.

We will deliver our strategy via:

1. **People**
 - a. Academic-to-industry bridging through exchanges and other longer-term initiatives such as the NU Academic Track scheme, ERDF Intensive Industrial Innovations Programme, Knowledge Transfer Partnerships, ARROW (a major EU-funded programme to engage regional SMEs) and AHSN-NENC (with a six-year track-record).
 - b. Sector-leading PPE/I/P input via VOICE will identify and help to overcome blocks in the development pathway, provide real-time consumer feedback and accelerate product commercialisation and adoption.
 - c. The NU Enterprise Academy will upskill via sharing best practice, industrial seminars and workshops, and promoting academic/industrial exchanges.
2. **Infrastructure**
 - a. **NIC-A and NIC-D**, co-located in Newcastle, will drive effective collaborations between industry, academia and the public. NIC-A works with stakeholders to bring innovative products and services

to market that improve life for an ageing society. NIC-D delivers key technical and practical skills into organisations to maximise the potential of their data for innovation.

- b. Advanced horizon-scanning tools via the **NIHR Innovation Observatory** to inform future medicines, devices and diagnostics for the Life Sciences Industry.
- c. **Develop our 30-acre Campus for Ageing and Vitality site (CAV)** for innovation and evaluation. A translational ageing research hub will develop new treatments and technologies, feeding into a **“Spectrum of Independence” model**. This will comprise: (i) Intergenerational and independent living for older people; (ii) Intermediate care and; (iii) A care home and dementia care village. NIC-A will generate a pipeline of external industry partners to utilise CAV as a collaborative research site and “living laboratory,” integrated with strong academic and consumer partnerships.
- d. Our **unique Diagnostics NE infrastructure** will engage with life science organisations, managed via the "Pathfinder Site".

3. Networks and Partnerships

- a. Work with the North East Local Enterprise Partnership (NELEP) to coordinate commercial activities locally. AHSN-NENC co-funds a Programme Manager within NELEP to develop this sector.
- b. A UKRI Strength in Places application (outcome April 2020) called NE-CHAIN (**North East Cluster for Healthy Ageing and Independent Living**) was led by NU, working with AHSN-NENC, Newcastle City Council, NUTH, CNTW, and Northumbria University in a wider partnership that includes industry and citizens. NE-CHAIN, to be coordinated by NIC-A, provides the blueprint for a world-class eco-system, embracing the multiple stakeholders required to find innovative solutions for our ageing society.
- c. Build upon our networking and collaborative partnerships with five other MRC/EPSC Molecular Pathology Nodes and Digital Pathology Consortia.
- d. Utilise NU Malaysian and Singapore campuses to develop relationships with companies in South-East Asia and drive life-science investment via our international networks in ageing.
- e. Work with the NHSA to increase international investment in the North of England.

Routes to Commercialisation of Innovative Technologies

We aim to be a globally-leading centre for industrial co-development and adoption within an outstanding clinical environment. Research excellence, evaluation and adoption into service underpin this. We believe this represents a unique offer at scale.

AHSN-NENC and NUTH/NU Joint Business Office have experience in development and monetisation of therapeutic and diagnostic products (e.g. Rucaparib monetised for \$30M). Additionally, NUTH are developing a Commercial Enterprise Unit, to deliver returns for reinvestment back into improving patient outcomes.

NHIP will adopt the OMNIA system, developed by AHSN-NENC, to provide a:

- Portal for innovators to register new ideas for triage and prioritisation.
- Information repository, providing signposting advice relating to regulation, procurement and funding.
- Project management tool, incorporating Customer Relationship Management functionality to record customer and stakeholder interactions.

OMNIA will ensure secure project pipeline access to all NHIP partners. **NHS-E have commissioned AHSN-NENC to develop OMNIA as a “Single Front Door to the Innovation Ecosystem” for the AAC.**

We have well-established routes to commercialisation for locally-generated innovation. An AHSN-NENC-developed **Innovation Pathway** (Fig.5), utilised across the AHSN Network, provides bespoke services to develop translational research outputs through to realisation of commercial success and patient benefit. The award-winning **Northern Accelerator Collaboration** also supports the entire commercialisation journey, through to formation of spin-out companies.

AHSN-NENC has developed a database (for the whole AHSN Network) which has tracked engagement with companies since April 2018. It holds due diligence data for over 5,500 innovations and is a repository for economic

growth metrics.

Fig.5 AHSN-NENC Innovation Pathway



Mechanisms to Measure Our Contribution

We will capture NHIP success in commercialisation via:

- Intellectual property filings and registrations
- Products licensed and brought to market
- Spin-out companies created
- UK jobs created and safeguarded
- Investment secured by companies
- Inward investment leveraged
- Foreign Direct Investment
- Exports of new products overseas

These metrics are captured by the AHSN Network database (concept and delivery of which originated here) and HE-BCIS returns.

6. Other Information

Please provide evidence that the partnership has a strong digital infrastructure platform, with demonstrated intra-operability between partners, to underpin the delivery of the proposed AHSC objectives.

NHIP has a well-established record of innovation in digital health. **NUTH and CNTW were awarded Global Digital Exemplar (GDE) status** because of their high digital maturity and track-record of leading digitally-enabled,

health and care initiatives. **CNTW** is a partner in the **UK-CRIS informatics platform**, providing research linkage to Biobank and nascent linkage to primary care.

NUTH is the largest acute GDE site and an **innovator in digitally enabled services**. It is facilitating **rapid recruitment to clinical trials** using an AI-enabled search engine.

NUTH is sector-leading in robotic surgery development and is exploring augmented-reality in delivery of medical education. The GMC identified the **NU 'Medical Learning Environment (MLE)'** as an area of exemplary practice in 2018. The MLE supports medical students in the UK and our overseas campus in Malaysia with learning through the curriculum, including interactive patient cases and condition-specific videos, as well as personalised student feedback.

Newcastle was "**UK Smart City of the Year 2019**". The City Council's **Digital Newcastle Programme** has been key in connecting public, private, academic and voluntary sector organisations across the city to deliver collaborative projects.

NUTH is working with the City Council to establish a **data-driven Command Centre** to improve the flow of patients through the Health and Social Care system. This expertise was instrumental in creating a **coherent Digital Health Economy blueprint**, supported by joint partnership funding. This work established **the Great North Care Record**, a region-wide, interlinked electronic health and care record platform, capable of transforming clinical care and supporting research. 100% of primary care data are now supported, with continued expansion including community, secondary and social care and the provision of a research and population health data repository. This, combined with a patient-facing digital infrastructure capable of supporting real-time patient feedback and easy adaptation for specific trial requirements, will enable pragmatic trial design to deliver large patient cohorts for observation studies, real-world evaluation of products, and the evaluation of existing and new patient pathways.

The population-level "big data" generated through this approach and our ability to analyse this effectively and innovatively will generate a **Learning Healthcare System** within which "**Better Care Loops**" may be interrogated, including the effect of interventions (drugs, devices *etc.*). Such population-level "product" feedback will augment our offer to the Life Sciences Industry as part of the "**Pathfinder Site**" (section 5, Fig.4). Through the NHTA we are expanding our population reach with other partner organisations in the North.

7. Administrative contact details

Administrative contact name	Fiona Airey
Administrative contact job title	Grants & Contracts Manager, Newcastle University
Administrative contact telephone number	0191 2824515
Administrative contact email address	fiona.airey@ncl.ac.uk

8. Acknowledgement, review and submit

AHSC Director - Agreement to terms and conditions

In ticking this, you as AHSC Director confirm that the information given on this form is correct and that you will be actively engaged in this AHSC and responsible for its overall management. In addition, you will accept responsibility for ensuring that the Host Institution and interested parties are kept informed.

Ticking this box constitutes an electronic signature of the AHSC Director with regard to this application

Confirmed