

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

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Institution Director	Professor David Wynick
Director Institution	University of Bristol
AHSC Name	Bristol Health Partners Academic Health Sciences Centre
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### 1. Details of the Partnership

#### Institutions

Avon and Wiltshire Mental Health Partnership NHS Trust
Bristol City Council
NHS Blood and Transplant
NHS Bristol, North Somerset and South Gloucestershire CCG
North Bristol NHS Trust
North Somerset District Council
Sirona Care & Health
South Gloucestershire Council
University Hospitals Bristol NHS Foundation Trust
University of Bristol
University of the West of England, Bristol

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.

Bristol Health Partners AHSC (see organogram, and acronyms therein) has operated under a legally binding collaboration agreement since 2012. NIHR-NHSE/I AHSC designation would strengthen and extend the reach and scope of the Partnership. The AHSC consists of the three acute and mental health NHS Trusts (UH Bristol, NBT and AWP), Bristol, North Somerset and South Gloucestershire (BNSSG) CCG, the two Bristol Universities (UoB and UWE) and the three Local Councils. Recently Sirona, the newly commissioned provider of adult community health services across BNSSG, and the Bristol-based NHS Blood and Transplant (NHSBT) have joined the AHSC. The AHSC is nested within and works very closely with the West of England AHSN.

The AHSC uses our internationally recognised strengths in population and applied health research to generate significant improvements in value-based healthcare (VBH) for our 1.1 million local population. We deliver six

overarching Programmes, underpinned by six Thematic areas (organogram), leading to world-class health outcomes and wealth gains. To ensure seamless integration of the work of the MRC IEU, our NIHR Infrastructure, AHSN and STP, the AHSC has pioneered the use of Health Integration Teams (HITs) to focus on and implement VBH, and to deliver the aims of the NHS Long Term Plan. HITs (see below and section 5) address system-wide complex problems by developing NHS-relevant research programs and driving service developments that improve healthcare delivery, reduce health deprivation and inequalities, and increase population health and well-being.

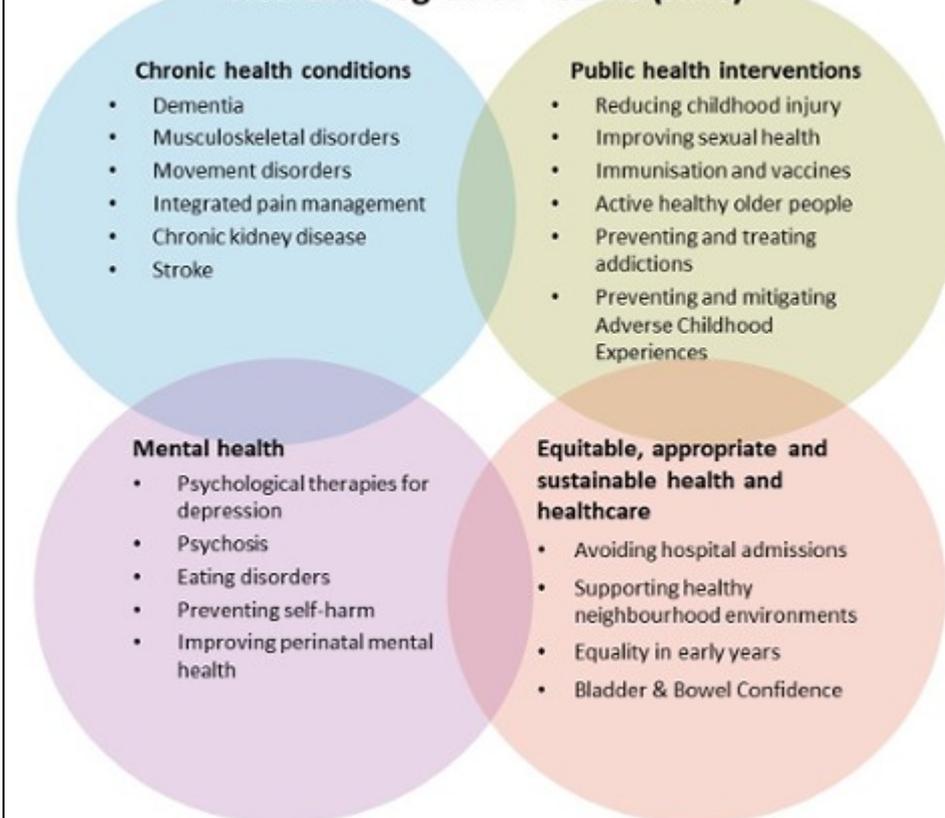
The AHSC Board meets quarterly and consists of senior executive representatives of all partner organisations and an independent Chair. The AHSC is led by the Director, chairing and working via the monthly Joint Executive Group (which provides strategic and operational planning) and reporting to the Board. Programme management is led by the Chief Operating Officer (COO) who is responsible for the core team of 7 jointly funded by the partner organisations, reports to the Director and is accountable to the Board. The monthly Programme Delivery Group (organogram), chaired by the COO, delivers the tripartite mission of the AHSC by integrating our excellence in healthcare provision, research and innovation, education and training. The Board reviews the outcomes, effectiveness and governance of the partnership annually.

**Meaningful Patient and Public Involvement and Engagement (PPI/E):** People in Health West of England (PHWE) is a nationally recognised collaborative network that brings together the AHSC, the AHSN, Bristol BRC, ARCWest, HPRU, CRN, Research Design Service and local Healthwatch, to promote and deliver high quality PPI/E. All members contribute, financially and/or through provision of staff. The PHWE Steering Group includes senior representatives of all member organisations, guides its work and agrees areas of collaboration. The AHSC governance structures include PHWE patient representatives.

PHWE's mission is to advocate for strong PPI/E by:

- Supporting members of the public to become involved and engaged in health research and innovation;
- Training and developing staff undertaking PPI/E;
- Co-ordinating access to patients and public to facilitate the AHSC Programmes;
- Developing a consistent policy and coordinated approach to PPI/E across partner organisations.

### Health Integration Teams (HITs)



# AHSC Board

Independent Chair

Chief Executives & Medical Directors of: North Bristol Trust (NBT), University Hospitals Bristol Foundation Trust (UH Bristol), Avon and Wiltshire Mental Health Partnership Trust (AWP), BNSSG (Bristol, North Somerset and South Gloucestershire) Clinical Commissioning Group (CCG), Sirona Care & Health, NHS Blood & Transplant (NHSBT)

BNSSG Local Authorities (represented by the Executive Director Adults, Children, Education and Public Health, Bristol City Council), University of Bristol (UoB, PVC-Health & Dean of Faculty of Health Sciences), University of the West of England (UWE, VC & Executive Dean of Faculty of Health and Applied Sciences), West of England AHSN (Chief Executive)

## Remit:

- Governance
- Oversight
- Strategy and budgetary approval
- Delivery assurance
- Integration

# Joint Executive Group

AHSC Director and COO, Directors of: Research, Clinical Strategy, Public Health, Social Care, Education, MRC Integrated Epidemiology Unit (IEU) and NIHR Infrastructure (Biomedical Research Centre [BRC], three Research Schools, Health Protection Research Unit [HPRU], Applied Research Collaborative [ARC], Clinical Research Network [CRN] and Bristol Trials Centre)

Senior representatives of AHSN, STP, PHWE and two Public representatives

## Remit:

- Strategy and operational planning
- Monitoring performance and delivery of aims and objectives
- Coordinating and facilitating the Programmes

# Programme Delivery Group

AHSC COO, Programme Leads, Theme Leads and COOs of: IEU, all NIHR Infrastructure, AHSN and STP

## Programmes:

- Public health and prevention
- Mental health and neuroscience
- Cardiovascular science
- Surgical innovation
- Perinatal, reproductive and children's health
- Integrated, optimal and equitable care

## Cross-cutting Themes\*:

- Translational population science (IEU, BRC)
- Clinical informatics and applied data science (BRC, ARC, CCG)
- Behavioural and qualitative research (BRC, ARC)
- Clinical Trials and Health economics (BRC, ARC, Bristol Trials Centre, CRN)
- Research implementation and evaluation (HITs, ARC, AHSN, CCG, STP)
- Capacity building, workforce development and PPI/E (BRC, ARC, CRN, AHSN, STP, PHWE)

## Remit:

- Integration and delivery of research and innovation; education and training; wealth creation; implementation and care
- Adoption and use of informatics
- Capacity building and workforce development
- Patient and public involvement and engagement

\*Enabling organisations in brackets

## 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.

### AHSC-wide strengths

- Compared with the six currently-designated AHSCs, BHP AHSC had the fourth highest aggregated Research Capability Funding (RCF, a measure of total NIHR grant income) in 2018/19, greater than Cambridge, Imperial or Manchester, consistent with our current total awarded NIHR grants of >£135M;
- UoB is the only English institution to be a member of all three NIHR Research Schools (Primary Care, Public Health and Social Care) and is one of the top 8 MRC-funded UK universities;
- In REF 2014, 50% of UoB Public Health, Health Services and Primary Care research rated 4\* and 86% as 3 or 4\*. 100% of research impact and the research environment rated 4\*;
- 15 NIHR Senior Investigators, 15 Wellcome Trust Investigators, 21 FMedSci.

### Primary care

- 97% of BNSSG GP practices rated Outstanding or Good by CQC;
- BNSSG has for the last 6 years the highest RCF allocation of any English CCG;
- Impact of nationally adopted research:
  - The IRIS trial outcomes drove national commissioning of a primary care domestic violence training and support programme in 33 areas, via a social enterprise, significantly reducing exposure to violence and leading to improved mental health and quality of life;
  - ESCAPE (UWE-led self-management osteoarthritis programme) was adopted by AHSNs (2017) and runs in 230 UK locations. Outcomes show significant improvement in pain, function and mental health with savings of £1500/person.

### Public Health

- Shanghai GRAS Ranking for UoB Public Health (2019): 2nd in the UK, 3rd in Europe and 8th globally;
- Impact of nationally adopted research:
  - Our research was critical to the DHSC decision to introduce meningococcal B vaccine for all babies. In the first year of the programme MenB cases halved;
  - The secondary school peer-led ASSIST smoking prevention programme is cost effective and has been implemented in 700 UK schools, resulting in ~2,200 young people not starting to smoke.

### Social Care

- Impact of nationally adopted research:
  - Our work developing better social inclusion practices for marginalised older adults in housing with care was cited as good practice by the CQC and led to development of new resources from Age UK, targeted at reducing loneliness in older men;
  - A UoB study of social care support for parents with learning disabilities (PwLD) was: (a) cited as best practice by DfES/DHSC guidance on working with PwLD, (b) highlighted by the Joint Committee on Human Rights and the President of the Family Division (Family Court), and (c) led to the formation of the UK network which supports PwLD.

### Secondary care

- UHBristol is one of only 3 acute trusts in England to achieve successive CQC Outstanding rating (2017 and 2019). NBT is rated as Good with Outstanding for care (2019);
- UHBristol scored the highest of all acute trusts for overall hospital experience in the national inpatient survey (2018);
- National awards include:
  - Self-harm HIT won team award at the BMJ Patient Information Award 2019 and SW Health Education England Star Awards 2018;

- ED safety checklist won HSJ 'Best Patient Safety Initiative in A&E' award 2017.

### 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.

#### Impact track record

1. Work using the National Joint Registry, the world's largest arthroplasty database, has substantially improved patient care internationally (Hunt LP, *Lancet*. 2014 and 2013). Our findings include: (a) withdrawal of poorly performing implants, such as metal-on-metal hip replacements (Smith AJ, *Lancet*. 2012); (b) implants with worse than expected performance were identified and reported to the MHRA (Lenguerrand E, *Lancet Infect Dis*. 2019 and 2018; Deere KC, *BMJ Open*. 2019); (c) identification of poor performance led to cessation or modification of bad practice; and (d) cemented hip replacements in over 70s have better outcomes with lower replacement rates, resulting in >£500k/year savings across BNSSG (Fawsitt C, *Value Health*. 2019). Arthroplasty revision rates in England and Wales have halved, and the UK has the world's lowest nationally-reported failure rates.

2. We have shown: (a) single embryo transfer in women <40 years maximises livebirth and minimises adverse outcomes whereas in older women transfer of two embryos is best (Lawlor DA, *Lancet* 2012); (b) couples conceiving using IVF can achieve livebirth rates similar to those conceiving without IVF but take twice as long to do so (Smith ADAC, *JAMA* 2015); and (c) widespread application of segmentation and freezing of embryos results in lower cumulative livebirth rates and should be restricted to women with a clinical indication (Smith ADAC, *BMC Medicine* 2019). We developed and widely disseminated a tool that accurately predicts livebirth outcome with IVF (Smith ADAC, *PLoS One* 2015). Our research informed current NICE fertility guidelines, contributing to an increase in elective single embryo transfer and reduction in multiple births.

3. The Prostate testing for cancer and Treatment trial ( ProtecT; Hamdy FC, *NEJM* 2016), provided evidence of the comparative effectiveness of radical surgery, radiotherapy and active monitoring for men with localised prostate cancer. We conducted the largest randomized trial on the 10-year effectiveness of PSA-based screening (Martin RM, *JAMA* 2018). These results were: (a) included in the PHE review of UK policy for prostate cancer screening, (b) used in Sweden which decided not to introduce PSA-based screening, (c) part of the US Taskforce recommendation (2018) to not promote population-screening for prostate cancer. Not introducing population-based PSA screening in the UK will substantially reduce harm and should save £1 billion/year in NHS costs.

#### Transformative technologies

The AHSC includes the South West (SW) Genomic Laboratory Hub (GLH, hosted by NBT), one of seven responsible for driving **innovative genomic services into clinical care**. The Bristol Genetics Laboratory (BGL) is the lead partner (alongside Exeter): it employs >120 staff enabling analysis of >35,000 diagnostic samples/year, and delivery of novel service developments. BGL provides accredited training programmes for 10 Clinical Scientists and Bioinformaticians/year. The SW GLH provides cancer and rare disease genetic services for a 5M population and specialist testing for inherited renal, cardiac and endocrine disorders nationally.

Recent examples of BGL-academic partnerships resulting in new genomic services for patient benefit include:

- Research with the Bristol Heart Institute led to development of Next Generation Sequencing analysis for inherited cardiac conditions;
- Gene discovery and functional analysis of renal patients led to the implementation of a new diagnostic gene panel;
- Specialised testing of minimal residual disease in childhood acute lymphoblastic leukaemia (ALL) is now a routine service determining patient treatment.

The AHSC is a leading centre for **stem cell and gene therapy**. The combined adult and paediatric Bone Marrow Transplant (BMT) programme serves a population of 6.5M, undertakes 55 adult and 30 paediatric allografts annually and was the first UK centre to achieve a 4<sup>th</sup> quality accreditation (JACIE, 2018). In 2018, the adult BMT Unit was selected as one of 7 first-wave NHSE commissioned CAR-T cell centres (11 patients treated to date; planned expansion to 40/year from 2021). Over 40% of BMT patients are enrolled in clinical trials (double UK mean). We deliver phase I/II studies including genetically modified T cells, mesenchymal stem cells, viral-specific cellular therapy and tumour infiltrating lymphocytes therapy. We have recruited to 20 stem-cell and gene-therapy trials since 2014.

Our work is underpinned by the Bristol-based NHSBT, which hosts the British Bone Marrow Registry and UK cord blood bank, providing cellular material to support research in regenerative medicine and translate basic research into clinical products. The 4 room GMP Advanced Therapy Unit has just received £10M to double its capacity, providing proteins and viral vectors for the expanding *Advanced Therapeutic Medicinal Product* UK market. The NIHR Blood and Transplant Research Unit (funding £3M), manufactures red blood cells from stem cells and uses gene editing to create blood for patients with rare blood groups or multiple antibodies. NHSBT trains >35 clinical scientists/year in transfusion and transplantation (funded by HEE), complemented by an MSc in Transfusion and Transplantation.

The AHSC provides leadership in **informatics and artificial intelligence (AI)** by promoting strong engagement between computer scientists and the local NHS and applying data science expertise and resources to healthcare challenges and securing public trust. Over the next 5 years this includes: (a) 60 PhD students in the Centre for Doctoral Training (CDT) in Digital Health and Care, (b) ~200 Masters students in the HDR-UK supported Digital Health MSc programme, (c) 20 Alan Turing Institute Fellows including 8 projects focusing on health and social care AI. The AHSC is increasing AI-awareness of medical students and trainees by accessing the above programmes, in line with the recommendations of the Topol Review and the Topol Programme for Digital Fellowships.

Examples of leadership and developments in informatics/AI include:

- ARCWest provides leadership in applied health informatics for the national ARC network promoting collaboration in the use of novel informatic research methodologies;
- Our joint academic-STP leadership of Population Health Management enables the best use of local data through research and population analytic projects, via AHSC funded posts within the CCG;
- Development of MR-Base, a widely-used online platform allowing estimation of causal effects by combining genome-wide association study results with Mendelian randomization and sensitivity analyses;
- We developed innovative training for patients and public in digital health and use of data, praised as good practice by Understanding Patient Data.

#### 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 unite our excellence in healthcare provision, research and innovation, education and training to deliver healthier lives, through improved prevention of illness and disease and better integration of health and care services. We want our region to be known for:

- Equal and fair access, experience and outcome, by tackling health deprivation and inequalities in care in inner-city, rural and coastal communities;
- The excellence of the care we commission and provide, underpinned by cutting-edge research and innovation, education and patient and public involvement;
- Connectedness and collaboration, delivered by a committed, well-trained and research-literate workforce.

Our **goals** are:

- To use our combined strengths and expertise in population and applied health research to deliver six overarching Programmes of work (see organogram, section 2):

- Public health and prevention;
  - Mental health and neuroscience;
  - Cardiovascular science;
  - Surgical innovation;
  - Perinatal, reproductive and children's health;
  - Integrated, optimal and equitable care.
- To act as a platform for collaboration across the health and care system, focusing on education, capacity building and workforce development. We will train the next generation of public health, healthcare and scientific staff to deliver novel interventions, treatments and technologies that will transform health and social care provision.
  - To drive service change, leading to world-class health and patient outcomes and wealth gains. Our 21 Health Integration Teams (HITs, see section 2) comprise health professionals, public health staff, researchers, commissioners, voluntary sector organisations and service users. They work closely with local health and care organisations and networks to deliver the NHS Long Term Plan by adopting and evaluating new research and technologies. HIT aims include:
    - Removing organisational barriers across the health and care system;
    - Ensuring all implementation activities meaningfully involve patients and the public;
    - Delivering and promoting evidence-informed care and interventions;
    - Creating an integrated, equitable and whole-system approach to health and care.

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.

Our **vision and purpose** is to unite our excellence in healthcare provision, research and innovation, education and training to drive service change, leading to world-class health, clinical and economic outcomes.

### **Objectives and deliverables**

#### Research and Innovation:

Short-term:

- Increase PPI/E across all Programmes, reflecting the diversity and needs of our population;
- Develop specific projects targeting health deprivation and inequalities in care, in inner-city, rural and coastal communities;
- Secure funding for Phase III randomized trials, based on pilot and feasibility studies undertaken by our NIHR infrastructure.

Medium-term:

- Expand the IEU and BRC translational pipeline by identifying risk factors, mechanisms and predictive

biomarkers that inform diagnosis and development of novel treatments;

- Scale-up the Bristol Translational Hub, facilitating industry engagement and initiating collaborations focusing on feasibility and proof of concept studies across the AHSC Programmes;
- Work with the £16M EPSRC-funded SPHERE project to develop novel wearable monitors and home sensors to measure behavioural changes in chronic disease.

Long-term:

- Develop existing and establish new collaborative multidisciplinary research partnerships across the national AHSC, BRC, HPRU, ARC and AHSN networks.

#### Training and Education

Short-term:

- Offer internships and exchange partnerships for AHSC staff to explore the commissioner and industry/academia interfaces;
- Provide training and support for commissioners and health and care staff to increase their understanding of research and evidence implementation.

Medium-term:

- Contribute to the AHSN's development of an Innovation and Improvement Academy providing staff with skills, toolkits, networking opportunities and early career support;
- Expand the Wellcome Trust GW4 integrated clinical academic training programme to all clinical PhD studentships (including NIHR, MRC, BHF, and CRUK).

Long-term:

- Work with HEE to develop new postgraduate programmes that build capacity, focussing on local research needs and novel transformative technologies.

#### Implementation and Care

Short-term:

- Work with the AHSN to support implementation of evidence-informed interventions, innovations and service changes, including those initiated by our HITs;
- Evaluate promising developments of local relevance which are scalable for national impact;
- Work with the Local Health and Care Record Programme to establish a system-wide population analytics platform for service planning and research with dataflows from primary, secondary, community, social care and mental health providers.

Medium-term:

- Develop methods to integrate bioinformatic (genomics and other biological), judicial, educational and environmental datasets into the analytics platform, facilitating evaluation of service changes and evidence implementation.

Long-term:

- Work with commissioners and service providers to implement effective interventions and services and establish acceptable methods for disinvestment in non-evidenced interventions, clinical procedures and practices;
- Implement decision-support and machine learning across key health and care electronic systems to drive transformation.

Our AHSC has a well-developed strategy to support and deliver **the goals of the Life Science Industrial Strategy**. It builds on our strengths and the technological expertise of world-leading regional companies in AI, robotics, high-performance computing and quantum technologies. We actively support the Local Economic Partnership/West of England Combined Authority (WECA) and the UK Office for Life Sciences in developing the SW life science industry ecosystem. This includes the Global Centre of Innovation Excellence, the Powerhouse for the West industry initiative, Future Space, Engine Shed, UnitDx, Scale-Up Generator, UWE Health Technology hub and the new UoB Temple Quarter campus. Over the last 3 years this joint working has contributed to a 25% increase in local health and life science businesses.

Examples of this innovative approach include:

- Cluster in the Cloud Software, developed at UoB Advanced Computing Research Centre, facilitates AHSC platforms in synthetic vaccines, Mendelian Randomisation, *in silico* drug discovery, Virtual Reality and

robotics, partnered with Oracle Cloud infrastructure;

- Close working between the joint UWE/UoB Robotics Laboratory (>£20M funding) and the local cluster of robotic companies trains >250 postgraduates/year (including EPSRC-funded CDT in Robotics and Autonomous Systems), leading to robotic platforms including: (a) the world's first 3D-printed prosthetic device (Open Bionics), (b) stereotactic neurosurgery (Renishaw), (c) complex minimally invasive surgical operations (including haptics and visual prompts), and (d) assisted living and mobility for older and disabled users;
- Use of synthetic biology and gene editing to generate ATMP cell lines for phenotypic drug screening led to formation of the spin-out company Cytoseek, facilitated by collaborations with Cell and Gene Therapy Catapult, LifeArc, Medicines Discovery Catapult and bioprocessing expertise at NHSBT. Several major international companies are discussing licencing our work.

The AHSC fully participates in local delivery of the **Accelerated Access Collaborative (AAC)**, led by the AHSN, which provides dedicated resources to support rapid uptake of proven innovations. This has successfully ensured a proactive approach to the local roll out of each AAC rapid update product:

- *HeartFlow Analysis* has been fully implemented at UHBristol and NBT;
- An application has been submitted to the Pathway Transformation Fund (PTF) to support introduction of *PCSK9 inhibitors* at UHBristol and NBT;
- *Urolift* has been successfully adopted by the regional Urology service at NBT;
- Following a successful application to PTF, *placental growth factor-based tests* have been rolled out at UHBristol - a second application will complete uptake at NBT;
- *High sensitivity troponin tests* to rule out early suspected MI are in routine use at UHBristol and NBT;
- The AHSN is facilitating work with UHBristol and NBT to introduce both *Quantitative Faecal Immunochemical testing* and *Cladribine*.

The AHSC HIT research programmes are closely aligned with the capacity and expertise of the AHSN to rapidly advance **real-world testing and validation** of a range of technologies and treatments to provide evidence of their effectiveness and cost benefit to commissioners. These include the AHSN Innovation Exchange, which provides resources and tools to match innovations with the expertise of our local academic and industry partners, complemented by the ARC's evaluation expertise. Recent examples include combined physical and cognitive exercises to build resilience in vulnerable children and young people, and immersive virtual reality technology as an adjunct to mental health treatments.

**Joint working:** The AHSC is nested within and works closely with the AHSN, to complement and simplify the local innovation support landscape. AHSN projects developed with the AHSC that have been selected for national adoption and spread following successful local implementation and evaluation include:

- The ED Safety Checklist, which is proven to improve patient safety and clinical outcomes during periods of crowding;
- Use of National Early Warning Scores in pre-hospital settings to trigger responses across patient pathways and improving outcomes;
- A program to increase the uptake of MgSO<sub>4</sub> in preterm babies (PReCePT), which reduces the risk of cerebral palsy by >30%. An initial local pilot showed a sustained increase in the uptake of MgSO<sub>4</sub> from 21% to 88%. PReCePT has now been scaled up as a national QI implementation programme (2018-2020) funded by NHSE (£1M) and is included in the NHS Long Term Plan (2019).

Our AHSC currently has 23 collaborative projects with other AHSCs, with a further 12 in development. Further opportunities for collaborative working will arise through national programmes led locally by the AHSN, including the NHS National Innovation Accelerator and Innovation and Technology Payment programmes. The AHSC will continue to benefit from the implementation of local innovations, including the 3D multi-morbidity approach and a validated secondary care AMR reduction programme.

**Multi-disciplinary and multi-professional research and education:** The AHSC educates >900 high quality (TEF Gold [UWE] and Silver [UoB]) undergraduate medical, dental, nursing, AHP and psychology students/year. Our collaborative programmes deliver an integrated and safe workforce where 'the teams that work together train together', e.g. medical students working with nursing assistants and joint simulation of real-world events.

In addition to our research and training expertise in transformative technologies (section 4 and Robotics, above), our postgraduate multidisciplinary programmes are fully aligned with the STP and Integrated Care System workforce models of care. Examples of best practice across the AHSC include:

- Practical Obstetric Multi Professional Training (PROMPT), is a national safety initiative using multidisciplinary practical simulation of obstetric emergencies. The training is used by most UK maternity units and is expanding its global reach. Our data have improved the safety of mothers and babies and was cited in NHSE Better Births national maternity review (2016);
- The Bristol GP training programme has top quartile outcomes and 100% fill rates for the last 5 years, in marked contrast to the national picture. Public Health specialist training is assessed as “excellent”, supported by three AHSC MSc programmes in Public Health and Epidemiology, training 90 students/year;
- Bristol Medical Simulation Centre developed a novel multidisciplinary course that enhanced team working and improved management of critically ill patients requiring transfer between hospitals. It won first prize at the HEE regional conference (2019);
- Development of novel Advanced Clinical Practice apprenticeships:
  - In cardiac care, reducing inpatient admissions and improving patient care experience;
  - Recruiting graduate paramedics to significantly improve patient point-of-care in our community workforce.

The AHSC is committed to **Diversity and Equality (D&E)**. Notable examples include:

- Widening participation work with local schools and colleges to showcase health and social care careers in disadvantaged communities;
- Change pilot site working with NHS Workforce Race Equality Standard team improving cultural indicators, staff and patient experience;
- Dedicated funded D&E posts; Athena Swan silver (UoB Medical School), bronze (UWE) awards;
- The Stepping Up learning and coaching scheme improving the representation of BAME communities, disabled people and women in senior leadership roles.

## 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.

The overarching **AHSC commercialisation strategy** is to focus on identifying and securing the optimal route to patient benefit. Our ambitions are to:

- Foster the development and rapid delivery of novel healthcare innovations across the AHSC, complemented by, and working closely with, the AHSN;
- Generate maximum benefit to the local economy, employment and wealth generation;
- Exploit our population health expertise with a focus on public/societal benefit and not-for-profit/low-margin enterprises centred on low- or middle-income global health opportunities.

**Routes to commercialisation:** The Innovation offices of all AHSC partners collaborate on identification, protection, translation and commercialisation of IP relating to products and technologies. We use an agreed set of pragmatic commercialisation guidelines and nurture a positive “can do” culture. Building on our close partnership working over the last 7 years, the expanded life science commercialisation team led by UoB have established a Translational R&D Hub across the AHSC, led by Dr Richard Seabrook. Its aims are to:

- Provide early identification and proactive project management across all our Programme areas leading to accelerated translation and commercialisation;
- Spread best practice across the AHSC by integrating multi-disciplinary R&D and business into all relevant projects;
- Ensure regulatory, end user and clinical pathway needs are built into all R&D plans;
- Provide a portal for industry and private investors to access the clinical and scientific expertise across the AHSC;

- Deliver a single point of contact for academics and clinicians to access and engage with business and industry.

The Hub ensures consistent provision of high-quality expert support for commercialisation, industry engagement, translational grant submission and project delivery. This supports implementation of biological, biomedical and clinical research to produce practical patient-centred health benefits, including new therapeutics, devices, diagnostics and complex public health interventions. The Hub's membership includes all commercialisation managers across the AHSC, ensuring seamless transition to commercialisation across all stages of the translational pathway.

**Measuring our contribution:** The Translational R&D Hub will collate and report the measures below, demonstrating the AHSC's contribution to economic growth.

Over the last five years the AHSC has managed >600 disclosures, filed >160 patents, received £5M in licence income and realised £9M from share sales. Current active patent portfolio is ~140 families with a current licence portfolio of 135. The AHSC has driven creation of >70 spinouts of which 29 have been in healthcare with 17 established in the last 5 years, raising over £60M in investment. Additionally, we have generated 5 social enterprises in collaboration with several voluntary sector organisations.

The AHSC has a strong record of industry engagement (including working with major international CROs). Building on this is key to delivering our strategic objectives of maximal and rapid patient benefit, associated with wealth creation. Direct commercial funding for AHSC projects totalled £17M over the last 5 years: key collaborators include GSK (over 20 projects), Astra Zeneca (11), Eli Lilly (11) and Pfizer (9). Other collaborators include AbbVie, GE Healthcare, Vertex, UCB Celltech, Vertex, Gilead, Celgene, Takeda, Edwards, Genzyme, Unilever, Procter & Gamble, Biogen and Sanofi. Total commercial trial income across the AHSC over the last 5 years was >£20M and includes successful delivery of >380 industry-sponsored clinical trials of which >65% were Phase IIa or III CTIMP or device studies.

The positive trajectory in our outputs and metrics was driven by: (a) increased number of specialist technology transfer staff across the AHSC, (b) greater availability of pre-translational funding (£3.25M invested via Proof of Concept funds), (c) high profile success stories (acquisition of Ziylo by NovoNordisk for up to \$800M), and (d) availability of wet-lab space in Bristol (FutureSpace and UnitDX) to complement services provided by SetSquared, awarded the "world's best incubator" by UBI Global (2019). In support of this growing portfolio, Research England recently awarded £1.5M towards a new state-of-the-art life sciences incubator with Unit DX, as part of its University Enterprise Zone programme.

Examples of **successful impacts of our commercialisation activities** include:

- As a leading centre in the UK Paediatric Vaccine Group, Bristol has led and participated in many commercially and publicly-funded vaccine trials in children, adolescents since 2004 and recently in adults. Underpinned by its strong track record in epidemiology and vaccinology, the AHSC has been selected by *Pfizer* for a multimillion-dollar research investment, as one of six global centres of excellence, to conduct detailed prospective epidemiological studies to evaluate disease burden targeted by its pipeline vaccines, initially focusing on adult pneumonia (pneumococcal and respiratory syncytial virus vaccines) and diarrhoea (*Clostridioides difficile* vaccine);
- The UoB spin-out Ziylo, formed in 2014 to generate glucose-binding molecules, was sold to *Novo Nordisk* (2018) for up to \$800M, giving them full rights to develop glucose responsive insulins. This technology is key to development of the next generation of insulins, leading to safer and more effective therapies and reducing the risk of hypoglycaemia;
- An NIHR- and Arthritis Research UK-funded-study at UHBristol demonstrated efficacy of adalimumab (an anti-TNF agent) in children with sight-threatening uveitis associated with juvenile idiopathic arthritis and demonstrated that the treatment is highly cost-effective. (Ramanan AV, *NEJM* 2018). NHSE approved access to the biologic immediately after the results were presented (2015). Based on these data we collaborated and worked closely with the manufacturer *AbbVie* to obtain approval of this drug for children with uveitis by the European Medicines Agency (2017), FDA (2018) and subsequently in >70 other countries;
- Funded by an NIHR i4i award a UoB team developed and validated a novel clinical platelet function analyser. They are now in discussions with a major international device company to complete

development and further clinical testing, aiming for its use as a bedside device for diagnosis of a range of haematological and bleeding disorders;

- A Phase IIa study at NBT has demonstrated the safety of a new device (Odon, *Becton Dickinson*), to assist vaginal birth. The aim is to extend this to developing nations since it is easier and safer to use than forceps and can be used by non-medical staff. This work is being extended to a multinational RCT funded by The Bill and Melinda Gates Foundation and led by NBT.

## 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.

The AHSC has a unified approach to developing the digital infrastructure required for effective population health management. We have established joint NHS-academic leadership of infrastructure development and delivery of key strategic projects, supported by jointly funded posts. We are responsive to key initiatives around standards in data integration, metadata and discovery including the HDRUK data quality and standards programme. Public fair processing is based on Understanding Patient Data best practice guidelines and the National Patient Opt-Out will be applied.

**Data delivery, storage and sharing:** our local inter-operability shared care record programme, **Connecting Care (CC)**, is frequently cited as a national leader and was one of the first such initiatives to use open FHIR standards. We have mature data sharing arrangements between NHS Trusts, primary care, local authorities, CCGs and the voluntary and community sector. We are extending this work using open standards to create APIs for further connection and integration. CC has created a research facility, allowing use of clinical data for follow up for research studies.

Our **population analytics and research platform** links local primary and secondary care data for our >1M population. We are developing direct data feeds to this platform from multiple local health and care settings. With South Central and West Commissioning Support Unit, ARCWest has developed a blueprint for health data access and linkage, which will host feeds from source systems in an industry-grade data safe-haven with NHS Digital's Data Security and Protection security certification.

Working with our commercial partner System C as part of the **Global Digital Exemplar** programme, UHBristol is developing and integrating new data capture platforms (e.g. streamlining and standardising clinical handover within teams and between organisations and flagging alerts for routine patient care) to support service improvement and research. With the BRC we are creating research and analytics datasets for intensive care and cardiology, linked through the NIHR Health Informatics Collaborative.

We are an active partner in One South West, a **Local Health and Care Record Exemplar Programme** covering 6 STPs, 55 partners and 4.8M patients. This will support population health management at scale by connecting disparate shared care record programmes into a unified platform across this large geography. Our involvement will increase the reach and power of the AHSC research, drawing on our BNSSG work.

**Bristol is Open** provides an award-winning research infrastructure for the study of software defined networks, Internet of Things and Big Data technologies.

## 7. Administrative contact details

<b>Administrative contact name</b>	Lisa King
<b>Administrative contact job title</b>	Chief Operating Officer, Bristol Health Partners AHSC
<b>Administrative contact telephone number</b>	07875 077715

<b>Administrative contact email address</b>	lisa.king@bristolhealthpartners.org.uk
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**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