Department of Health & Social Care

DEPARTMENT OF HEALTH & SOCIAL CARE DESIGNATED ACADEMIC HEALTH SCIENCE CENTRE (AHSC)

2019/20 FINAL REPORT

Note: Please note this form should be completed in font no smaller than 10-point Arial.

1. ACADEMIC HEALTH SCIENCE CENTRE DETAILS

Name of the Department of Health & Social Care Academic Health Science Centre:

Oxford Academic Health Science Centre (now Oxford Academic Health Partners)

Contact details of the DHSC AHSC lead to whom any queries and feedback on this Annual Report will be referred:

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2. OVERVIEW OF ACTIVITIES (no more than 4 pages)

Oxford AHSC's objectives in the first two years were to initiate work on the major theme projects, establish strategic objectives for the expanding clinical informatics programme both within Oxford AHSC and links to the AHSN, and contribute to regional discussions on economic growth. Within the first year, discussions with Health Education Thames Valley considered the evolution of training programmes that aligned with the ambitions of the AHSC.

Having established the themes, the main activity for the AHSC aimed to generate data and identify and support exemplar projects in chronic disease management programmes. Collaborative work in digital health, mapping of major infections led to progress in the antimicrobial resistance drug discovery field. An immunological monitoring lab focused on large scale analysis of health related data sets was established and we initiated a further open innovation platform and created a set on incubating programmes in virtual biotech companies. Decisions of priorities based on data from all these programmes for the next five years were also considered.

Long term objectives were exceeded for digital and clinical informatics.

The Oxford AHSC now hosts the National Consortium of Intelligent Medical Imaging (NCIMI) a new technology centre with local activities integrated in the BDI in which UK Research and Innovation has invested £10 million. The NCIMI will benefit its commercial and NHS partners through data linkages across 15 NHS Trusts and multiple SMEs.

The Oxford AHSC's Big Data Institute (BDI), opened in May 2017, is one of the most significant capital developments described in 2014. The BDI has gone from strength to strength and is now a leading player in COVID data studies and is co-located on an integrated clinical-academic campus along with the BioEscalator which hosts both early spinout/start-up companies as well as large pharma, including Novo-Nordisk. Over 100 scientists benefit from direct interactions in this space.

Theme structure and content changes were specifically designed to prepare for the future long term with a focus on translation and innovation and concomitant alignment across the partnership with major infrastructure, such as the two NIHR BRC. New investments, including the BDI, made the application of big data and clinical informatics tools available to all across the AHSC membership. Industry and partnerships in life sciences continue to be a significant element of our work as outlined below.

Chronic disease, multi-morbidity and ageing continues to date as part of The Therapeutics for Ageing consortium (iTAc) a national public-private partnership to accelerate the discovery & development of therapeutics for ageing. It will provide industry with a pipeline of novel clinically de-risked drug targets and assets in a large and rapidly growing area of therapeutic need (age related morbidities). Expertise in 5 major complementary UK centres was pooled to form the core of this initiative: The Francis Crick Institute, University of Oxford (UofO), and partners Oxford AHSC, Oxford AHSN & NIHR Oxford BRC), University of Dundee, University of Birmingham, Birmingham Health Partners and the Medicines Discovery Catapult. Work with Birmingham and Dundee – UK SPINE KE - an award of £4.820m to support an open innovation approach across universities, NHS & business, to advance clinical research & medical innovation focused on improving health in old age.

Oxford Brookes University (OBU) established a Health Ageing theme involving a number of stakeholders including health and social care, patients and the public and others – see current activity for an illustration.

Immunity, Infection and Inflammation continued to be key and the development of the Immunity Network was significant during the final year to March 2020. Impacts from the infection element include the global work in Africa, SE Asia and the important local work on TB & bv0063 MRSA in Oxford University Hospitals (OUH) and UoO as outlined below. Construction and establishment of the UK's first dedicated Vaccines Manufacturing Innovation Centre (VMIC), announced by Business Secretary Greg Clark MP, led by the UoO's Jenner Institute will deliver to the Industrial Life Sciences Strategy. The VMIC will address the UK's structural gap in late-stage vaccine manufacturing process development, and is expected to be fully operational by 2022. VMIC will allow development and manufacture of vaccines for clinical trials and at moderate scale for

emergency preparedness for epidemic threats to the UK population so pertinent and apposite in 2020 and beyond for work to manage the COVID pandemic (see also section 3)

Oxford AHSC's broad focus on **cognitive health** expanded to include **mental wellbeing**. The Sleepio app, a digital cognitive behavioural therapy (CBT)-based self-help programme, easily accessible via app or web, has been adopted across the whole South East region. The first such NHS rollout of direct-access digital medicine, Sleepio builds on the largest research trial into the impact of digital cognitive behavioural therapy (dCBT) on adults with insomnia. This work demonstrated the link between better sleep and improved overall health. The research team from the UoO's Department of Clinical Neurosciences, supported by the NIHR Oxford BRC, led a 12-month study showing that Sleepio improved overall wellbeing, mental health and quality of life. The development of the Centre for Brain Health has been a significant piece of work

Economic growth and the economy, including through partnerships with industry.

Oxford AHSC has a significant number of initiatives and partnerships with individual organisations and industry.

A **strong mid-sized company ecosystem** including Nanopore, Immunocore, BlueEarth, Vertex, Novo Nordisk and Vaccine Manufacturing Innovation Facility has been supported through Oxford University Innovation spin outs, Oxford Brookes University's Bio-Innovation Hub and The Hill. The **Innovation Exchange**, an AHSN-coordinated approach to improve our economy and patients' lives, also provides regional 'import and export' of healthcare innovation by all 15 AHSNs

Our track record in **multidisciplinary biomedical engineering innovations** is extremely strong. It includes academic-commercial collaborations and spinouts in areas such as tissue engineering, organ preservation (Organox), remote monitoring (OxeHealth), virtual reality (Oxford VR) and targeted drug delivery (OxSonics). UoO's **Bioescalator** facility, is located on the OAHP integrated clinical-academic campus alongside early spinout/start-up companies and large pharma, including Novo-Nordisk. Over 100 scientists benefit from direct interactions in this space.

Specific examples:

- *Perspectum Diagnostics* has pioneered the use of new multimodal MRI techniques based on T1 mapping to support accurate, quantitative measurement of liver, gall bladder and pancreatic disease.
- *Optellum* uses artificial intelligence (AI) and machine learning (ML) applied to develop the first AI Clinical Decision Support software for lung cancer diagnosis & treatment. Identifying at-risk patients reduces unnecessary interventions and expedites optimal therapy for patients with cancer. Now supported for NHS-wide adoption by Innovate-UK.
- *Ultromics* developed the FDA-approved EchoGo, which uses AI to accurately calculate routine measurement of heart function, that are highly prone to human inter-observer variability. This includes automated cardiac strain imaging, a unique 'first' for an AI application.
- *Caristo Diagnostics* uses AI techniques to analyse adipose tissue from routinely-acquired cardiac CT scans, enabling patient stratification and prediction of heart attack risk.

Development and delivery of an appropriate e-Health informatics platform.

Progress continued in the clinical informatics programme, based in the Big Data Institute (BDI) and supported by funding from NIHR and UKRI (Innovate-UK).

- The clinical informatics team have developed a Data Warehouse, including data on 12m patient episodes, 131m biochemistry results, 58m microbiology results, and 12m radiology reports. The Warehouse supports service improvement, translational research, and data science.

- Oxford AHSC continued to work with commercial and public sector organisations to develop the Data Warehouse through a spinout company, creating an EHR linking

existing infrastructure to make data accessible to clinicians and patients.

- AHSC teams have developed new technologies that will support health data management and re-use at scale, such as the metadata catalogue toolkit being used by **NHS Digital** to support a new version of the **NHS Data Dictionary,** by **HDR-UK** to support the **Innovation Gateway**, and by a range of other organisations to support the management of large health datasets.

NIHR Oxford BRC is the coordinating centre for the **NIHR Health Informatics Collaborative** (HIC), now incorporating 23 NHS Trusts in a framework data sharing agreement. These data are used to address 'real world' clinically relevant questions in multiple therapeutic areas. **NIHR Oxford Health BRC** launched spin-out **Cristal Health** in May 2019. This company provided a sustainable pathway for the NIHR and MRC funded **UK-CRIS programme**. UK-CRIS manages secure access to one of the World's largest repositories of de-identified patient data in mental health and dementia. Cristal Health will facilitate early-stage drug discovery, reduce clinical trial costs, and underpin Phase IV evaluation and pharmacovigilance. UK-CRIS also supports NHS Trusts' participation in the global trials market and supports academic research by developing text-mining tools and generating real knowledge from distributed and heterogeneous data.

The BDI (see above) hosts **NCIMI**, an Innovate-UK funded national cloud-connected network bringing together 15 NHS Trusts, academia, large-scale industry such as GE Healthcare, Alliance Medical, multiple SMEs and patient groups. OAHP is a lead partner in **PathLAKE** (Pathology Image Data Lake for Education, Analytics and Discovery), a UK ecosystem for AI development in pathology. PathLAKE will drive deployment of digital pathology platforms to transform diagnostic NHS cellular pathology laboratories. Oxford's AHSC is part of the **Thames Valley and Surrey Local Health and Care Record Exemplar (LHCRE)**, creating an information sharing environment for health and care services across the Region

Leadership, strategy and governance arrangements

Sir John Bell, Regius Professor of Medicine remains as Chairman of the Board of the Oxford AHSC.

Oxford Academic Health Partners (OAHP) records its appreciation for the work and direction provided by Stuart Bell CBE, Chief Executive of Oxford Health NHS FT and Dr Glenn Wells' critical contributions as Chief Operating Officer throughout the six years for the Oxford AHSC.

Leadership remained stable throughout the term of the AHSC to March 2020. This stability enabled clear and effective succession for Stuart Bell's retirement. Dr Nick Broughton was able to spend valuable time with AHSC colleagues before formally taking up the role of Chief Executive of Oxford Health NHS FT in June 2020. Dr Broughton also actively engaged with planning meetings for re-designation.

Identification of a Director, Professor Keith Channon, for Oxford Academic Health Partners from 2020 was also key during the latter part of 2019-2020 providing additional and exceptional expertise to underpin the development of plans and objectives for the next five years and beyond. OAHP will build on the strengths of the Oxford AHSC and its development since 2014.

3. SUMMARY OF PROGRESS MADE (2014-2020)

2014 was Oxford's first designation as an AHSC. Principal impacts during the period to 31 March 2020 included alignment of governance structures and processes to facilitate collaboration across the four member organisations and included a MoU. Accordingly, in this section we have included examples that are broadly strategic and three specific developments delivering patient benefit.

1. System leadership

Designation of two BRCs in 2016 was significant and a direct result of AHSC designation. OAHSC worked to secure funding and embed Oxford Health BRC dedicated to brain health and neuroscience. OH-BRC was the only entirely new BRC awarded and one of two mental health BRCs nationally. The Board took active interest in this project, receiving regular updates on the progress and process. BRC, ARC and MIC Directors attend Board meetings ensuring engagement across all NIHR infrastructure.

Continued collaboration and involvement with Oxford Brookes University (OBU) is fundamental and increasingly important to research, teaching and healthcare locally and of potential national value going forward. Re-designation from April 2020 enables specific impacts in research in key professions to be realised in the next five years.

Oxford Institute for Nursing Midwifery and Allied Health Research (OxINMAHR), part of OAHSC, has been an important contributor, invigorated by collaboration with BRCs and NIHR Oxford and Thames Valley ARC. Several projects are carried forward into 2020-21 including implementation of Clinical Academic Research Pathways for nursing and allied health professionals. OBU Research at the Centre for Movement, Occupational and Rehabilitation Science, the Centre for Nursing, Health and Social Care; the Centre for Nutrition and Health and groups covering sports health, cardiorespiratory sciences, and radiation biology, genomic instability and cellular communication has been shared widely and understood.

The impact on the health and wellbeing of patients within Oxford and Thames Valley and well beyond through engagement with AHSN continues to add value in several ways.

Oxford BRC established the NIHR Health Informatics Collaborative (HIC), bringing together BRC NHS Trusts nationally making clinical data readily available to researchers, industry and the NHS. AHSC continues to lead the Innovate-UK funded National Consortium for Intelligent Medical Imaging (NCIMI) to provide access to large-scale NHS imaging datasets across multiple NHS Trusts, for academic and commercial partners to develop and apply AI-based imaging solutions.

2. Digital Health and Artificial Intelligence

Benefits of two complementary BRCs and the consequent ability to transform the care of hundreds of thousands of patients include:

Gestational Diabetes (GDm) App - approved by NICE and adopted by hospitals significantly reducing preterm birth, diabetes medication requirements and caesarean section rates.

System for Electronic Notes Documentation (SEND) - early warning scores in hospitals for deteriorating patients. This commercial App is now applied across many hospitals.

Sleepio enables sleep and is distributed widely by NHS and disseminated by Oxford AHSN across SE England, **Cristal Health,** a spin out delivering sustainable development of UK-CRIS, a large linked dataset of de-identified mental health (including dementia) records from around the UK. CRIS provides a unique resource for both early-stage drug discovery and clinical service development. **OpenPrescribing and OpenPathology** platforms, providing AI-determined early warnings to all registered UK practices when prescribing trends deviate from comparators.

Brainomix is a start-up launched in 2010. New artificial intelligence (AI)-driven imaging support software has the potential to deliver huge benefits to hundreds of stroke patients each year and significant cost savings to the NHS and has been implemented at the Royal Berkshire Hospitals (RBH). Careful planning, stakeholder engagement, contracting, governance and data security reviews, IT planning, training, deployment and configuration and collaboration between the

company, the AHSN and the acute Trusts (backed by NHS England) has resulted in implementation of the tool into six acute Trusts during 2020 including OUH. The CE-marked e-Stroke Suite includes tools for non-contrast CT and CT angiography brain scans, connecting physicians and facilitating information transfer. The software supports physicians in identifying patients who would benefit from acute stroke treatments, selecting patients most likely to benefit from specific interventions, such as mechanical thrombectomy.

Oxford AHSN, Brainomix and RBH are partners in NCIMI – described above.

3. Microbiology and Anti-Microbial Resistance

Oxford AHSC researchers have pioneered the use of whole genome sequencing (WGS) to modernise microbiology in the NHS. These techniques and collaborations have had a significant impact on clinical services. Sequencing capability at the Oxford Genomics Centre (OGC) uses Illumina's 'sequencing-by-synthesis' technology on one of several instruments, each tailored to different output scales and specifications. In the Illumina technology, libraries of short DNA fragments are prepared from DNA or RNA samples and loaded onto glass flow cells, where they are initially amplified into an array of millions of clones or clusters, each containing a unique sequence to be determined.

WGS capability has delivered an understanding of *Clostridium difficile* genetic epidemiology, transforming the approach to hospital outbreaks in the NHS.

WGS of *Mycobacterium tuberculosis* to identify the pathogen, pattern of drug resistance/susceptibility and contact tracing.

Clinical data and pathogen sequencing rapidly solved the potential large-scale hazard of new *Candida auris* outbreaks in hospital ICUs.This programme has been adopted by Public Health England and is increasingly used globally. Same-day sequencing using Oxford Nanopore integrates clinical records with genomic data.

4. Musculo-skeletal impact

Oxford AHSC delivered a programme of major clinical trials in musculoskeletal and orthopaedics that have provided the evidence base to transform clinical practice and deliver significant patient benefits at reduced cost. The CSAW study evaluated arthroscopic subacromial decompression. Patients who had sham surgery did no worse than those with surgical intervention. As a result, withdrawal of this procedure in the NHS saves >£125 million /year. Similarly, the Back Skills Training Trial tested cognitive behaviour therapy for persistent low back pain showed considerable benefit, now applied in 165 hospitals, saving £1 billion of care costs/year. Oxford AHSC supported the DRAFFT trial of fixation techniques for wrist fracture, comparing K-wire fixation with plates, showed that wire fixation was better and more cost-effective and changed NICE guidance (NG38). Use of plates has reduced from 80% to 50%, with major cost savings and patient benefit.

5. Early, rapid response to COVID-19 pandemic

The development of the Oxford vaccine was underpinned by prior MERS research and pipeline planning from genome to immunisation dose. This prior knowledge enabled trials to start as soon as safety assessment criteria were satisfied. See public information video for summary illustration.

The RECOVERY trial set up was exceptionally rapid; process through the Integrated Research Application System (IRAS) and ethical review to recruitment of the first affected patient, at OUH, took 9 days.

PRINCIPLE was also facilitated by the Oxford AHSC, and benefited from re-orientation of resources to urgent COVID work.

Oxford AHSC and its global collaborators assembled and re-purposed existing teams and other resources including physical space to support the vaccine trial, to COVID-19 work from January 2020. A significant number of research proposals were considered for funding in early 2020 and this work continues under the auspices of the re-designated AHSC – now Oxford Academic Health Partners (OAHP).

The completed AHSC Annual Report 2019/20 must be submitted via email, to the NIHR CCF Infrastructure mailbox: ccf-infrastructure-team@nihr.ac.uk copying the programme manager Charlotte Scott (charlotte.scott@nihr.ac.uk) by 1pm on **Monday 19th October 2020.**

The Final Report aims to capture progress against the stated objectives, specific themes and work programmes as set out in your application, in order for the Department of Health and Social Care to be able to understand the overall progress of the AHSCs. However, please note that we will not be providing feedback for the AHSC Final Reports.

An electronic sign off confirming the AHSC Final Report 2019/2020 is required by the Department of Health and Social Care. An electronic declaration/signature page for each report will be provided directly to the Director/CEO to sign and return once the submissions have been received.

The key NIHR CCF contact for the AHSC Final Report 2019/20, to whom all queries should be addressed (copying in ccf-infrastructure-team@nihr.ac.uk) is Charlotte Scott, charlotte.scott@nihr.ac.uk, Tel: 020 8843 8082.