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

Reference number	NIHR201644
Programme	Infrastructure
Call	Academic Health Science Centres Competition 2019
Institution Director	Professor Graham Lord
Director Institution	The University of Manchester
AHSC Name	Manchester Academic Health Science Centre (MAHSC)
Start Date	01/04/2020
End Date	31/03/2025

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1. Details of the Partnership

Institutions

Manchester University NHS Foundation Trust
The Christie NHS Foundation Trust
Salford Royal NHS Foundation Trust
Greater Manchester Mental Health NHS Foundation Trust
The University of Manchester

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 AHSC has transformed the health research landscape in Greater Manchester (GM), founding Health Innovation Manchester (HInM), the most advanced integrated system in the UK for aligning academic research with local health needs to expedite the translation of discoveries into deployment at scale. This is achieved by leveraging GM's devolved, streamlined governance and decision-making to connect MAHSC to providers and commissioners across a population of 2.8m.

HInM incorporates our AHSC, AHSN, NIHR Applied Research Collaboration (ARC), Biomedical Research Centre (BRC), Clinical Research Facilities (CRFs) and Patient Safety Translational Research Centre (PSTRC), all GM NHS organisations, and our four Universities [Manchester (UoM), Salford (UoS), Bolton (UoB) and Manchester Metropolitan University (MMU)]. This fully integrated ‘One Manchester’ system operates in a cooperative, synergistic and citizen-focused way to drive our mission to ‘Discover, Develop and Deploy’ for population benefit.

MAHSC’s discovery and translation strategy is delivered by six domains (Cancer, Cardiovascular and Diabetes, Inflammation and Repair, Mental Health, Neuroscience, Women and Children) each led jointly by an academic and an NHS clinician and chaired by a CEO from our partner Trusts (see Organogram). Domain teams are supported by HInM’s Portfolio Management Office (PMO) which also underpins AHSN and ARC activity. Oversight, information sharing and horizon scanning is conducted through the Domain Leadership Forum, including the Trust CEOs, Medical and Research Directors and the BRC, AHSN, ARC and PSTRC Directors.

MAHSC's Director chairs its Executive which is responsible for strategy, decision making, performance monitoring, facilitation of cross-working between domains and ensuring that all partners, in collaboration with industry, effectively support MAHSC activity.

MAHSC is supported by HInM's Innovation Prioritisation and Management Committee (IPMC) (providing system oversight of the whole portfolio), the Research and Education Committee, and the HInM Industry Advisory Group. The Research and Innovation NIHR Oversight Board provides cohesion across underpinning NIHR infrastructure.

The accountable body for MAHSC is the HInM Board, which includes senior executive leaders from academia, health, industry and GM's civic authorities. The Board sets strategy, monitors performance and holds MAHSC's Director and HInM's CEO to account. HInM is hosted by Manchester University NHS Foundation Trust (MFT) and follows NHS processes for financial and information governance, audit and procurement. MAHSC's Director is supported by HInM's Executive Management Team and HInM's PMO.

Patient and public involvement, engagement and participation (PPIEP), led by HInM's PPIEP Director, is embedded in all we do and enabled by a Public and Community Panel, which defines PPIEP strategy for the MAHSC, AHSN, ARC and PSTRC portfolios. The PPIEP Director serves on the MAHSC Executive, Domain Leadership Forum, AHSN and ARC Steering Committees and IPMC.

We have established a 'One Manchester' PPIEP forum of leads (lay and professional) across the Universities, Trusts, the GM Health and Social Care Partnership (GMHSCP), NIHR infrastructure, MAHSC domains, and the GM Voluntary Community and Social Enterprise Network to support co-production of projects and ensure inclusion of our diverse and marginalised communities. Our activities are recognised by our Gold Engage Watermark from the National Coordinating Centre for Public Engagement.

Organisational Model & Accountability [heavy lines]

Health Innovation Manchester Board
Senior Executive Leaders from the Universities, the major Trusts, the GM Combined Authority, the Councils, the GM Health and Social Care Partnership, Manchester Science Partnerships, Industry, Commissioners and Providers, and the HInM CEO and the MAHSC Director

HInM Executive
Members: HInM CEO, MAHSC, BRC, AHSN, Clinical & Digital Directors

AHSN

MAHSC Executive:
Members: MAHSC Director, Clinical lead, Research lead (also **BRC** Director), PPIEP lead (also **HInM** lead), Education lead, Industry lead, Academic Partnerships lead, **AHSN** & **ARC** Directors

ARC

Domain Leadership Forum:
Members: Trust CEOs and Medical Directors, Domain Leadership, MAHSC Director, HInM CEO, **BRC**, **AHSN**, **ARC** & **PSTRC** Directors

Cardiovascular & Diabetes Domain Chair: CEO Manchester University FT (MFT)	Cancer Domain Chair: CEO Christie FT (CFT)	Neuroscience Domain Chair: CEO Salford Royal FT (SRFT)
Inflammation & Repair Domain Chair: CEO MFT	Women & Children Domain Chair: CEO MFT	Mental Health Domain Chair: CEO GM Mental Health FT (GMMH)

MAHSC NHS Partners	Manchester University NHS Foundation Trust – One of the largest providers of all age specialist services in the UK The Christie NHS FT – Technologically the most advanced cancer centre outside North America Salford Royal NHS FT – Leads the largest major trauma service in Europe GM Mental Health NHS FT – Formed in 2016 from two Trusts, one in the top two in the UK for research activity

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.

The metrics span a period of intense reorganisation across our GM region, and we highlight here major achievements. Since redesignation in 2014, our partnership has accelerated the delivery of excellence by bringing together our biology and health scientists into the UK's largest single Biomedical Faculty (Biology, Medicine and Health [FBMH]), creating HInM to unite our NHS and academic power and attracting major investment in our research infrastructure (first infographic).

Excellence in Research

Our increased volume of discovery science, post Faculty merger, and our deeper NHS collaborations have led to a 25% increase in publications, second amongst current AHSCs for the increase in highly cited papers, and joint second for the increase in papers published jointly by UoM and NHS partners (first infographic). Our health scientists continue to be recognised by both NIHR (21 Senior Investigators in total; 7 over 2014-2019) and the Academy of Medical Sciences (43 FMedSci in total; 7 over 2014-2019) placing our partnership first outside the South East of England. Three consultants were awarded MRC Clinical Academic Research Partnerships (out of 26 in second round in 2019).

Since 2014, MAHSC has generated £870m of external research funding, and our CRN is a top recruiter to commercial studies and overall has the highest population rate for recruitment (second infographic).

Excellence in Education

FBMH's degree and continuing professional development (CPD) programmes span the full spectrum from discovery science to healthcare delivery, are research-based and delivered to >10,000 students. The UoM programme in Nursing is ranked third globally (QS) and those with NSS scores above sector averages are shown (second infographic). Our provision is enhanced through partnerships with the NHS, industry, professional bodies, Royal Colleges and other universities and recognised by Higher Education Academy awards for the support of student nurses in clinical practice across GM. We provide Master's programmes to >70% of healthcare scientists nationally, and we hold the only HEE contract for Higher Specialist Scientist Training (second infographic). Our Medical School's extensively modernised MBChB programme, over 2014 to 2019, is delivered to 2,200 students experiencing training across 60 diverse clinical sites, with 20% intercalating. Our graduates have a high level of academic foundation post offers (54% versus 42% 2019 national average).

Excellence in Patient Care

Our partner NHS Trusts have consistently high CQC ratings. The creation of research networks within our clinical services, stimulated by the MAHSC domains and our unique award of 55 MAHSC Professorships to outstanding consultants and allied health professionals (AHPs), is leading to improvements in care at rates higher than national levels (e.g. cancer, cardiovascular, mental health - second infographic) and to pathway redesign (e.g. acute stroke units; acute kidney injury recognition).

Our Cancer domain exemplifies the added value of bringing together researchers, clinicians and patients into 'GM Cancer'. This has led to clinical innovations (e.g. the CURE tobacco treatment service), patients co-producing research, and major awards (Radnet £16.5m [basic and clinical proton research], International Alliance for Cancer Early Detection £3.3m and a Clinical academic training scheme including an MB PhD programme £6m).

MAHSC: Driving An Integrated & Expanded Ecosystem (2014-19)

Strategic milestones in the alignment of research strategies and priorities across MAHSC to increase capacity and capability

- **2014** — MAHSC re-designation
- **2015** — Formation of GM Health & Social Care Partnership
- **2016** — Formation of UoM Faculty of Biology, Medicine & Health; Connected Health Cities GM award £4m
- **2017** — HInM formation
- **2018** — NIHR awards: £28.5m BRC; £12.5m CRFs; £6.7m Patient Safety TRC
- **2019** — Genomic Laboratory Hub Award; NHSE £7.5m LHCR; NIHR Awards £9m ARC
- **2020** — 1st for AHSN Delivery

University of Manchester: Equality, Diversity & Social Responsibility

Stonewall TOP 100 EMPLOYER 2019

disability confident EMPLOYER

United Nations SUSTAINABLE DEVELOPMENT GOALS

2019: UoM 1st in Europe and 3rd in the world

Athena SWAN

FBMH: Silver

Race Equality Charter Bronze Award

MAHSC Leading the Development of Infrastructure supporting Discovery to Deploy

Discover
Lydia Becker Institute of Immunology and Inflammation
Stoller and Cancer Biomarker Centres
Molecular Imaging Platforms
Trauma Audit & Research Centre
NIHR Patient Safety Translational Research Centre

Develop
Clinical Trials Unit
Diagnostics and Technology Accelerator
Manchester Genomics Centre
NIHR Clinical Research Network
NIHR Policy Research Units for (i) Frailty & (ii) Health & Care systems & Commissioning

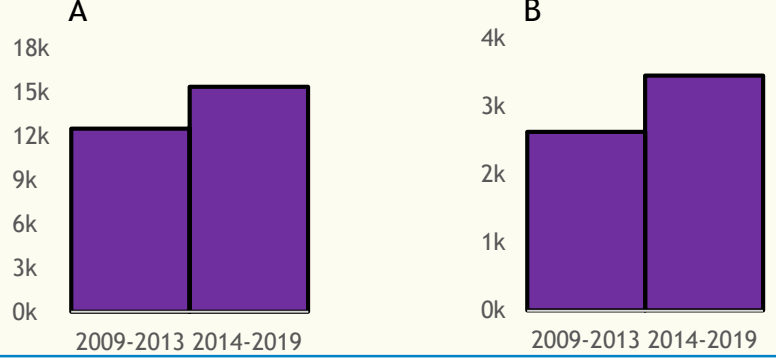
Deploy
North West Genomics Laboratory Hub
NorthWest EHealth

Joint Commissioning Board
Provider Federation Board
Primary Care Board

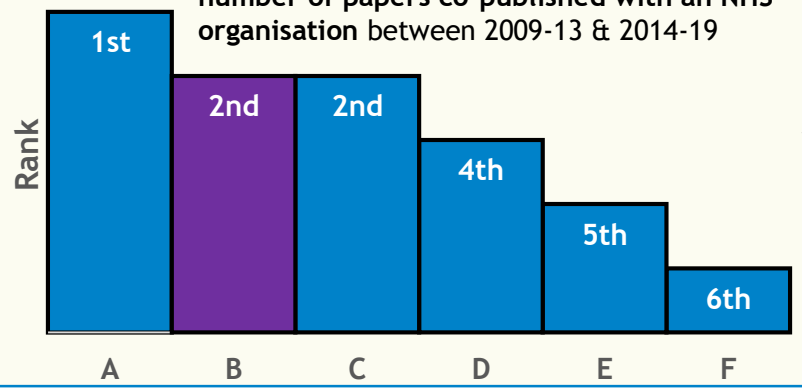
NIHR BRC & CRF — NIHR School of Primary Care Research — GM AHSN & NIHR ARC

MAHSC Driving Improvements in Bibliometric Performance

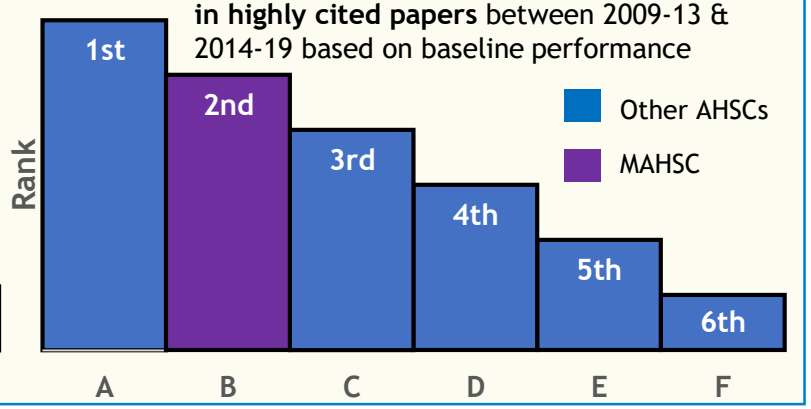
(A) Number of publications; (B) Number of Highly Cited Papers – SciVal Categories of Medicine, Nursing & Dentistry



Percentage Increase, shown as a rank (highest 1 to lowest 6 for the current AHSCs), **in the number of papers co-published with an NHS organisation** between 2009-13 & 2014-19



Percentage Change, shown as a rank (highest 1 to lowest 6 for the current AHSCs), **in highly cited papers** between 2009-13 & 2014-19 based on baseline performance



RESEARCH EXCELLENCE

£870m

Research funding to MAHSC partners since 2014

£77m

Quality-Related (QR) research

6th in England

University of Manchester (2019)

University of Manchester:
1st for collaborative research involving public funding (£81m)
3rd for company contracts (£75m)
4th for SME engagement (£4m)
Source: HESA 2017/18

612 Cumulative UoM patent portfolio in 2017/18
6th in England

Commercial Income generated from UoM IP
9th in England

- GM CRN ranked **1st** nationally for commercial clinical trial recruitment
- MFT in **top 5** recruiters nationally

29% of all studies are commercial (national average 22%)

Research Outputs from Nursing & AHP staff: **3.7 fold increase** (2017-19) at MFT- 52% are in the 1st quartile for impact

TEACHING EXCELLENCE

FBMH programmes perform above sector averages (2019 NSS scores)

	UoM	Sector av.
Biological Sciences	89%	85%
Nursing & Midwifery	86%	83%
Pharmacy & Pharmacology	95%	89%
Speech & Language Therapy	95%	91%
Anatomy, Physiology and Pathology	94%	85%

NIHR Clinical Academic Training (2006-15)

- 240 Academic Clinical Fellows: 65% to PhD
- 93 Academic Clinical Lecturers: 80% to fellowships or Academic related appointments

Integrated, Interdisciplinary Innovations in Healthcare Sciences Hub

UoM investment of over **£5m** to support research and capacity building in digital transformation for healthcare

Manchester Academy for Healthcare Scientist Education (MAHSE)

>1,300 Trainees 2013-19

Largest provider in the UK for Clinical Scientist Training (Masters Level), currently 580 students

The only HEE designated **Higher Specialist Scientist Training** centre (Doctoral level), currently 342 students

Building Capability in our Local Workforce

HEE current annual contract value £9m: To increase multidisciplinary capability and skills in digital literacy, general practice, care homes, and pharmacy

PATIENT CARE EXCELLENCE

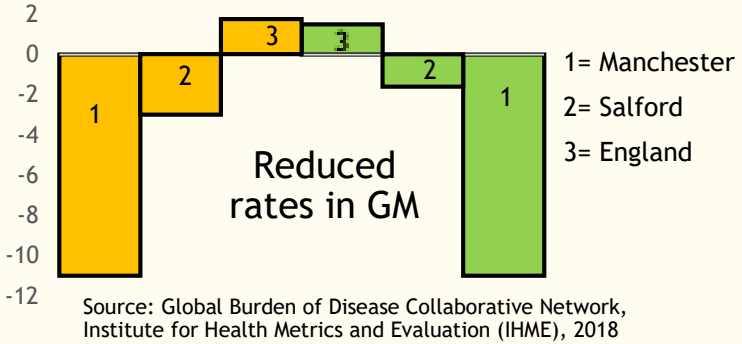
CQC 2019	Overall	Patient Care
Christie	Outstanding	Outstanding
GMMH	Good	Good
MFT	Good	Outstanding
SRFT	Outstanding	Outstanding

GM Cancer 2013-18

Fastest improvement in 1-year cancer survival; **Early diagnosis** 2% above national average; **Emergency presentations** fallen by 6%; GM best performer for **early referral** by GPs

GM Cardiovascular Disease 2014-17

% Change in Ischaemic Heart Disease (Amber) and Stroke (Green) **Mortality Rates** 2014-17



Source: Global Burden of Disease Collaborative Network, Institute for Health Metrics and Evaluation (IHME), 2018

GM Mental Health 2010-18

45% reduction in suicides in Manchester compared to England = 99 lives saved (Source: Public Health England)

Global Firsts: Communication therapy for Childhood Autism, and Digital interventions for psychosis

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.

1. Improving lung cancer outcomes

We pioneered novel therapies for non-small cell lung cancer (epidermal growth factor receptor targeting) and for small cell lung cancer (novel radiotherapy interventions) which improve survival for over 1,000 patients per year in the UK and have changed practice nationally and internationally (in National Institute for Health and Care Excellence [NICE] guidelines). Recognising that a step change requires early detection, the Manchester Lung Health Check (LHC) programme used low dose CT-scanning in shopping centre car parks to target higher risk individuals from deprived communities. An initial study of 1,429 participants (75% from the lowest deprivation quintile) identified 1 in 23 as having lung cancer, with 90% offered curative treatment and others enrolled in precision medicine programmes. LHCs are included in the NHS 10-year plan and NHSE is expanding LHCs to 10 new sites (£70m) as a step towards a national screening programme.

2. Safer and more effective use of common and high cost drugs

1.8m serious prescribing errors occur in primary care each year in England. We co-produced the PINCER methodology and developed the SMASH intervention that targets 12 forms of hazardous prescribing that account for 80% of serious medication errors. PINCER is incorporated into national medicine optimisation guidelines (NICE, NHSE) and SMASH is being deployed in all general practices in GM. Initial trials provide insufficient data on high cost drugs for immune-mediated conditions to accurately quantify their potential risks. Our UK-wide biologics registers (>50,000 patients) revealed a 4-fold increased risk of serious infection within six months of starting TNF-inhibitor drugs. We also showed that whilst these drugs do not increase the risk of lymphoma, all immunosuppressed patients with rheumatoid arthritis require vigilance for skin cancers (in NICE and European guidelines).

3. Reducing lives lost from stillbirth

We provided insights into placental dysfunction as a key cause of stillbirth and the association of stillbirth with maternal factors (diabetes, age >40 yrs, prior stillbirth) and reduced foetal movements. Our translational clinics changed clinical practice and contributed to a 24% reduction in stillbirth; the service model gives a six-fold return on investment. Implementation of the national Saving Babies Lives care bundle, based on our research, reduced stillbirths by 20% in early adopter sites potentially saving over 600 babies' lives per year in the UK. It is also implemented in Australia and New York State. Our research supported public awareness campaigns (#sleeponside and #movementsmatter) with wide national and international reach including Spain, Australia and New Zealand.

System Leadership

The alignment and integration of our local authorities and health and social care organisations with the vision of the GM Combined Authority and the Mayor to make GM 'one of the best places in the world to grow up, get on and grow old' underpins our 'One Manchester' approach to health science. MAHSC's domains apply this through multi-disciplinary 'team science' to address regional, national and international health challenges. Domains provide expert horizon scanning and strategic oversight that enable disruptive innovations to be tested, prioritised and presented to our Joint Commissioning and Provider Federation Boards to sign off their delivery to all GM patients. MAHSC will provide leadership in the three areas outlined below, in line with our Vision (section 4).

Person-Centred Healthcare: MAHSC will drive innovation within a personalised health and care service. We are in the vanguard of developing a national Genomic Medicine Service, and we lead the Genomics England Clinical Interpretation Partnerships in Cardiovascular and Enhanced Interpretation. Genomics underpins our expanding

gene therapy trials portfolio (including ophthalmology and lysosomal storage diseases). We are pioneering near-patient 'acute' genetic testing (gentamicin-induced ototoxicity prevention) and our work linking genomics and informatics has attracted Qiagen to locate its research hub in GM, in the process creating the SME Apis and attracting other SMEs to the region (Elucigene, Genedrive).

MAHSC facilitates rapid implementation of transformative technologies with major cost savings. Our work on high-sensitivity troponin has led to its incorporation into national and international guidelines, and HInM is driving implementation programmes with the AHSN network and NHSE. The programme has attracted industry support (nine companies) through our Diagnostics and Technology Accelerator (DiTA). Our artificial intelligence (AI)/machine learning programme is now refining and personalising these patient pathways using real-world data.

Capacity & Capability Building: MAHSC supports world-class facilties such as our Biomarker Discovery Centres and health initiatives in science and engineering, including the National Graphene Institute and the Royce Institute for Materials Science. MAHSC has driven the establishment of the Manchester BRC and the CRFs, our PSTRC, Clinical Trials Unit and NHSE-designated NorthWest Genomic Laboratory Hub. We are using all these platforms to accelerate innovation, attract investment and define where strategic investment will be required. To date this has included international appointments in both Cancer and AI.

MAHSC connects academic, clinical and industrial partners to scale up the adoption of new innovations. 12 partners have formed the £9m Innovate Manchester Advanced Therapy Centre Hub (iMATCH) to bring Advanced Therapeutic Medicinal Products (ATMPs) into routine clinical practice. The number of trials has increased rapidly (20 open). We were the first to introduce CAR-T into both adult and children's services across MFT and The Christie Foundation Trust. We have also established the first NHS-deployed Proton Beam Therapy Unit (first patient: 2018).

Digital Infrastructure: Through MAHSC, we are creating a shared strategy and timeline to integrate our infrastructure to support a learning health system building on the 'Connected Health Cities' programme (£20m Department of Health and Social Care). This enables cycles of rapid service improvement through generation and mobilisation of health intelligence and evidence from routine data. For example, investment of £20m into The Christie (Roche) will track cancer treatment, survival and patient reported outcomes in real time. Our pioneering ClinTouch/Actissist mobile applications track symptoms of severe mental illness, thereby enabling early community-based intervention for relapse. Through our domains, these approaches will be deployed into other sites and disciplines. Through NorthWest EHealth (an academic initiative, that is now a SME), we will deliver an increasing portfolio of efficient pragmatic trials to support adoption programmes across GM.

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 goal is to make new scientific discoveries and shorten the time to turn them into effective treatments that deliver benefits for patients. The Manchester Academic Health Science Centre (MAHSC) will do this by building on the established collaboration between the world-leading research and teaching of Greater Manchester's universities and our uniquely devolved health and social care partnership between the NHS and local authorities. Everyone is working together on a three-point strategy:

1. Doing excellent research that delivers outcomes for patients

Our understanding of illness is being transformed by new techniques that describe how our bodies work combined with the collection of a greater depth of clinical information about individuals and the population. We will use these new insights to discover how to prevent disease, diagnose it earlier and treat it more safely and effectively using therapies that are personalised for each patient. MAHSC will work with the public to identify and focus on the areas of greatest need and will ensure that the best developments are rapidly adopted.

2. Growing Greater Manchester's healthcare strengths

MAHSC will improve and expand our existing facilities and create new institutions so that Greater Manchester becomes the best place in the UK to do health research. MAHSC will train and develop our workforce to

accelerate the introduction of new treatments and care pathways into hospitals and the community. Industry will be attracted to drive innovation and create new jobs.

3. Utilising clinical and social information

The NHS, social care and other public organisations generate a lot of information on individuals that is not fully used to prevent, detect and treat disease. MAHSC will develop methods that make best use of all this information for prevention and early diagnosis of illness, tailoring treatments to the individual patient, and monitoring their impact on society.

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.

Vision and Purpose
MAHSC will amplify the discovery and development of our best innovations and, through our integration within HInM, deploy them at pace and scale to improve health outcomes regionally, nationally and internationally, whilst upskilling our workforce and generating economic return for our city region.

Objectives & Deliverables

1. Innovation within a GM Person-centred Health Service

MAHSC will accelerate the delivery of a research-led, person-centred health service. We will promote interdisciplinary working and horizon scan for new opportunities within a culture of co-production with our citizens.

Short term, we will

- Focus our research on three challenges:
  Discovering novel biological, psychological and social mechanisms;
  Developing new approaches to prevention and early detection;
  Developing person-centred therapies, interventions and care pathways.
- Deliver a fully populated innovation pipeline supported by NIHR infrastructure and industry with three projects per year entering system deployment.

Medium term

- Use routinely collected patient data to evaluate the impact of domain innovations.
- Introduce a clinically-led system to horizon scan and signal the best innovations to the GMHSCP and national networks.

Long term

- Demonstrate continuous reductions in differential outcomes across quintiles of socioeconomic status for health priorities in GM localities.
- Implement new person-centred care models with major improvements in patient reported outcomes, that deliver healthcare efficiencies, and attract investment across GM with a 20% increase in Gross Value

Added from healthcare.

2. Expanding Manchester's capacity & capability

MAHSC will capitalise on its proven experience of working as a dynamic, integrated and aligned partnership to expand our research and innovation capacity (including materials science), accelerate health and care improvements and upskill our workforce. We will extend our PPIEP activity to ensure disadvantaged and 'seldom heard' groups and communities are part of all our research.

Short term, we will:

- Capitalise on the integration of our NIHR infrastructure to support the innovation pipeline, and ensure direct linkage to commissioners, providers. primary and social care.
- Develop and attract cost effective innovations for patient benefit by expanding our real world testing, 'first adopter' culture and capabilities, thereby enabling efficient access for industry partners to support the aims of the AAC.

Medium term

- Embed digital transformation competency training in all GM health professional undergraduate programmes; enhance workforce skills in digital technologies and data science through tailored CPD programmes (50% staff take-up); provide opportunities for all healthcare scientists and clinicians to undertake postgraduate research training through flexible learning.
- Deliver expanded NIHR programme renewals (BRC, CRFs, CRN, PSTRC) to amplify GM's impact on healthcare, using these to leverage five-fold additional funding.

Long term

- Demonstrate with at least four examples how MAHSC's managed pipeline approach reduces the timeline from discovery to deployment by 50%.
- Deliver cohesive organisations that link clinicians, clinical services, researchers, digital capabilities and patients to a long-term plan (as achieved for GM Cancer), and in at least two areas deliver an internationally recognised brand – Cancer Centre in the top 5 globally; an Immunity and Inflammation Centre with a focus on multi-morbidity.

3. Integrating our Digital Infrastructure

MAHSC will catalyse GM's digital transformation to make a step change in our interconnectivity and interoperability to drive innovations and develop new services to substantially increase the capability of our domains. Our PPIEP team will explore public trust for data sharing and tackle digital skills inequalities.

Short term, we will

- Make linked data from the integrated digital care record available for secondary uses, including research, and map, curate and publish data within NHS/NIHR infrastructure.
- Make a cloud-based Trustworthy Research Environment for secure data analytics available to researchers.

Medium term

- Optimise benefits for research from Electronic Patient Records (EPR) through collaboration with NHS partners, and establish Clinical Research Informatics Units at key NHS Trusts to enable deeper phenotyping from integrated healthcare records.
- Extend linked data from the regional Local Health Care Record (LHCR) to include public service data from across GM (e.g. police, fire departments, and transport).

Long term

- Use data-driven complex systems to plan GM's public services.
- Use real-time, granular, linked data to focus interventions and to evaluate the health and societal benefits of innovations.

Life Science and Local Industrial Strategies (LSIS, LIS)

The LSIS is inherently supported by MAHSC through translational research excellence, our University-NHS

partnership, and by anchoring companies in the locality. UoM and HInM's leadership were instrumental in setting the core themes of health innovation and healthy ageing for GM's LIS, one of only three regions with an agreed LIS. HInM now has a lead role on the GM LIS implementation group, ensuring that MAHSC is at the core of GM economic development.

Manchester's entire asset base (people, programmes, research and digital infrastructure, and property) is set up to deliver commercialisation capability to attract investment and talent with a focus on diagnostics and digital technologies. MAHSC's unique link to GMHSCP positions us at the centre of a population scale 'test bed' for national and international markets.

Strategic leadership is provided by the HInM Industry Advisory Group, chaired by the CEO of the Medicines Discovery Catapult. Additionally non-executive Directors on the HInM Board include the chair of the life sciences cluster group, BioNow, and the chair of the Manchester Growth Company.

An exemplar of MAHSC's place-based offer is Citylabs, a unique venture on the MFT site developed by Manchester Science Partnerships (MSP), UoM, MFT and commercial property partners to attract life science firms to a world-leading precision health campus. Qiagen is establishing its global genomics centre in CityLabs 2.0, creating 1,500 jobs and contributing £150m to the economy over a decade.

Accelerated Access Collaborative (AAC)

MAHSC will provide direct input to the AAC via our NIHR evaluation infrastructure, combined with major strengths in real world testing, as exemplified by NorthWest EHealth. New technologies will pass into the HInM innovation pipeline under the IPMC's guidance, and then into the GM Health and Social Care system. MAHSC's own member Trusts are positioned to be first adopters.

Distinctive contributions to the AAC include: MAHSC's partnership with NICE to provide advice on evaluation for digital health and artificial intelligence in the NHS (currently demonstrated by Datalab), the Innovate-UK Digital Health Catalyst, the iMATCH consortium, and the Qiagen collaboration. Future priorities are to ensure that GM and national NHS system needs are communicated and prioritised by MAHSC researchers and industry partners.

AHSN

Our AHSC, AHSN and ARC are co-located on the MFT campus (CityLabs 1.0), and organisationally embedded in HInM with a single PMO supporting all three. We are building a highly skilled workforce that appreciates the complexity of generating effective health innovations but understands how to navigate the system and use digital capabilities. This has already resulted in our AHSN becoming one of the top performers across the network.

Joint working between the AHSN Patient Safety Collaborative, our PSTRC and our digital team has enabled deployment of SMASH across GM. In addition, our domains provide our AHSN with academic and clinical expertise to prioritise discoveries for development and to identify programmes for national adoption.

Our ARC will work with our AHSC and AHSN to co-produce HInM's evaluation and implementation frameworks and support local and national evaluation of innovation.

Examples of active collaboration with other AHSCs and AHSNs include:

- Regular meetings of the current AHSCs that focus on development of joint initiatives where we can add to national agendas e.g. accelerated access, joined up digital programmes between the NHS and universities, and increasing research active clinicians.
- The development of healthcare technologies in collaboration with Birmingham and Cambridge Health Partners on a plan prepared by the Association of British Healthcare Industries.
- Our Digital Health Accelerator working with six other AHSNs.
- Engagement with Northern AHSNs to seek evaluated innovations that address joint needs.
- Joint events (e.g. STEP into Health and Bridging the Gap) with other AHSNs.

Workforce Development and Support

MAHSC, through collaboration with GM's four Universities, delivers education to >24,000 health and care

students. For the multidisciplinary and inter-professional CPD of GM's workforce, we have established cutting-edge methodologies for flexible and interactive online learning and, with HEE, we are pioneering new training and career pathways in genomics, informatics and AI to accelerate digital transformation. Furthermore the GM Universities are expanding their immersion, augmented and virtual reality infrastructure to support inter-professional learning.

MAHSC is actively engaging researchers from GM's Universities in its domains, with an increasing number of joint health publications (287 over the last five years). Our multidisciplinary 4-year funded doctoral training schemes are designed to address areas of clinical and translational importance. To engage and support research talent across professions, we have established integrated clinical lecturer positions for nursing and allied health professionals and offer six week research experience placements for NHS staff funded by our BRC.

MAHSC's partners are committed to exceeding the requirements of the Public Sector Equality Duty and ensuring staff are valued and respected, treated with dignity and have opportunities for personal and professional development. MAHSC's partners strive to reflect the diversity of GM's population and in 2019 UoM renewed its Race Equality Charter Mark. Implicit in this inclusive culture is positive impact on patient care, on meeting the needs of marginalised groups and eliminating discriminatory practice.

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.

MAHSC's overarching economic growth ambition is to contribute significantly to GM's strategy of increasing its R&D to GDP ratio from 1% to 2.4% through local partnership working with industry to support the LSIS, AAC and GM's LIS. This is exemplified by our partnership with Qiagen, that has brought together the GM system with clinical and academic strengths in genomics and data science to establish a new biomarker industrialisation business.

These activities will be directed by MAHSC's Industry Lead, who also leads for the BRC and for FBMH, and will be overseen by the HInM Industry Advisory Group. Collectively, MAHSC provides a unified system for industry to engage with our partners including the Universities and GM's health and care assets, and with the Northern Health Science Alliance (an academic-NHS partnership across a population of 16m), which works closely with the Northern Powerhouse.

GM offers a unique test bed and strong patient assets (e.g. cohorts, clinician insight, bio-sample set or dataset) as a microcosm of a global health system that can track outcomes against interventions in all major disease areas. We are working closely with industry to co-locate SMEs with Universities and NHS Trusts to find solutions to health needs which can then be spread across an international network. MAHSC, UoM and GM have established strong links in China, India and North America.

MAHSC, via HInM, engages with the Local Economic Partnership (LEP), MSP (the largest property company for the life sciences, including in its portfolio Citylabs and the nearby 400 acre Alderley Park life sciences campus), and three Manchester companies dedicated to economic development, inward investment, skills, employment and enterprise, to support co-location of industry with our partners. For example, the 'Oxford Road Corridor' is a one square mile LEP-designated innovation quarter that is home to 79,000 employees (11% growth 2015-19), 8,800 businesses (61% growth 2012-18) and contributes £3.6bn (20% of Manchester's GVA). The area has a significant concentration of life sciences businesses accounting for 50% of Manchester's and 23% of GM's businesses in this sector. In addition, plans for 'Innovation District Manchester' are underway to create a dynamic, world-class community with innovation, collaboration and enterprise at its heart on a 26 acre site on the edge of the city centre.

The importance of 'place' to anchor investment is further exemplified by the Alderley Park Partnership consisting of the Medicines Discovery Catapult, MFT, MSP and HInM. This partnership hosts exceptional clinical, industry and scientific assets in innovative diagnostics. 66 such companies, including 24 with existing UoM collaborations (12 of which are UoM spin-outs), contribute 55% of the sector's GVA in the NorthWest.

The HInM Industry Advisory Group creates a central route for commercialisation and market entry. Our innovation pipeline, which is overseen by the IPMC, is fed by a number of routes, including the MAHSC domains, the BRC's

Rapid Translational Incubator, the GM Clinical Research Network and HInM's Innovation Nexus (Exchange). It supports over 100 SMEs per year and has assisted over 500 companies since launch.

This pipeline is supported by other specialist groups, working to shared goals and objectives, with most co-located on the MFT-UoM campus:

- **Biopharma**: iMATCH; Centre of Excellence in Biopharmaceuticals; Drug Discovery Unit (CRUK); UoM Cell and Gene Cleanroom Facilities;
- **MedTech**: Stoller Biomarker Centre; Diagnostics and Technology Accelerator (DiTA); 'Manchester: Improving Medicine with Innovation Technology' (MIMIT); Innovate UK Centre of Excellence for Precision Medicine and GM Centre for Genomic Medicine;
- **Artificial Intelligence, Data and Real World Evidence**: NorthWest EHealth, Digital Accelerator, Health e-Research Centre (HeRC), Connected Health Cities.

All are linked operationally to provide a coordinated industry access system, bespoke commercialisation support, extending to real world trials, health economic evaluations, and a route to the NHS as early adopters.

The power of our system is recognised in the Memorandum of Understanding (MoU) between HInM and the Association of the British Pharmaceutical Industry, a UK first. Early outcomes include innovative partnerships across areas such as COPD, Hepatitis C, virtual biologics and mental health. A similar MoU has been signed with the Association of British HealthTech Industries which facilitates working with life sciences companies.

Commercialisation expertise for 'home grown' innovation is provided by UoM's technology transfer organisation, UMI3, which has one of the most consistent and high-volume, high-quality pipelines of intellectual property (IP) propositions of UK universities – over the last five years: 49 new patents filed; 81 commercial licences; 1,486 research licences; nine spin-outs. This is facilitated by the MAHSC IP Policy and a streamlined contracting process with industry.

To monitor KPIs and benchmark our performance, the HInM Industry Advisory Group, and upward to the HInM Board, will receive and review a variety of metrics collected biannually overseen by the MAHSC Industry lead including industry funding, IP generation, number of licences, number of spin outs, investment leveraged, SME assists and jobs created.

Several current initiatives are focused on developing capability and capacity in innovative diagnostics and digital health and will provide a strong, proactive base to accelerate and expand new industry growth opportunities and person-centred health and care solutions. These include:

- **The Christabel Pankhurst Institute for Health Technology**: This £25m development in the heart of the UoM campus (including £5m support from the GM LEP) will maximise our academic strengths in digital health and advanced materials to discover innovative health and care solutions in line with the GM LIS. The Institute will drive business growth, employment and health benefits.
- **SME Campus at Citylabs 3.0**: This development will support innovative diagnostics with its focus on genomic innovation, linking with MAHSC, Qiagen's genomics hub, MFT's fast-track procurement unit and DiTA. Citylabs 4.0 will be established in the next 5 years, signalling our longer-term economic ambition.
- **Paterson Cancer Institute rebuild**: This £150m building, in part funded by UK Research Partnership Investment, will maximise collaboration between cancer research groups, scientists, clinicians, AHPs and trial teams to speed up development of new diagnostics and treatments. The total GVA for GM generated by the employees is estimated at £59m.

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.

MAHSC has contributed to the development of a city region digital strategy in partnership with the GMHSCP and GM Combined Authority. At the heart of this is the GM integrated digital care record (GMIDCR): interoperable, linked, longitudinal care records across all health and social care providers, for the whole GM population, that can be used for direct care and population health management with live data feeds from GPs, hospitals, mental health, community and social care. The GMIDCR enables:

- Improved information at the point of care.
- Analytical capabilities to meet the needs of research, policy makers, and industry.
- Innovation via digital transformation, underpinned by HInM's system engagement and innovation pipeline management.
- Measurement of the impact of interventions and innovations.

HInM has a major role in digital delivery on behalf of the city region, and in future will have delegated responsibility for multiple programmes ensuring that MAHSC will continue to attract investment and will drive the use of digital assets across GM, and that analysis of healthcare outcomes will focus research activities for the benefit of our citizens. Our clinical domains are directly connected to our digital infrastructure through HInM.

NHSE's award of LHCR status to GM is accelerating and expanding the scope of the programme to link data across public services, including police, fire and transport. Importantly, we have already procured the system to deploy a master citizen index to create a single identifier. The LHCR programme includes provision of an analytics platform to enable complex approaches to service improvement, multi-morbidity, public health, and policy evaluation.

Digital maturity across MAHSC partners is continually improving with procurement of a comprehensive EPR system by MFT, with research requirements considered from the outset. The Christie has developed a new partnership with Flatiron and Roche for AI/machine learning and deployed patient reported outcome systems. Through their Global Digital Exemplar programme, SRFT is enhancing its existing digital maturity by creating a 'Future Digital Factory' and a novel command centre to address operational problems in specific areas such as inpatient flow .

Through our BRC, we have joined the Health Informatics Collaborative, and developed national partnerships in various areas, including musculoskeletal disorders, hearing health, viral hepatitis and colorectal cancer, for extracting deep phenotypic data from hospital EPRs. MAHSC has further established capacity building initiatives including internal recruitment of expertise and providing additional investment in workforce development to underpin future data analytics including AI/machine learning.

7. Administrative contact details

Administrative contact name	Dr Jonathan Massey
Administrative contact job title	Programme Development Lead
Administrative contact telephone number	[redacted]
Administrative contact email address	[redacted]@healthinnovationmanchester.com

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