Department of Health

ACADEMIC HEALTH SCIENCE CENTRES

PRE-QUALIFYING QUESTIONNAIRE

Note: The accompanying *"Academic Health Science Centres - Invitation to Submit Pre-qualifying Questionnaire"* contains essential guidance on the information you need to provide when completing this proforma.

Please adhere to the page limits stated within each box. Only information submitted up to this page limit can be assessed. Please do not alter the margins of this proforma.

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

All fields must be completed.

Please insert your unique Reference Number into the Footer space provided.

1. DETAILS OF THE PROPOSED ACADEMIC HEALTH SCIENCE CENTRE (AHSC)

Name of the English NHS Provider/University Partnership:

Cambridge University Health Partners

Name, email and telephone number of the Lead Contact for the proposed AHSC:

Professor Patrick Maxwell FMedSci
Regius Professor of Physic & Head of the University of Cambridge School of Clinical Medicine

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Please list the members of the partnership involved in the proposed AHSC:

University of Cambridge
Cambridge University Hospitals NHS Foundation Trust (CUH)
Cambridgeshire and Peterborough NHS Foundation Trust (CPFT)
Papworth Hospital NHS Foundation Trust (PH)

2. STRATEGIC PARTNERSHIP (2 pages)

Please provide a brief overview of the NHS provider/university partnership which will support the proposed AHSC:

Members of the partnership: Cambridge University Health Partners is a partnership between the *University of Cambridge* and three NHS organisations: *Cambridge University Hospitals NHS Foundation Trust (CUH), Cambridgeshire and Peterborough NHS Foundation Trust (CPFT)* and *Papworth Hospital NHS Foundation Trust (PH).* CUHP brings together one of the world's leading universities and three high-performing NHS Foundation Trusts. The primary partnership is between the School of Clinical Medicine (SCM) and the NHS, although there are increasing interactions with other Departments across the University. In terms of research grants and contracts, SCM is the largest of the six Schools of the University, accounting for ~ £118m of the University's ~ £320m activity. The three NHS partners serve local services for a population of ~0.75 million, regional services for up to 5.5 million people, and specific nationally contracted services.

In March 2009 the partnership was one of only 5 UK centres to be designated as an Academic Health Science Centre following a competitive process judged by an international selection panel.

The track record of the partnership: A strong partnership between the NHS and the University of Cambridge has been integral to the successful establishment of a clinical medical school in less than 40 years which is world leading (ranked no.1 in the Academic Ranking of Worldwide Universities in Clinical Medicine and no.2 in the QS rankings in Medicine in 2012). The School of Clinical Medicine was only established by the University in 1976; prior to that students from Cambridge all undertook their clinical training elsewhere, mainly in London. From the outset, SCM has shared the new Addenbrooke's site in South Cambridge with the NHS. The site is also shared with a range of world-leading research institutions, notably the Medical Research Council (MRC) Laboratory for Molecular Biology, a number of other MRC Centres and Units, and the Cancer Research UK Cambridge Institute which joined the University in 2013. There is also an industrial presence on the site with the GSK Clinical Unit Cambridge which has been headed by Ed Bullmore since 2005; he is Professor of Psychiatry in SCM and Honorary Consultant with CPFT, and has been on a full secondment to GSK as Vice President for Experimental Medicine since 2005. The MRC LMB, MRC Units, GSK and Cambridge Medipark Ltd have a formal status as Campus Associates of CUHP.

The site benefits from being part of a much wider cluster with remarkable capability for innovation. Within a small geographic area are the multi-faculty University of Cambridge, the Wellcome Trust Sanger Institute, the European Bioinformatics Institute, the Babraham Institute and Research Campus, and several science parks. Furthermore, Astra-Zeneca announced recently that it is relocating its world headquarters to the Cambridge area and developing a new global research and development centre here.

The CUHP partnership has a very successful track record across the full spectrum of excellence in clinical care, fundamental biomedical discoveries, translation to improvements in diagnosis and treatment, and training the next generation of outstanding clinicians and scientists. This is particularly illustrated by our approach to developing the campus, and an integrated approach to developing translational research capacity (see section on the Biomedical Research Centre, below). Since 1999 CUH, the University and MRC have been jointly committed to a strategy of expansion and development of their shared site as the 'Cambridge Biomedical Campus' (CBC), envisaged as a location of international stature for clinical care, research and education. This strategy has been successfully prosecuted and planning permissions and development agreements have been secured as part of a **2020 Vision** which is doubling the size of the campus to 140 acres.

CUHP is also playing an important strategic leadership role in the NHS. Throughout 2012 and 2013, a major priority for CUHP has been leading the development of the Eastern Academic Health Sciences Network. This is an extended, highly inclusive network involving other academic partners and 20 organisations delivering health and social care for 4.5 million people in the East of England. Members include acute and mental health trusts, primary care, clinical commissioning groups, Health Enterprise East and patient and service user representatives. The formal prospectus (http://www.cuhp.org.uk/publications/EAHSN-Prospectus-and-Business-Plan-2012.pdf) proposed a novel, highly devolved model reflecting the strengths of four natural clinical and biomedical communities (termed 'nodes') in Cambridge and Peterborough; Norfolk and Suffolk; Hertfordshire and Bedfordshire; and Essex. This maximises the scope for local engagement and ownership, and provides the optimum environment for the EAHSN to deliver wealth creation, and adoption and diffusion of innovation. Informal feedback from the interview with DH and national industry partners in January 2013 indicated that the EAHSN application was probably the strongest of the 15 nationally because its sharp focus on working with industry will deliver economic growth and wealth creation; it has recently been granted its license without conditions. Our four organisations (UoC, CUH, CPFT, PH) will be important contributors to the EAHSN agenda. In parallel, CUHP will concentrate on developing its position as a world leading academic health science centre delivering innovation in biomedical discovery, education and training, and advanced patient care.

Three specific examples of strategic alignment leading to deliver added value:

(1) *Partnership with NIHR to develop comprehensive infrastructure for translation, through our NIHR Biomedical Research Centre (BRC) and NIHR Collaboration for Leadership in Applied Healthcare Research (CLAHRC).* The strategic alignment of CUH's research strategy with that of SCM enabled us to secure a £67m award to become one of only five National Institute for Health Research (NIHR) Comprehensive Biomedical Research Centres (BRC). The success of the Cambridge BRC was recognized in 2012 with a very substantial uplift in funding to £110m for the period 2012-2017. Importantly, the BRC award supports research activity in the cardiovascular and mental health domains, thereby underpinning research with CPFT and PH and extending across the whole CUHP partnership. In 2012 we were also awarded a new Biomedical Research Unit focused on dementia, a field in which the partnership was identified as a national research leader. Cambridge BRC investment has facilitated, and in many cases provided full investment for, a wide-reaching research infrastructure that includes the Core Biomedical Assay Laboratory, Cambridge NIHR Genomics CoreLab, the GMP Resource for Stem Cells and Regenerative Medicine, Haematology Translational Research Laboratory, the Herschel Smith Building for Brain and Mind Sciences, MRI core facilities, PET/CT, the Human Tissue Bank, the Cambridge BioResource and the Addenbrooke's Clinical Research Centre. The latter consists of the Wellcome Trust Clinical Research Facility and the Clinical Investigation Ward and provides outstanding facilities, including a 3T MR scanner dedicated to magnetic resonance spectroscopy, an appetite laboratory and nutrition resource, a research endoscopy suite and an area dedicated to intravenous treatment including cancer chemotherapies. Similarly, alignment of our research strategies led to the award of a very successful NIHR CLAHRC (see section 3). Building on the success of the initial CLAHRC, the application for a new CLAHRC for the East of England includes a comprehensive plan to drive NIHR's Cambridge investments from T1 translation, through T2 and into policy and practice.

(2) The Clinical Academic Training Office (CATO) which provides core administrative support to academic training pathways for clinicians across the partnership. CATO provides an effective interface both with multiple aspects of CUHP and with bodies that oversee clinical responsibilities including the East of England Deanery (now replaced by Health Education East of England). Each clinical academic trainee has to interact with many organisations which can be very challenging. CATO helps candidates to navigate this complexity and matches training requirements to appropriate funding. Through this 'joined-up' approach CATO is now responsible for the day-to-day administration of eight major programmes; it reports on over £20M funding and looks after over 300 trainees.

(3) Formation of The Institute for Metabolic Sciences (IMS). The IMS is led by Co-Directors Professors Stephen O'Rahilly and Nick Wareham. Purpose built clinical and laboratory facilities opened on the Biomedical Campus in 2007 are dedicated to research, education, prevention and patient care in the areas of obesity, diabetes and related diseases, all of which are major and increasing threats to global public health. Almost a quarter of all adults and one in five children in the UK are considered obese, and these numbers continue to increase. Obesity significantly increases the risk of developing life-threatening conditions such as Type 2 diabetes, cardiovascular, gastrointestinal, osteoarticular and reproductive diseases, reducing both quality of life and life expectancy of affected individuals. The IMS provides outstanding clinical facilities including specialized services for childhood obesity and the national referral centre for severe insulin resistance. These are fully integrated with world-leading research bringing together clinicians, laboratory and clinical scientists and epidemiologists to forge the multidisciplinary links that will improve understanding of the causes and consequences of these conditions and allow advances in basic science to be rapidly applied to improving patient care and disease prevention. Since its formation IMS scientists have made numerous discoveries identifying genetic variants and mutations that contribute to obesity, the mechanisms by which they influence behaviour and metabolism. Several of these are being investigated as potential therapies. Recently the Wellcome Trust and MRC made a joint £15m Strategic Award to the IMS, including funding for new dedicated clinical research facilities, and on 1st May the MRC Epidemiology Unit became a University Unit within the SCM.

3. ACADEMIC HEALTH SCIENCE CENTRE PROPOSAL (3 pages)

Please provide a brief overview of the strategy and vision for the proposed AHSC:

Vision. The Cambridge AHSC will be a world-leading academic clinical partnership, improving patient care, patient outcomes and population health through innovation and the integration of service delivery, health research and clinical education. We will be a centre of excellence that provides outstanding care to our local population, and has a global impact on health.

Purpose. The purpose of our AHSC is to generate, transmit and apply knowledge for improvement in health and health care. Each strand of the tripartite mission (care, research, education) will strengthen the other to create capability and build capacity towards this purpose.

Goals. Our strategic goals include knowledge generation; building research capacity; fostering innovation in service delivery; knowledge application for health and healthcare improvement - embedding translational and applied research in service; promoting a service culture of systematic enquiry and openness to innovation; engagement of our people in mechanisms for developing, diffusing and applying evidence for improvement; alignment of service between partners and with the academic mission; knowledge transmission - providing a shared setting for the education, training and development of healthcare professionals and the wider healthcare workforce that is characterised by systematic enquiry and a commitment to the use of evidence in practice; contributing to a knowledge-based economy and the economic and social development for the benefit of the Cambridge sub-region, the East of England and the UK as a whole; fully engaging with the attributes that make the Cambridge sub-region notable as a system for innovation.

Deliverables. Over the next five years specific deliverables will include the following major construction projects on the biomedical campus; (1) a complete new build for Papworth Hospital (2) a new Heart and Lung Research Institute (3) a new Institute for Stem Cells and Regenerative Medicine (4) the Forum, which will include a hotel, private hospital and world-class education centre housing state-of-the-art simulation facilities and a cadaveric training centre (5) a £100m UoC pre-clinical translational medicine facility for the School of Biological Sciences and SCM. Additional major deliverables will be (1) the implementation of a £200m eHospital system, led by CUH in partnership with PH, which will transform the ability to use clinical data both for research and service improvement (2) the expansion of SCM to allow all medical students admitted to Cambridge to undertake their clinical training here (3) relocation of selected CPFT mental health services to the CBC.

Supporting strategies. Following the development of the EAHSN we have refreshed our strategy within CUHP to focus on developing specific platforms for effective collaboration and integration. In particular, we have determined that CUHP will deliver on those goals which go beyond the capability or capacity of any single organisation amongst the four partners; ie CUHP's focus will be on areas where joint working is essential. In addition, the four partners have agreed that wherever possible they will align their strategies and decisions to help deliver CUHP's collective vision. Our approach over the next five years can be summarised as "local integration for global impact".
CUHP is a not-for-profit legal entity governed by a Board of Directors which includes the Chair and Chief Executive of the three NHS Foundation Trusts and the Vice-Chancellor, Registrary (Senior Executive Officer) and Regius Professor of Physic (Head of SCM) from UoC. In addition there are three senior clinical academic leaders on the board, one nominated by each NHS organisation; currently these are Professors Bradley (Transplantation), Neal (Surgical Oncology) and Jones (Psychiatry). This structure ensures that CUHP is an organisation that is owned and driven by its four members. The board has an independent chair (currently Sir Keith Peters) and an international adviser, Professor Louise Gunning-Schepers (President of the Executive Board of the University of Amsterdam and former President of the Amsterdam Medical Centre). CUHP is designed to harness "bottom-up" creative thinking from people across our four organisations by coupling this with "top-down" assessment, prioritisation, resource allocation and buy in from the senior leadership.

To deliver on its strategic objectives, CUHP is developing four workstreams centred on (1) research (2) education (3) fundraising (4) campus development. These will optimise our capability as a world-leading partnership addressing disease areas selected on the basis of health burden and on our research capabilities, which are cancer, neurosciences & mental health, infection and immunity, metabolism and cardiovascular disease. Each of the four workstreams is led by a CEO from one of the four partner organisations. The research workstream is the responsibility of the Regius Professor of Physic (Head of SCM) and will oversee the following; (1) progressive harmonisation and streamlining of R&D governance processes across the organisations (2) developing coordinated support for industry liaison and translational funding streams (3) improving access to patient data (4) talent management of the best students and early career researchers (5) remodelling clinical pathways and services wherever this will both support more effective R&D and improve patient experience and outcomes. The education workstream led by Dr Attila Veigh (CEO CPFT) oversees (1) progressive implementation of technology-enhanced learning through an e-learning platform, expanding clinical simulation, and supporting on-line learning including telepresence (2) establishing a healthcare management and leadership programme (3) formation of a Centre for Healthcare Education which will include revision of selected postgraduate medical training programmes in partnership with HEEoE to move these to world-class standard including the possibility of bridging specialty boundaries (for example the different specialisms relevant to cancer treatment). The fundraising workstream is overseen by Dr Keith McNeil (CEO CUH) and will bring together the philanthropic fundraising operations of three NHS organisations and UoC into a single entity, aiming to more than double our income from this source. A key part of this workstream will be developing explicit cases for support and spending priorities for each of our disease-related themes. This will both require and stimulate extensive “bottom-up” engagement to determine specific expenditure that would transform aspects of clinical care and our research capability. Finally the campus development workstream overseen by Mr Stephen Bridge (CEO PH) will develop a new master plan for the campus which will complete the transition from a successful piecemeal approach to a concerted plan to exploit fully our opportunity to develop the campus as a world leading environment for patient care, discovery science, translational research and state-of-the-art training. Importantly, besides continuing to develop the facilities necessary for the activities of the four partnership organisations we consider it crucial that the campus benefits from the presence of a range of other organisations with complementary capabilities, including independent research institutes, biotech companies, incubator space and large pharmaceutical companies. The campus development workstream will foster interactions with other relevant organisations based on the campus and nearby, including the MRC Institutes and LMB, Cambridge Medipark Ltd, UoC Departments of Chemistry, Physics, Engineering, Maths & Computer Sciences, the Babraham Institute, the Wellcome Trust Sanger Institute, and the European Bioinformatics Institute.

Nesting within the Eastern Academic Health Sciences Network. CUHP’s leading role in the development of the EAHSN is described in Section 2 above. Chaired by Sir Michael Rawlins, the EAHSN will lead a transformational programme of work that will benefit the Cambridge sub-region and the East of England as a whole. Each of the three NHS organisations within CUHP is an important component of the EAHSN, and for a number of aspects it will be important that they engage separately and regionally, rather than collectively with the network to enable the EAHSN to meet its challenges. Locally, it will be crucial for our population that CUH and CPFT - as the major providers of acute hospital services and mental health services – engage with the commissioners, with primary care and with local government to consider new approaches to providing appropriate care for the frail elderly and patients with chronic conditions. In contrast, PH’s major roles are as a regional and national provider and will be engaged with the entire EAHSN to ensure appropriate access to state-of-the-art advanced cardiac interventions.

CUHP contains a very high proportion of the world-class research capability within the EAHSN, and will play a crucial role in industry engagement and wealth creation right across the geographic span of the network. Similarly, engagement of our four partner organisations with the education agenda of EAHSN is likely to be most appropriate through CUHP. University of East Anglia (UEA) is the only other medical school in the network, and we envisage that UEA and CUHP will work closely with CCG’s across the network and with HEEoE to ensure that our undergraduate and postgraduate medical training addresses the future needs of NHS providers and the population across the network. In terms of research capacity that is specific to the needs of the EAHSN, UEA and Cambridge’s SCM have made strategic and complementary investments in health services research and are jointly leading an application to NIHR for a new CLAHRC East to be hosted by CPFT and aligned to the EAHSN. In partnership with RAND Europe the Cambridge SCM has developed

the Cambridge Centre for Health Services Research which was ranked second worldwide in the 2012 Global GoTo think tank report. Furthermore, we have great strengths in epidemiology and public health that will be valuable to the EAHSN, and will assist in forming an ideal "population laboratory" in which CUHP investigators will answer some of the most important health questions facing society. Crucially these questions simply cannot be addressed in secondary/tertiary care organisations; they require the systems approach and comprehensive population coverage of the EAHSN.

Relationship to other AHSN's. CUHP was the lead author of a discussion paper 'From Academic Health Science Centre to Academic Health Science System'. Many of the concepts and ideas advanced in this paper were incorporated into two reports 'Innovation, Health and Wealth' and 'A Strategy for Life Sciences', published in December 2011. CUHP has contributed to the development of AHSNs nationally, through ongoing interaction with the Innovation Health and Wealth Board, providing advice on the Licence between the AHSNs and NHS England and in developing a 'network of networks' for AHSNs, through work with the NHS Confederation and AUHUK. CUHP has extensive interactions with other AHSN's, which will be developed further. CUH was instrumental in forming the Shelford Group of major teaching hospitals which has proved highly effective, particularly in benchmarking multiple indicators. An established research partnership between CUHP and UCLP involves a Strategic Award from the Wellcome Trust for the Neurosciences in Psychiatry network. Two evolving relationships are;
(1) The development of an effective cluster centred on London. UoC, Oxford, KCL, Imperial and UCL have worked together as the Global Medical Excellence Cluster (GMEC) which led the development of Imanova as a national facility for molecular imaging research, and is now addressing interfaces with major pharmaceutical companies across the rare disease landscape.
(2) The development of a national approach to rare diseases and bioresources. The Cambridge BRC has played a major role in developing a national approach to rare diseases and bioresources.

Pharmaceutical companies, healthcare innovation and capital investment are all increasingly mobile across the globe. For Cambridge and the UK to compete we require effective joint working to ensure that our strengths and capabilities are not constrained by intra-national inefficiencies and unproductive competition. To this end, CUHP will work effectively with the NHS, academic and industrial organisations. Building on our current initiatives we envisage a major role for CUHP in interfacing with other AHSN's to increase the effectiveness and capacity of the overall "network of networks", and to coordinate a national approach to rare diseases which is world-leading.

4. VOLUME, CRITICAL MASS AND WORLD-CLASS EXCELLENCE IN BASIC MEDICAL RESEARCH AND THE ABILITY TO TRANSLATE FINDINGS INTO EXCELLENT TRANSLATIONAL, CLINICAL AND APPLIED RESEARCH ACROSS A RANGE OF INTERESTS (3 pages)

Please provide evidence of appropriate track record and capacity in research and translation to clinical and applied research

Volume and critical mass of excellent world-class basic medical research;

The volume and critical mass of world-class research is reflected in metrics which consistently rank the University of Cambridge amongst the top five biomedical research organisations worldwide, and by the scale of research spending and investment across CUHP, and is enhanced by our partnerships with key external organisations. In the UK's last Research Assessment Exercise (2008), Cambridge had the highest GPA (3.11) of all UK medical schools across biomedical and clinical research, and was ranked highest in the following individual Units of Assessment (UoA); Laboratory Based Clinical Subjects, Epidemiology and Public Health and Psychiatry and Neurosciences. The University anticipates that it will return ~500 Category A FTE's in the 2013 Research Excellence Framework across UoA 1 (Clinical Medicine), UoA 2 (Public Health, Health Services and Primary Care), UoA 4 (Psychology, Psychiatry and Neuroscience) and UoA 5 (Biological Sciences). The forecast total annual direct expenditure for 2013/14 of UoC's School of Clinical Medicine and School of Biological Sciences is ~£290m. This comprises £198m derived from research grants and contracts, £50m derived from General University funds (HEFCE grant, student fees, general donations).

Biomedical scientists at the University of Cambridge have achieved many markers of esteem. Amongst current employees who will be returned in REF2013, the University includes 60 Fellows of the Royal Society across biomedical disciplines, and 80 Fellows of the Academy of Medical Sciences. Within the last five years major international awards to Cambridge academics include the 2012 Lasker Clinical Medical Research Award for Sir Roy Calne for his pioneering work on liver transplantation, the 2008 Lasker Basic Medical Research Award for Sir David Baulcombe for gene silencing small RNAs, and Nobel Prizes for Medicine or Physiology to Bob Edwards (2010) for in vitro fertilisation and Sir John Gurdon (2012) for work on nuclear transfer underpinning stem cell programming.

Over recent years, CUHP has invested strategically to create additional areas of critical mass, including; health services research, cardiovascular biology and global health. In health services research we have set up the Cambridge Centre for Health Services Research. The Institute of Public Health was one of the founder members (based on research merit) of NIHR School of Public Health Research. Cambridge was also recently one of six BHF Centres of Excellence in Cardiovascular Research across the UK, and in a joint bid with Oxford one of three BHF Centres for Regenerative Medicine. Cambridge was also recently awarded one of five Centres for Global Health Research by the Wellcome Trust.

World-class biomedical research facilities are provided not only through the Departments of the University, but also by several Institutes which are largely funded through major external awards. These include (1) the *Cancer Research UK Cambridge Institute* (2) the *Cambridge Institute for Medical Research* supported by a Wellcome Trust Strategic Award, and a second Strategic Award to the *Juvenile Diabetes Research Foundation / Wellcome Trust Diabetes and Inflammation Laboratory* (3) the *Wellcome Trust/MRC Institute of Metabolic Science*, which includes the Wolfson Diabetes and Endocrine Clinic, the Weston Centre for Childhood and Adolescent Diabetes and Endocrinology and the *MRC Epidemiology Unit* (4) *The Institute of Public Health* and associated *Strangeways Research Laboratory* (5) *Wellcome MRC Stem Cell Institute* (6) *The Wellcome – CRUK Gurdon Institute*.

The strength in biomedical research benefits from extensive interactions with other organisations located in Cambridge or nearby, many of which are Campus Associates of CUHP. In addition to the *MRC Laboratory of Molecular Biology*, MRC Units in Cambridge that work closely with the University and CUHP are the *Biostatistics Unit*, the *Human Nutrition Research Unit*, the *Mitochondrial Biology Unit*, the *Cancer Cell Unit* and the *Cognition and Brain Sciences Unit.* Our rare disease research, immunology, cancer and infectious diseases research benefit from extensive interactions and joint appointments with the *Wellcome Trust Sanger Institute (WTSI),* one of the world's leading genomic research centres. Other key partnerships are with the *European Bioinformatics Institute* and *the BBSRC Babraham Institute.*

The excellence of biomedical science and the strength of the partnership is also exemplified by the success of the *NIHR Cambridge Biomedical Research Centre* (BRC, described in Section 2 above), a major research collaboration between CUH and the University of Cambridge, in partnership with CPFT and PH. Established in 2007, the BRC was reviewed by an international panel in 2011 and re-designated as a NIHR BRC with an ~40% uplift to £110m funding for the period 2012 - 2017. The panel concluded that the partnership between CUH and the University of Cambridge represented the UK's primary academic resource in biomedical research. The BRC provides extensive infrastructure support facilitating the bidirectional translational

interchange between the biomedical science base in Cambridge and experimental medicine. “Gap 1” translational facilitation is also enabled by the *NIHR-CRUK Cambridge Experimental Cancer Medicine Centre* and *NIHR Cambridge BRU in Dementia* which are complementary to the NIHR Cambridge BRC. The *Addenbrooke’s Clinical Research Centre* comprises the *NIHR Clinical Research Facility (CRF) for experimental Medicine* and a dedicated *Clinical Investigation Ward*. CUH has been awarded over £10m funding from 2012 to 2017 to support the CRF. The BRC has invested in the *Clinical Trials Unit***,** which was established under CUHP and attained provisional registration with the UK Clinical Research Network in 2012, and will apply for full membership in 2013. The Cambridge BRC has led establishment of the *NIHR BioResource*, which provides a national cohort of volunteers willing to be recruited to academic and industry led studies on the basis of their genotype and/or phenotype. In parallel the Cambridge BRC is leading, with Newcastle BRC, the establishment of the *NIHR Translational Research Collaboration in Rare Diseases*, which will facilitate collaboration between NHS organisations and NIHR infrastructure, research funders and the life science industry to support research into rare diseases.

Track record / ability to translate discoveries from basic research into world-class early translational, clinical and applied health research across a range of interests.

Translation of basic research into world class clinical and applied research is facilitated by the *BRC*, the *Clinical Research Networks* and the CLAHRC. The *CLAHRC for Cambridgeshire and Peterborough* is hosted by CPFT and the University component includes the Department of Psychiatry, the Institute of Public Health, the *Judge Business School* and the *Engineering Design Centre*. The CLAHRC focuses on “Gap 2” the application of research to every day practice in mental health and disability care.

The following examples illustrate effective translation into policy and practice. Further examples of effective translation are provided in subsequent sections.

- Professor Gordon Smith’s work on predictors of outcome in pregnancy has informed NICE Guidelines (*Induction of Labour* and *Caesarean Section*).
- A Cambridge led trial demonstrating that machine perfusion offers no advantage over cold storage in renal transplantation was used in preparing NICE technology appraisal guidance 165 "Machine perfusion systems and cold static storage of kidneys from deceased donors".
- A comprehensive risk prediction algorithm for familial breast and ovarian cancer (BOADICEA) was recommended in 2008 by NICE as a risk model for familial breast cancer, and by the American Cancer Society in 2011.
- Clinical IT and surveillance systems developed in the CAMEO early intervention service for psychosis (www.cameo.nhs.uk) supported by the Wellcome Trust have tracked psychosis incidence in a population sample generating Bayesian models of sociodemographic risk factors and providing precise estimates of incidence for national policy and service planning (www.PsyMaptic.org).

Track record of translating research in disciplines such as engineering, computer science and material science, and integrating into excellent translational, clinical and applied research for patient benefit to improve health and healthcare delivery.

There are strong links between CUHP and basic science departments, exemplified by centres such as the Cambridge Centre for the Physics of Medicine, and the Engineering Design Centre which has a key focus on engineering safe systems in healthcare. Specific examples of effective translation include:

SenseCam: Microsoft Research (Cambridge UK) developed a wearable camera that captures still images every 20 seconds. A partnership between Cambridge University and Microsoft Research and other collaborators is investigating the use of the SenseCam to support rehabilitation in day-to-day life following brain injury including prospective memory problems, problem solving deficits, impulsivity and poor emotional adjustment. Further software will integrate ECG and SenseCam data to identify emotionally interesting sections of sensecam movie and thereafter conduct feasibility studies of rehabilitation interventions for executive problems (goal management training) or mental health issues.

ICM+ (www.neurosurg.cam.ac.uk/icmplus) is a software tool for research in neurointensive care. It allows researchers to access and analyse data generated in a modern neurointensive care setting. The development of ICM+ is ongoing with the help of a worldwide network of collaborators. 61 non-exclusive licences have been granted to other research institutions worldwide.

3-D bone mapping: a collaboration with the Department of Engineering led to development of a novel, patented, technique that has shown that thinning of the femoral neck in women with hip fracture is highly focal, with the location of thinning correlating with whether a fracture occurs at trochanteric or femoral neck sites.

^{13}C hyperpolarised MRI was developed in Cambride and provides a 10,000 fold increase in sensitivity over conventional MRI, and through the use of ^{13}C labelled metabolic intermediates such as fumarate,

provides metabolic information about tumours in real time. Kevin Brindle has been awarded a £5.3M grant from the Wellcome Trust to take ^{13}C hyperpolarised MRI imaging to the clinic

How the research excellence of the proposed AHSC will strengthen the ability to translate research into improved patient care across a range of interests, including how this will support the proposed strategic objectives of the AHSC;

The breadth of expertise and facilities across CUHP provide an outstanding environment for translation of excellence in research into patient care. The AHSC provides a framework for the partnership to continue to work effectively to exploit synergies across shared infrastructure and resource, and build capacity throughout the research pathway.

Three examples which display the partnership's translation of world-class excellent basic research into excellent translational, clinical and applied health research leading to excellent patient care and patient outcomes;

Inherited forms of early onset obesity: Stephen O'Rahilly and colleagues co-ordinated the first proof-of-concept clinical trial of recombinant human leptin in patients with severe, life-threatening obesity due to congenital leptin deficiency, and now offer this treatment to patients worldwide on a named-patient basis. Further studies in patients with severe early-onset obesity have led to comprehensive descriptions of several monogenic obesity syndromes, which are beginning to alter approaches and attitudes to childhood obesity, reducing the associated stigma among medical and social service professionals. In several cases, identification of pathogenic mutations by the Cambridge group has prevented severely obese children from being removed from their families and placed into the care of social services, under the assumption that a dysfunctional family environment caused the child's obesity. These advances have led to the development of international policy in relation to the assessment of severe, early onset obesity, with CUHP researchers having a leading role in many of these initiatives.

Myeloproliferative neoplasms; Studies of the myeloproliferative neoplasms, coordinated from Cambridge, have already altered patient management internationally, are saving the NHS >£22m / year in drug costs, and continue to provide a unique clinical dataset and source of samples. Tony Green and colleagues were also amongst the first to report the presence of the *JAK2* mutation in most myeloproliferative neoplasms. Detection of this mutation is now embedded in national and international guidelines, and JAK2 inhibitors are in clinical trials. Multiple other Cambridge papers relating to the *JAK2* mutation have defined subtypes with clinical significance.

Multiple sclerosis: Describing the 'window of opportunity' for immunotherapy early in the disease course has altered concepts on the strategy for treating multiple sclerosis. The first disease modifying treatments, introduced in the early 1990s, provided modest benefits for treated groups of patients and did not affect the outcome that matters – fixed disability. Work led by Professor Alastair Compston led to mechanistic accounts explaining why the treatment of people with significant disability due to multiple sclerosis with immunosuppressive agents does not work. It followed that treatments must be given early – probably within the first few years after onset and before sustained accumulation of disability has manifested – in order to alter natural history of the disease. Studies of alemtuzumab in patients with relapsing-remitting multiple sclerosis have shown a marked and durable reduction in disease activity with cumulative sustained recovery of function, no conversion (to date) to secondary progression, and responses that are predictable for the individual patient. These data have had a profound effect on concepts and therapeutic strategies in multiple sclerosis. A decision on licensing from the EMA expected in July 2013 (and FDA in December 2013) in the light of successful completion of Phase III (two) and on-going Phase IV studies.

5. EXCELLENCE IN PATIENT CARE (2 pages)

A description of the existing excellent patient care, including:

- Details, and relevant evidence of the NHS provider partners' excellence in delivering patient care within the local community and the wider NHS landscape;
- How excellence in research and health education will together support excellence in patient care and delivery of the best patient outcomes.

The three member NHS Foundation Trusts in this application – a general and specialist acute hospital, a mental health and learning disability provider and a specialist cardiothoracic hospital - have all achieved high levels of external recognition for clinical excellence.

Cambridge University Hospitals NHS Foundation Trust, comprising Addenbrooke's Hospital and the Rosie Hospital, provides district general hospital services for its local population of around 500,000 in the Greater Cambridge area and specialist services for people from the region and beyond. CUH delivers nationally and internationally renowned services for a regional population of up to 5.5M people in specialist cancer care, neurosciences, metabolic medicine, specialist paediatrics, allergy and immunology and organ transplantation. CUH also provides nationally commissioned services in multiple organ transplantation and rare metabolic disorders. CUH hosts the operational delivery networks for neonatal care, critical care and trauma and is the regional Major Trauma Centre for the East of England.

Clinical services are closely linked to Cambridge NIHR Biomedical Research Centre (CUH and UoC), in its second year of £110 million NIHR funding. The funding supports a large number of existing and new projects designed to benefit patients with diseases such as cancer and diabetes, specifically targeting advances in diagnosis, prevention and treatment. CUH was awarded 'NHS Trust of the Year, 2012' by Dr Foster Intelligence (DFI) on the basis of a broadly based array of clinical outcome measures to include Hospital Standardised Mortality Ratio (HMSR) and Summary Hospital Mortality Index (SHMI), death following low risk procedure and death following surgery. The metrics used also included 13 parameters relating to operating efficiency including senior staffing at weekends, use of day surgery and cancelled operations. DFI particularly noted that CUH had scored well on its efficiency index, had lower than expected rates on both mortality indicators used and had no concerns in relation to the clinical outcomes assessed.

At the same time as the DFI award Monitor found CUH to be in significant breach of its authorisation in November 2012. The finding was based a number of issues: failure of CUH to meet challenging access targets, eight 'never' events, concern in relation to financial viability, and capability at Board level during a time of transition. The Trust has already taken a number of actions, including the appointment of a new CEO, Keith McNeil, to achieve a sustainable future and Monitor is satisfied with progress that has been made to date.

Cambridgeshire and Peterborough NHS Foundation Trust (CPFT) is a partnership organisation providing mental health and specialist learning disability services across Cambridgeshire and Peterborough, and children's community services in Peterborough. It is the lead partner in the local Collaborations for Leadership in Applied Health Research and Care (CLAHRC), and has an extensive portfolio of research projects. The Trust also provides nationally-recognised regional and sub-regional specialist services to people across the East of England and nationally, with particular expertise in Improving Access to Psychological Therapies (IAPT), Specialist eating disorders for adults and young people, Services for adults with personality disorders, Early intervention in psychosis, Child and adolescent in-patient services, Liaison psychiatry and Specialist learning disability.

CPFT is a partner in the first national consortium of leading mental health trusts providing secondary mental health services to Ministry of Defence and United States Air Force staff and is also the host employer for the Mental Health and Learning Disabilities Research Network covering Cambridgeshire, Norfolk and Suffolk.

In March 2012, Monitor informed CPFT that it was in significant breach of the terms of its authorisation based on its failure to provide effective leadership and governance. The decision was triggered by the failure of CPFT to address Care Quality Commission concerns within an appropriate period of time. Following a year of radical change within the Trust, it was announced in March 2013 that CPFT was out of significant breach (with both Monitor and CQC) in record time.

The Trust is planning to relocate many of its Cambridge-based services to the Cambridge Biomedical Campus to achieve better synergy with research, reduce stigma and better manage multiple morbidities. A new mental health and learning disability unit has been built as part of the new general hospital at Peterborough. CPFT has close ties to the University Department of Psychiatry, which achieved the highest quality rating in the 2008 Research Assessment Exercise.

Papworth Hospital NHS Foundation Trust has an outstanding national and international reputation as a leading specialist centre for the treatment of heart and lung disease. Its services include the diagnosis, treatment and management of patients in three principal areas: Cardiac; Thoracic: Advanced Heart and Lung Failure, including transplantation.

PH is one of the highest volume centres in the UK for cardiac services and has provided a regional acute 24/7 Primary Percutaneous Coronary Intervention (PPCI) since September 2009. PH provides regionally commissioned electrophysiology (EP), pacing and programmable defibrillator services, and has developed innovative technologies with ventricular assist devices and a regional extra-corporeal membrane oxygenation (ECMO) service. In the field of cardiac surgery Papworth has a reputation for treating difficult and complex cases and has pioneered cardiac interventional techniques including MRI, CT, echocardiography and nuclear imaging.

PH is the only UK pulmonary hypertension centre commissioned to perform pulmonary endarterectomy surgery (PTE), and is second only to San Diego in the number of procedures undertaken. It operates an internationally recognised centre for the treatment of most thoracic diseases including a joint Cancer Centre with CUH for the treatment of thoracic malignancy, supporting active research programmes in mesothelioma and lung cancer screening, a regional cystic fibrosis centre, supporting pioneering research on nosocomial infection control. PH also has the largest respiratory support and sleep centre (RSSC) in the UK, providing a regional and national service

PH retains an excellent record on infection control, and in the use of audit to improve quality and outcomes. The experience patients and service users is given great emphasis by the Trust board and continues to be of primary importance to staff. PH was rated among the best performing Trusts in the NHS Adult Inpatient Survey 2012. PH and CUH's multi-disciplinary cancer service was recognised by Macmillan Cancer Support as being the third highest-performing hospital in the UK, based on analysis of the National Cancer Patient Experience Programme 2011/12 survey results.

6. EXCELLENCE IN HEALTH EDUCATION (2 pages)

A description of the existing excellence in health education and training:

Partnership with Health Education East of England (HEEoE). CUHP is represented by the Regius Professor of Physic on the Board of HEEoE, The Director of Education of CUHP (Dr Gupta) has been extensively involved in the strategic planning and authorisation of HEEoE, with particular input into the skills strategy and leadership strategy. CUHP's member Trusts and the University of Cambridge are represented within the Cambridgeshire & Peterborough Workforce Partnership Group board (one of the four local partnership boards reporting to HEEoE). CUHP and HEEoE also collaborate on education improvements and delivery through the newly authorised Eastern Academic Health Science Network. The collaboration of HEEoE and CUHP is strengthened by the Postgraduate Dean and Head of Quality of HEEoE (Dr Simon Gregory) being a member of the CUHP Multiprofessional Education Board. Most recently CUHP has been awarded funding by the Cambridgeshire & Peterborough Workforce Partnership Group to develop a regional trauma care education programme and for county-based leadership development.

Overview of CUHP's excellence in healthcare education. CUHP partners are committed to the provision of high quality education, training and development for the NHS and research workforce, ranging from basic skills training to pre-registration, post-registration professional education and continuing professional development.

Undergraduate medical education in the University of Cambridge is provided jointly between the Schools of Biological Sciences and Clinical Medicine leading to the MB BChir degree. The university came first in the Complete University ranking guide 2013. Graduate education (Masters and PhD) is overseen by the Graduate School of Life Sciences, which supports ~1600 current students in PhD programmes. Our Integrated Academic Training programmes for clinicians are supported through the Clinical Academic Training Office (CATO). Postgraduate medical education is delivered by all partners to an excellent standard with the most recent GMC/Deanery visit of the largest Trust satisfying all requirements with five notable areas of excellent practice. Nursing, AHP and Healthcare Scientist education are provided by Anglia Ruskin University (ARU), University of East Anglia and Hertfordshire University, which are coordinated with CUHP through HEEoE. There is a Recovery College partnership between CPFT and ARU. CUHP members also provide extensive and innovative CPD programmes.

CUHP is also the sponsoring organisation of an entirely new educational venture in healthcare technology, University Technical College (UTC) Cambridge, in partnership with Cambridge Regional College. UTC Cambridge will provide outstanding educational opportunities for 14-19 year olds, linked to the globally-recognised growth industries of biomedical science and environmentally sustainable products and services (the Cleantech cluster) located in the Cambridge region. Planning permission is being sought for a new building adjacent to the CBC (see http://utccambridge.co.uk).

CUHP and its constituent partner organisations have made a significant contribution to the development and delivery of evidence-based healthcare education across all NHS organisations in Cambridgeshire and beyond. These programmes include:

Long-term conditions care: Delivery of the Cambridgeshire & Peterborough HIEC programme over the last three years with a focus on improving the care of people with long term conditions, end of life care and integrated care services.

Patient self-management and supported self-management: The Cambridge Centre for Self-Management Support initially focused on enhanced pulmonary rehabilitation, and is now delivering research and education across a wide range of clinical conditions.

Stroke care education: CUHP coordinated a stroke services review on behalf of NHS Midlands and East, including a review of the education and workforce development needs for staff within the stroke care pathway.

Leadership programmes: CUHP has a growing leadership programme, including the Cambridge Chief Resident/GP leadership and management programme in collaboration with HEEoE, and the Judge Business School.

Mental health: CUHP partners have established a range of mental health education programmes, including: dementia care within acute hospitals; dementia training for nursing and residential homes; the

Cambridge psychopharmacology programme; and an extensive recovery-based peer support worker training programme.

Education innovations: CUHP has taken forward education innovations, including a PG certificate in medical education with the UoC Institute of Continuing Education, and a programme of CUHP endorsed clinical education courses.

Technology enhanced learning: CUHP has led on a range of technology enhanced learning innovations, including: the Cambridge Simulation Centre providing 'state of the art' multi-professional clinical simulation training; the Cambridge Surgical Training and Research Centre (scheduled to open in June 2013) providing advanced cadaveric training across all surgical specialities; and the development of CUHP online learning.

Added benefit through the integrated research and clinical environment

CUHP partners have exceptional strength in undergraduate and postgraduate training in fundamental biomedical sciences and translational research. Examples of innovation include (1) the UK's first MB PhD course, providing a highly successful integrated scientific and clinical course (2) the development of the Clinical Academic Training Office (CATO) which provides extensive support for clinical academic trainees to enhance their research skills and experience. CATO has developed and coordinated new MPhil courses in Clinical Sciences including Translational Medicine, Primary Care, Neurosciences and Medical Microbiology. (3) SCM in partnership with GSK was awarded one of four *'Centres in Translational Medicine and Therapeutics'* which provides Wellcome Trust funded postgraduate training in translational medicine – at Masters, PhD and postdoctoral levels.

Research and development training is at the core of the CUHP partnership. Our quality is evidenced by the award of several thematic Wellcome Trust PhD programmes, including *a Clinical PhD programme to train Clinician Scientists*. Currently 1587 PhD students and 14 MD students are registered across the Clinical School and School of Biological Sciences. Research training is also an important theme of our NIHR BRC and is a central component of our *NIHR Collaboration for Leadership in Applied Health Research and Care (CLAHRC)* that provides R&D training and fellowships to build translational research expertise. Education and training activities led by CUHP will benefit from the new Forum planned for completion in 2016 on the Cambridge Biomedical Campus which will include a purpose built education and conference centre. This will house state of the art equipment and facilities to aid the delivery of high quality mutiprofessional education and training.

Evidence of education and training publications

1.Whyte R, Quince T, Benson J, Wood DF, Barclay S. Medical students' experience of personal loss: incidence and implications. BMC Med Educ. Mar 6;13:36. 2013;

2.. Prevalence and persistence of depression among undergraduate medical students: a longitudinal study at one UK medical school. BMJ Open 2012; 2:

3.Cox TM, Brimicombe J, Wood DF & Peters DK. The Cambridge Bachelor of Medicine (MB)/Doctor of Philosophy (PhD): graduate outcomes of the first MB/PhD programme in the UK . Clinical Medicine 2012; 12: 530–534

4.Quince TA, Barclay S, Spear A, Parker R, Wood DF (2011) Student attitudes towards cadaveric dissection at a UK medical school. Anatomical Sciences Education 4 (4) 200-207

5.Wheeler DW, Carter JJ, Murray LJ; Degnan BA, Dunling CP, Salvador R, Menon DK, Gupta AK. The Effect of Drug Concentration Expression on Epinephrine Dosing Errors. A Randomized Trial. Ann Int Med 2008(148) 1: 11-14

6. Wheeler DW, Degnan BA, Murray LJ, Dunling CP, Whittlestone,KD, Wood DF, Smith HL and Gupta AK. Retention of drug administration skills after intensive teaching. Anaesthesia 2008; 63:379-384

7.Silverman J The case for postgraduate anaesthetic communication skills training Bulletin of The Royal College of Anaesthetists (2008) 52, 2685-2687

8.Quince T, Hibble A, Emery J, Benson J The Impact of Expanded General Practice Based Student Teaching: the Practices' Story. Education for Primary Care 18 2007 593-601

9.Benson J,Quince T, Hibble A, Fanshawe T,Emery J Impact on patients of expanded, general practice based, student teaching: observational and qualitative study. BMJ 2005: 331: 89-92 A

10. Kurtz S, Silverman J, Benson J, Draper J. Marrying content and process in clinical method teaching: enhancing the Calgary-Cambridge guides. Acad Med. 2003 Aug;78(8):802-9

11. Kurtz S.M. and Silverman J.D. The Calgary-Cambridge Observation Guides: an aid to defining the curriculum and organising the teaching in communication training programmes. Medical Education 1996. 30, 83-89

If you have questions about the completion of this form please e-mail Jane Sinclair at jane.sinclair@nihr-ccf.org.uk.

This form must be submitted by **1:00pm on 31 May 2013**.