Transforming health through innovation: Integrating the NHS and academia

January 2020

The Academy of Medical Sciences

This report has been approved by the Academy of Medical Sciences' Council.

The Academy is most grateful to Professor Sir Robert Lechler PMedSci and to the members of the Steering Group for undertaking this study. We thank the Academy's Officers, Council members, the external Review Group appointed by Council, and staff, as well as our Fellows and all those who have contributed through our evidence-gathering workshops and stakeholder meetings.

Contributions by the Steering Group were made purely in an advisory capacity. The members of the Steering Group participated in an individual capacity and not as representatives of their organisations. Steering Group members are detailed below. A biography and summary of the Steering Group members' interests, as well as further details about the development of this report, can be found on our website at the following address: www.acmedsci.ac.uk/nhs-academia-interface/report-preparation.

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Introduction

The UK's life sciences environment is unique. We have an enviable competitive advantage because of our outstanding research base in world-class universities and dedicated research institutes; thriving pharmaceutical and medical technology industries; significant capabilities in clinical and translational research in the NHS; and considerable support provided by the medical research charities.[1,2] Initiatives such as the formation of the National Institute for Health Research (NIHR), investment in academic training pathways, and the development of Academic Health Science Centres and Networks, have transformed the UK's clinical research capacity. In 2018/19, every single NHS Trust in England took part in research, with over 1 million clinical research participants.[3,4] The UK also has a very strong and diverse portfolio of high-impact public health research, with the highest numerical output of publications in public health research of all European countries from 1995 to 2004.[5]

Such research has contributed to major advances in patient care (Box 1[6]). It also contributes to the wealth of the nation, with every £1 invested in medical research delivering a return equivalent to around 25p every year, in perpetuity.[7,8] In addition to wider benefits of clinical research to the UK economy, NHS organisations also benefit financially from participating in research due to increased revenue from investments by life sciences companies and pharmaceutical cost savings.[9,10,11,12] It has been estimated that over the financial years 2016/17 to 2018/19, the NIHR Clinical Research Network supported clinical research activity that generated £8 billion in gross value added, and that for each patient recruited into commercial clinical research studies, NHS Trusts in England received an average of £9,189 in revenue from life sciences companies, as well as a pharmaceutical cost saving of between £4,143 and £7,483.[13]

There is also a growing body of evidence that patients in research-active healthcare settings have better outcomes and receive better care, with benefits extending to patients beyond those actively involved in research.[14,15,16,17,18,19] Patients have long been calling for opportunities to engage in research (Box 2[20]): surveys show that they want opportunities to be involved in trials of new medicines or treatments, and that the public believes that the NHS should play an important role in supporting research for new treatments.[21,22,23]

Threatening this, recent studies report a decline in the capacity of NHS staff to undertake, or even to engage with, research.[24,25,26] This situation is likely to worsen given the current pressures on the healthcare workforce, that is facing difficulties in recruiting and retaining staff, which in turn cause significant challenges to service delivery. There is also a decline in the number of clinical academics, who operate at the interface between academia and the NHS and lead research (Box 3[27]). In 2017, clinical academics represented only 4.2% of NHS medical consultants (down from 7.5% in 2004), 0.4% of general practitioners (GPs) and less than 0.1% of the nursing, midwifery and allied health professions.[28] Only 42% of GP practices are research active.[29] Slow growth in government investment in research and development (R&D) is also threatening the UK's appeal as an international centre for life sciences. For example, the NIHR has received a flat cash settlement over a number of years, despite its significant contribution to health research.[30] In parallel, R&D investment in the UK by pharmaceutical companies has declined from 10.4% of global pharmaceutical R&D spend in 2011 (US$14 billion) to 7% in 2016 (US$11 billion).[31]

To accelerate the translation of research into patient benefit and population health, and increase the appeal of the UK as a global hub for life sciences, all sectors of the ecosystem – patients, industry, regulators, research funders, public health organisations, academia and the NHS – must work closely together. We are therefore deeply concerned by the widening gap in recent years between the NHS and academia, due in part to the misalignment of drivers across these sectors. For example, in academia, there is an emphasis on the Research Excellence Framework (REF). There are also limited mechanisms or incentives to engage with the NHS workforce to understand or address their training requirements or evidence needs (at either a local or national level) to enhance productivity and deliver safe and effective patient care.[32] In the NHS, there is a focus on financial and operational deliverables with some Commissioners and Trusts still regarding research as 'nice to have', rather than a central component of its business and one of the objectives in the Government's mandate to NHS England, as enshrined in the NHS Constitution for England.[33,34]

There is an urgent need to enhance the NHS-academia interface to better harness the research expertise and capability of the NHS for the health and wealth of the nation.

Having consulted with stakeholders across the sector, the Academy of Medical Sciences sets out in this report a series of actions to achieve six key outcomes that we believe are essential for enhancing the interface between the NHS and the UK's academic biomedical and health research sector:

1. **Creating a healthcare system that truly values research.**
2. **Fully integrating research teams across academia and the NHS.**
3. **Providing dedicated research time for research-active NHS staff.**
4. **Ensuring undergraduate curricula equip healthcare staff with the skills to engage with research.**
5. **Incorporating flexibility into postgraduate training pathways.**
6. **Streamlining research through joint R&D offices.**

Our proposals will generate the changes needed in academia and healthcare organisations across the UK that will be critical if we are to remain globally competitive in the life sciences. This includes facilitating the conduct of and participation in research, and adoption of effective innovation; increasing the UK's attractiveness to the life sciences industry to support further investment in R&D; modernising healthcare delivery to address challenges around recruitment and retention of NHS staff; and upskilling the healthcare workforce to deliver the care and research of the future.

Definitions

In this document we use the terms 'research', 'healthcare professionals', 'NHS organisations' and 'public health organisations' as follows:

- **Research:** Includes research in its broadest sense, from fundamental biomedical science to quality improvement, epidemiology, clinical trials, public health and operational research.
- **Healthcare professionals:** Includes health professionals operating in medicine, dentistry, public health, nursing, midwifery, allied health professions and pharmacy.
- **NHS organisations:** Includes NHS Trusts (NHS Hospital Trusts, NHS Mental Health Trusts, NHS Ambulance Services Trusts, Community Health NHS Trusts), NHS Dental Surgeries and NHS General Practice Surgeries. In this document, the term NHS Trusts also includes Health Boards in Scotland and Wales, and hospitals in Northern Ireland.
- **Public health organisations:** Includes employers of public health professionals, such as local authorities, Public Health England, NHS Health Scotland, Health Protection Scotland, Public Health Wales and the Public Health Agency in Northern Ireland.

Box 1: Examples of some of the UK's most significant contributions to advances in patient care since the inception of the NHS

The UK's NHS was launched on 5 July 1948. Since then, the UK has made many significant contributions to medical science resulting in ground-breaking advances in patient care. The case studies in the timeline below present a selection of some of the UK's most significant research contributions to the advancement of patient care since the inception of the NHS. The list is not exhaustive, and additional examples can be found in the full version of this box and in other resources.[35,36]

1940s	**Development of penicillin as a drug** The antibiotic properties of the Penicillium mould were first discovered by Sir Alexander Fleming FRS FRSE in 1928 in his laboratory in St Mary's Hospital in London. Ground-breaking work by Sir Ernst Chain FRS and Lord Florey OM FRS in the 1940s to purify and extract penicillin then enabled it to be mass produced as a life-saving drug.[37] Penicillin antibiotics became the first effective treatments against many bacterial infections and are still widely used today.[38,39]
1950s	**Smoking linked to lung cancer** The link between smoking and lung cancer was first made by Professor Sir Richard Doll CH OBE FRS and Professor Sir Austin Bradford Hill CBE FRS in 1950.[40] Their findings changed policy and treatment internationally. In 1954, around 80% of adults in the UK smoked, by 2017 this had fallen to 15.5%.[41,42]
1960s	**Discovery of the link between transplantation and immunology** In 1960, a Nobel Prize was awarded to the National Institute of Medical Research's Sir Peter Medawar OM CBE FRS and Sir Frank Macfarlane Burnet OM KBE FRS for their discovery that the rejection of skin grafts was an immune response, which could be overcome.[43,44] This showed that transplantation between a genetically non-identical donor and host was possible for animals, and would be for humans.[45]

1970s	**The invention of magnetic resonance imaging (MRI)** Sir Peter Mansfield FRS from the University of Nottingham devised a way to harness cells' natural magnetic properties to produce images of soft tissues in humans, leading to the development of MRI.[46] Today, all major UK hospitals have whole-body MRI scanners – pioneered by researchers at the University of Aberdeen in the 1980s – and the technique is used to diagnose and monitor many diseases.[47] Annual rates of MRI examination are as high as 140 for every 1,000 inhabitants in the developed world.[48]
1980s	**The invention of DNA fingerprinting** The technique of genetic fingerprinting was first developed by Sir Alec Jeffreys CH FRS FMedSci at the University of Leicester in 1984.[49] This revealed the variations in DNA unique to each individual, except for identical twins. Genetic fingerprinting is now widely used in medicine, forensics and paternity testing, among many other applications.[50]
1990s	**The first cloning of a mammal** Dolly the Sheep, the world's first mammal to be successfully cloned from an adult cell, was born in Scotland's Roslin Institute in 1996.[51] This fundamental achievement paved the way for a series of important advances in stem cell research.[52]
2000s	**Brain cooling treatment for newborns starved of oxygen** Imperial College London researchers pioneered the implementation of a brain cooling treatment to improve the survival of newborns starved of oxygen during birth.[53,54,55] It is now recommended by NICE guidelines and is the standard of care in most resource-rich and -intermediate countries.[56,57]
2010s	**Transforming treatment for oestrogen-receptor positive breast cancer** The Institute of Cancer Research and The Royal Marsden NHS Foundation Trust played a leading role in the clinical development of a class of hormonal drugs called aromatase inhibitors that are effective in treating oestrogen receptor-positive breast cancers.[58] Overall, this work has changed the way doctors treat this type of breast cancer across the world, saving the lives of thousands of women every year, and sparing many from unnecessary chemotherapy.[59] **Gene therapy for haemophilia** Haemophilia is a rare, mostly hereditary condition affecting the blood's ability to clot. The current gold standard treatment of severe disease is regular infusion of clotting factor concentrates.[60,61] Researchers at the UCL Cancer Institute developed the first gene therapy to treat haemophilia A, which has recently been successfully trialled in humans. Benefits were still apparent over one year following a single treatment with the gene therapy drug.[62,63] Gene therapy remains a potentially revolutionary future prospect for patients, replacing the need for regular injections with a single-dose treatment.[64,65]

Box 2: Involving patients in research

Throughout the course of this project, we heard that patients would value being offered opportunities to engage in research more systematically at the point of care and more equitably across the UK.[66] Involving patients in research improves the quality of research studies, and their relevance for patients and the health service.[67] Early involvement with patients in the design and implementation of studies is therefore important and should be sustained throughout the R&D process, including informing patients of the outcomes of research.[68] To enhance patient participation in research, it is not only important that researchers understand the value of engaging with patients and the public and are trained to do so effectively, but also that patients and the public understand the benefit of research and the importance of the role they play.

Box 3: The decline in number of clinical academics and of clinical academic reader and senior lecturer posts

Data from the Medical Schools Council staffing survey from 2004-2017 shows that, while the total number of NHS medical consultants and GPs has increased from 69,311 in 2004 to 95,096 in 2017, the number of clinical academic medical consultants has decreased from 2,436 in 2004 to 2,290 in 2017, and the number of clinical academic GPs has remained low, rising slightly from 127 in 2004 to 176 in 2017. This equates to a 3.3 percentage point decline in the proportion of clinical academic NHS medical consultants, from 7.5% of medical consultants in 2004 to 4.2% in 2017 (Figure 1). A significantly smaller proportion of GPs are clinical academics, stagnating at around 0.4% of the GP workforce over this period. The proportion of clinical academic medical and GP roles in universities has declined from 3.7% of the medical and GP consultant workforce in 2004 to 2.6% in 2017 (Figure 2). Over this period, while the number of professor roles has increased from 1,145 to 1,406 posts, the number of reader and senior lecturer roles has declined from 1,418 to 1,059. Overall, there has been a slight decline in the number of clinical academic medical and GP roles in universities, despite the increase in the total number of NHS medical consultants and GPs.

Figure 1: The proportion of clinical academic NHS medical consultants and clinical academic GPs over time

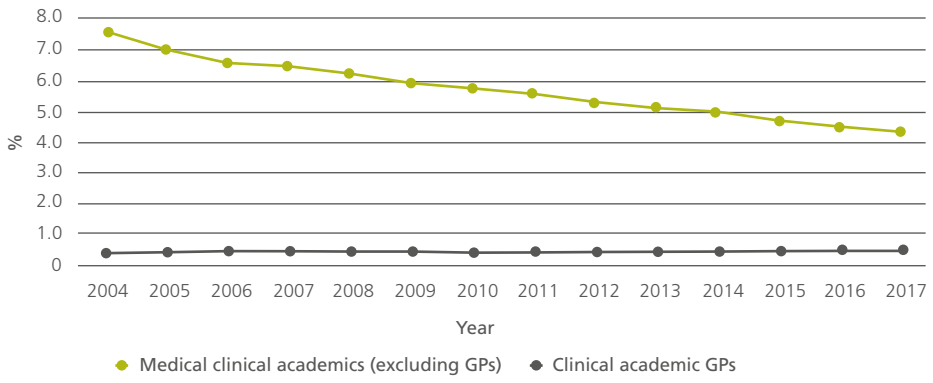
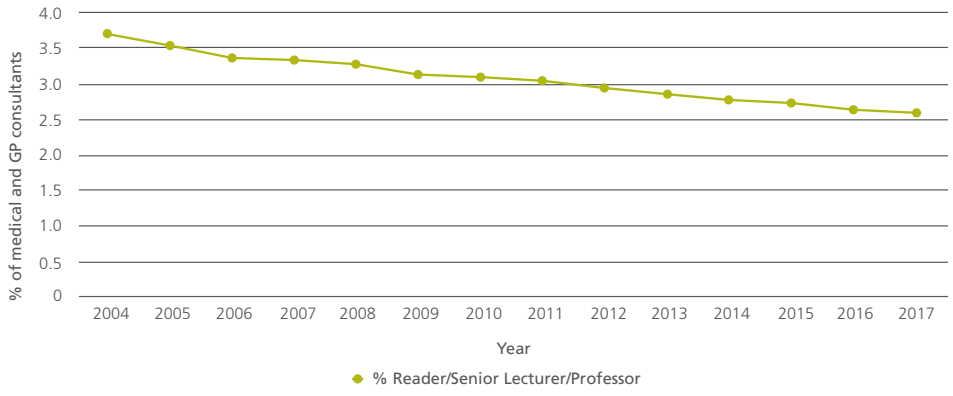


Figure 2: The proportion of clinical academic medical and GP roles in universities as a percentage of medical and GP consultants



1. Creating a healthcare system that truly values research

Recommendation 1 – To enhance how research is valued across the healthcare system, we recommend that:

a. **The Board of every NHS Trust and Health Board should have responsibility for valuing and promoting research across the organisation, and annually publish information on the outcomes and benefits of all of its research activities.**

b. **Building on the Care Quality Commission's (CQC) research performance indicators, NHS England and NHS Improvement and NIHR should work with relevant stakeholders from across the UK to co-develop a set of research metrics. These should be used for annual publication of NHS Trusts' and Health Boards' research activities and reported to their Boards to inform workforce and job planning.**

c. **In England, research should be a component of the 'balanced scorecard' being developed as part of the NHS People Plan to become a central part of the NHS Oversight Framework. The research metrics described above should be incorporated in the development of the balanced scorecard.**

d. **NHS England and NHS Improvement, NHS Wales, NHS Scotland, Health and Social Care Northern Ireland, the BMA General Practitioners Committee and the Royal College of General Practitioners should work together to develop research metrics to evaluate the level of research activity in primary care and encourage GP practices to engage in research.**

e. **Public Health England, NHS Health Scotland, Health Protection Scotland, Public Health Wales, the Public Health Agency in Northern Ireland and local authorities should work together to develop research metrics to evaluate the level of research activity and encourage further research in public health.**

A different approach is required in the healthcare system to create an environment where research is valued and participation in research is considered a patient's right (for a more detailed discussion of engaging patients in research, please see our associated report, 'From subjects to partners: putting patients at the heart of medical research').[69] The benefit and impact of research need to be recognised by senior management and promoted to staff at all levels within NHS and public health organisations. Academics have a role to play in instituting this new approach by engaging more closely with healthcare professionals to demonstrate the benefits of research and provide leadership.

We welcome efforts to raise the profile of research within NHS organisations, including:

- Health and Care Research Wales's Delivery Framework, which sets out how the Welsh Government will monitor Welsh NHS organisations' performance in relation to R&D, and the NHS Wales Delivery Framework, which includes measures of research activity.[70,71,72]

- The inclusion of research performance indicators as part of the CQC's well-led framework.[73] These will only be effective if appropriately implemented and measured, and the Academy urges researchers to participate in CQC's assessment of research as specialist advisors to ensure the consistency of the reviews.

Measures such as these are a move in the right direction, and could play a fundamental role in driving a research aware and engaged culture across NHS and public health organisations that supports the spread and adoption of research, as well as in ensuring that research opportunities are offered routinely to patients as part of service provision. However, to ensure that research is more widely valued, we recommend that NHS Trusts and Health Boards publish annual information on the outcomes and benefits of the entirety of their research activities, for example in their Quality Accounts.[74] This would support public accountability and send a clear signal that research is a core component of the quality of services provided. Impact and patient experience case studies would be particularly valuable in communicating the benefit of research to senior management, the broader workforce, and patients and the public more widely. Better recognition and communication in NHS leadership programmes of the role and importance of research would also help.

We are encouraged by NHS England and NHS Improvement's and NIHR's work to develop a set of research metrics. It will be important for such metrics to be co-developed with relevant stakeholders, including from the devolved administrations, to reflect the breadth of research across NHS organisations, minimise the risk of introducing any perverse incentives, and ensure consistency across the sector. These metrics must be provided at Board level to inform workforce and job planning. Such metrics could also inform the development of publicly available tables of Trust- or Health Board-specific research metrics, analogous to NIHR's research activity tables.[75] The purpose of such tables would be to encourage participation in research endeavours, while acknowledging that not all Trusts or Health Boards can be leading research.

We believe that research must also be considered in the 'balanced scorecard' being developed as part of the NHS People Plan.[76] It is anticipated that this scorecard will become a central part of the NHS Oversight Framework, which will set out how NHS Trusts, NHS Foundation Trusts, Clinical Commissioning Groups, Strategic Transformation Partnerships, and ultimately Integrated Care Systems, are overseen. The incorporation of research metrics in the development of the scorecard would place research firmly at the heart of healthcare delivery. Metrics that enable the level of research activity to be evaluated in primary care should also be developed (perhaps at primary care network level), along with similar measures for public health.[77]

2. Fully integrating research teams across academia and the NHS

Recommendation 2 – To promote integrated research teams, we recommend that:

a. **Higher Education Institutions (HEIs) should increase the number of honorary academic appointments offered to healthcare professionals that contribute significantly to research, as evidenced by the inclusion of research in their job plan for example. Their contributions should be appropriately recognised in the REF by submitting institutions and REF panels.**

b. **HEIs should provide research-active honorary clinical academics with access to the infrastructure to enable them to fully engage in research, including: access to the grant-making machinery and journal subscriptions hosted by the HEI; career development, mentoring, training and promotion opportunities; and opportunities for student supervision.**

c. **Research funders should develop schemes to encourage greater mobility across sectors, including academia, industry, and NHS and public health organisations.**

HEIs have a key role to play in improving the opportunities they provide to integrate healthcare professionals into their research teams (Box 4 – online[78]). This would ensure that the research agenda is informed by, and responds to, the evidence needs of the health and care sector, while also expanding the HEI's knowledge and skills base.[79] This could also play a vital role in tailoring research to local healthcare needs, and thereby help address regional disparities in health outcomes. Despite good practice in some universities, we heard that too often healthcare professionals' contributions are undervalued and that universities could do much more to support healthcare professionals in their research endeavours.

We welcome activities to increase healthcare professional engagement in research (Box 5[80]), including the pilot Clinical Academic Research Partnership (CARP) scheme by the Medical Research Council (MRC), which offers up to three years of funding to consultants to join an existing biomedical research team.[81] This supports multidisciplinary teams, and the re-engagement of research-trained clinicians, who can offer their clinical expertise to biomedical groups.

However, to put integrated teams on a more permanent footing, HEIs must offer increasing numbers of honorary academic appointments to healthcare professionals, not just in biomedical departments but in a full range of relevant disciplines including, for instance, engineering and social sciences. Such appointments must enable healthcare professionals to fully engage in research by providing them with: the same career development, mentoring, training and promotion opportunities as academic staff; access to the grant-making machinery and journal subscriptions hosted by the HEI; and opportunities for student supervision.

The contributions of such honorary appointments, and NHS-employed active researchers more widely, must be formally acknowledged in the REF environment statement, and appropriately recognised by submitting institutions and REF panels. Guidance for REF 2021 encourages the reporting of evidence of effective integration of clinical academics and NHS-employed active researchers, the role and research career development of clinical researchers, and the extent of collaboration or integration with health and social care services.[82] Research England should specifically assess the impact of this new reporting mechanism, including whether the contributions of NHS-employed active researchers are more comprehensively reflected than in previous REF exercises.

There is increasing recognition that training in softer skills – such as business and entrepreneurship, leadership, and patient and public involvement – are important.[83] In particular, communication and teamworking skills will be essential for working in integrated teams that bring together people from different disciplines and/or sectors. Alongside this, the development of leaders capable of operating and driving cultural and system change across sectors will be increasingly required. Such training could be delivered through Continuing Professional Development (CPD) programmes and credentialing, apprenticeships and cross-sector mobility, and leadership schemes (Box 6 – online[84]).

Box 5: Initiatives to provide dedicated time for research – *further examples can be found in the full version of this box.*[85]

Heath and Care Research Wales (HCRW) Clinical Research Time Award
HCRW's Clinical Research Time Award aims to build research capacity and capability in the NHS by offering NHS Wales staff the opportunity to apply for protected time to engage in research activity.[86] The scheme funds research time and training for those in primary, secondary or community care or public health, who aspire to become either a Principal Investigator or a Chief Investigator.

NHS Research Scotland (NRS) Career Researcher Fellowships
NRS Career Researcher Fellowships support the breadth of NHS-funded clinical staff in developing a research career within their NHS post.[87] This includes qualified doctors, nurses, allied health professionals, pharmacists, biomedical/clinical scientists and public health specialists. The award provides funding for protected time to contribute to, conduct and lead clinical research with a view to strengthening the research culture in the NHS and increasing capacity in priority areas.

The MRC Clinical Academic Research Partnerships (CARP)
CARP was set up by the MRC in 2018 to provide a flexible new route for research-qualified NHS consultants who are not research active to expand their research skills and experience by engaging with groups and centres of biomedical research excellence.[88] The scheme provides up to three years' funding to undertake a research project within an existing biomedical research team, including costs for consumables and up to half of the applicant's basic salary to support protected research time.

3. Providing dedicated research time for research-active NHS staff

Recommendation 3 – To provide healthcare professionals with dedicated time for research, we recommend that:

a. **NHS England and NHS Improvement, NHS Wales, NHS Scotland, and Health and Social Care Northern Ireland should undertake a pilot scheme in a number of hospitals where a proportion of consultants is offered a contract that includes dedicated time for research. The scheme should be evaluated for its impact on a range of factors, including research activity, staff recruitment and retention, and patient outcomes.**

b. **Similar pilots should be considered for primary care and public health practitioners, nurses, midwives, allied health professionals, dentists, and pharmacists.**

c. **Income generated thorough research activity in NHS and public health organisations should be ring-fenced and reinvested in research endeavours, including backfilling time dedicated to research.**

We believe that a proportion of the healthcare workforce should have part of its time dedicated to undertaking research. Without this, the generation of evidence to improve service delivery and patient outcomes will be impeded, as will the development of new and transformative innovations. Furthermore, the UK will not maximise the untapped research potential that currently exists within the NHS that will be vital both to ensure that the UK remains a global leader in the life sciences and to help meet the commitments made in NHS England's Long Term Plan to support research and the adoption of innovation. We welcome the range of initiatives to provide dedicated time for research, outlined in Box 5[89], but their reach is limited and more needs to be done.[90,91,92] It is essential that time for research is offered to a wider pool of healthcare professionals than clinical academics.

There is a crisis in the recruitment and retention of clinical and medical staff, with a significant number of unfilled posts, reliance on agency staff and high levels of burnout.[93,94,95,96,97,98,99,100] However, there is evidence that having academic content in medical posts actually enhances recruitment and retention, and that some doctors use research as a mechanism to avoid burnout.[101,102,103] Given current staff shortages and workload pressures, incorporating time for research in job descriptions could be an effective way of attracting staff and increasing job satisfaction, while contributing to the overall improvement in patient outcomes and healthcare delivery (Box 7[104]).[105,106] This could be particularly valuable in hard-to-recruit locations and specialties, provided provisions can be made for developing supportive infrastructure, teams and networks for conducting research.[107] Research-active staff could facilitate the promotion of evidence-based practice, adoption and spread of effective innovations, as well as stop the use of ineffective interventions.[108] Academia could support NHS and public health organisations in defining research

areas that would particularly benefit from dedicated research time. These research areas will need to be adequately resourced, with due consideration of the support required from clinical research fellows and nurses, among others.

Given the potentially transformational impact of dedicated time for research, we recommend that a pilot should be established in a mixture of large teaching NHS Trusts or Health Boards and district general hospitals across the UK with a comprehensive evaluation of its impact on a range of factors – including research activity, staff recruitment and retention, and patient outcomes – to inform decisions about wider implementation of the scheme. The pilot should also explore ring-fencing the income generated through research activities to support dedicated time for research, including backfilling posts. The establishment of the pilot will require new funding to cover the costs associated with backfilling consultant time. However, over time, we anticipate that the pilot would be cost-neutral or even cost-saving by improving recruitment and retention, reducing expenditure on locums, and increasing research funding from life sciences companies.

We have estimated the costs of conducting such a pilot using one scenario, where 20% of consultants have 20% of their time protected for research in ten NHS Trusts (five teaching NHS Trusts or Health Boards and five district general hospitals) across the UK. Such a pilot would cost between £21.7 million and £25 million per year, depending on whether the 20% dedicated research time is backfilled entirely with consultants at an average cost or locums at an additional premium of 15%. Further information can be found in our associated report, 'Estimate of the economic costs and literature review of the benefits of dedicated research time for Hospital Consultants in the NHS'.[109] While we have focussed on the consultant workforce in this particular scenario, similar pilots should be explored in future for primary care and public health practitioners, nurses, midwives, allied health professionals, dentists and pharmacists. Our study also found evidence that dedicated research time is associated with successful research programmes, improved job satisfaction and the potential for better employee retention. There is also evidence that publicly funded research programmes provide economic benefits in the form of improved patient outcomes and wider societal benefits, and by attracting research funding, including from life sciences companies.[110] The evidence linking research activity to better patient outcomes, staff recruitment, retention and satisfaction, and wider economic benefits is emerging. The evaluation of our recommended pilot will provide crucial evidence of how dedicated research time more specifically can contribute to making improvements in these areas.

Box 7: Incorporation of research time in posts to improve recruitment: example of NIHR Academic Clinical Fellowships (ACFs) in primary care – *a further example can be found in the full version of this box.*[111]

NIHR ACFs are specialty training posts that incorporate academic training.[112] Both medical and dental ACFs spend 75% of their time undertaking specialist clinical training and 25% of their time undertaking research training. ACF posts in primary care receive a consistently higher application ratio compared to standard GP posts (on average 6 applications per ACF post in contrast to 1.3 applications for traditional clinical posts), suggesting that the introduction of a research component may help to attract staff to understaffed specialties.[113]

4. Ensuring undergraduate curricula equip healthcare staff with the skills to engage in research

Recommendation 4 – To ensure all healthcare professionals can engage with research, we recommend that:

a. **Professional organisations responsible for the development and regulation of undergraduate degrees for healthcare students should ensure that each curriculum offers a research component.**

b. **HEIs should provide a range of opportunities for undergraduates to be exposed to research, from intercalated degrees to short-term research projects. Research funders should explore how they could support such projects.**

The skills and demands required of the healthcare workforce are changing. Shifts in population demographics and integration of care pathways require new approaches to protecting and promoting health and treating disease. In addition, rapid technology changes – for example in digital technologies, genomics, artificial intelligence, bioengineering and robotics – require a healthcare workforce that can readily use scientific evidence for the delivery of contemporary healthcare.[114] The advent of digital technologies provides new opportunities to engage with research. This will be important, as it is anticipated that 90% of all jobs in the NHS will require some element of digital skills within the next 20 years, meaning that staff will need to be able to navigate and utilise a data-rich healthcare environment.[115]

The value of research in driving enhanced patient outcomes should be communicated at early stages in healthcare professionals' training, along with information on the diversity of research opportunities that are available across disciplines and locations. Competencies in public and patient involvement in research are also essential. Training should be introduced to provide healthcare professionals with skills in research co-design and participatory research models, as well as in communicating research opportunities to patients. The Academy's INSPIRE programme has been designed to increase research interest by engaging medical, veterinary and dental undergraduates in research through the delivery of locally designed activities.[116] The Royal College of General Practitioners' curriculum also highlights research and the application of evidence-based practice as a core competence for maintaining performance, learning and teaching.[117] The Royal College of Physicians' 'Research for all' initiative recently proposed embedding evidence evaluation and research design in all trainee curricula. It also proposed the development of routes for those who did not follow academic training to become certified in research design and statistical skills at later points in their careers.[118] We endorse these proposals and call for such opportunities to be made available across healthcare professions, including nursing, midwifery, allied health professions, dentistry, pharmacy and public health. Intercalated degrees in a range of subjects – from data science and mathematics to bioengineering, health

economics and public health – as part of undergraduate training can broaden the skillset of the clinical workforce and should be more widely encouraged. The increasing numbers of graduate entry medicine students, the majority of which possess a life sciences bachelor's degree (and often a higher degree), present opportunities for greater engagement with research. Going forward, it will be important to develop mechanisms to engage industry in undergraduate education to provide students with insight into the research process and drug/device development, and to enhance opportunities for mobility across sectors.

Once qualified, it is essential that the skills of the workforce are continually updated so that it can deliver the most up to date medical interventions. It will be paramount to ensure that healthcare professionals receive the training that is required in a timely and proportionate manner, which could be delivered through a variety of mechanisms, from CPD and credentialing, to apprenticeships, Masters and PhDs.

5. Incorporating flexibility into postgraduate training

Recommendation 5 – To achieve greater flexibility in postgraduate training of healthcare professionals, we recommend that:

a. **The Medical Schools Council, Medical Royal Colleges, Conference Of Postgraduate Medical Deans, General Medical Council and Health Education England should continue to work together, and with the devolved administrations, to ensure that all medical trainees have access to 'step out and step in' training. In parallel, research funders, HEIs, industry and NHS and public health organisations, including local authorities, must work together to support academic career pathways and build capacity in clinical research leadership.**

b. **Professional organisations that oversee the postgraduate training of other healthcare professionals should work with HEIs, NHS and public health organisations, and research funders to develop a sustainable infrastructure for research and clear clinical academic career pathways, ensuring similar flexibility is provided in their postgraduate training.**

c. **HEIs should invest in and support clinical academics by increasing the number of clinical academic posts they provide, particularly at reader and senior lecturer level.**

d. **The General Medical Council should work with the Nursing and Midwifery Council, the Health and Care Professions Council, the General Pharmaceutical Council and HEIs to explore how the generic professional capabilities in research and scholarships could be included in a framework of agreed essential research competencies, which could inform the development of curricula across healthcare professions.**

e. **Research funders across the UK should review existing funding streams and work together to ensure that research opportunities are available across all healthcare professions.**

For the majority of healthcare professionals, an awareness of research and its application to improve the care that they deliver should be sufficient to complement or enhance their current work. However, healthcare professionals wishing to have a research-active career will need further postgraduate training. We heard that at present, the complexity and rigidity of current pathways into research careers is a deterrent to pursuing such opportunities. We also heard that exposure to research during regular postgraduate training is increasingly limited, meaning that some healthcare professionals may not consider it as a career option or as an important part of their role.

Clinical academics play an essential role in driving research and provide an important link between academia and the healthcare system, combining research and teaching roles in academia with clinical healthcare duties. We know that the proportion of clinical academic medical consultants is in decline and that it is stagnating at low levels in general practice, and in nursing, midwifery and the allied health professions (Box 3[119]).[120] We also know that the number of clinical academic posts offered by HEIs is decreasing. There is now an urgent need to expand clinical academic numbers. HEIs must invest in and support clinical academics by increasing the number of clinical academic posts they provide, particularly at reader and senior lecturer level.

The Integrated Academic Training pathway for medical trainees in England, the Wales Clinical Academic Track and the Scottish Clinical Research Excellence Development Scheme are widely regarded as successful schemes, which should be protected to ensure a sustainable pipeline of medical clinical academics (Box 8 – online[121]).[122,123,124,125,126] But introducing greater flexibility in postgraduate training is urgently needed to attract further talent into research careers. We understand that the Medical Royal Colleges, Conference Of Postgraduate Medical Deans and General Medical Council are willing to integrate greater flexibility in postgraduate medical training, which we welcome. We are also encouraged by the Royal College of Physicians' and Health Education England's flexible portfolio training, which demonstrates active change.[127] Building on this to enhance postgraduate research training across healthcare professions, the General Medical Council should work with the regulatory bodies of the other healthcare professions and HEIs to explore how the generic professional capabilities in research and scholarship could be included in a framework of agreed essential research competencies to inform the development of postgraduate curricula.[128]

We welcome the ambitions in the NHS Long Term Plan for England to explore ways in which the NHS can support the implementation of Health Education England's work to improve the working lives of doctors in training, including providing adequate time for supervision, accelerating implementation of 'step out and step in' training programmes, and further work to enable trainees to switch specialties without re-starting training.[129] The Shape of Training Review supported this, calling for a training structure that is flexible enough to allow trainees to move in and out of clinical training while meeting the competencies and standards of that training (Box 9 – online[130]).[131] The development and implementation of these activities is now urgently required.

The recent increase in the provision of funding for clinical research PhDs is welcomed.[132] As part of an integrated clinical academic training platform this offers the framework upon which the additional strategic skills modules discussed above can be deployed. However, the increased investment in PhD provision has been at the expense of post-PhD career support. Post-PhD there remains a critical need to better support academic career pathways and to build capacity in clinical research leadership. This will need to involve concerted action from research funders, HEIs, industry, and NHS and public health organisations, including local authorities. This must address equality and inclusivity, and areas where the clinical need is greatest – notably in primary-community care, and public and population health – to ensure that opportunities for postgraduate training are available across all healthcare professions.

There is also a critical need for the development of a sustainable infrastructure for research and clear clinical academic career pathways for other healthcare professions, notably nursing, midwifery and the allied health professions, supported by increased funding at both the pre- and post-doctoral levels.[133] This will require coordination across professional organisations that oversee postgraduate training, HEIs, NHS and public health organisations, and research funders.

6. Streamlining research through joint R&D offices

Recommendation 6 – To facilitate joint working across the NHS-academia interface, we recommend that:

University Vice-Chancellors and NHS Trust or Health Board Chief Executives should establish a more integrated research office function between NHS R&D offices and HEI research offices, and explore mechanisms to provide a single function.

To remain globally competitive in the life sciences, academia and the NHS need to work more closely together and with industry. Academia can facilitate collaborations between industry and the NHS – therefore optimising the interface between academia and the NHS will appeal to industry partners. However, we have heard from industry that engaging the UK is challenging due to complicated and protracted negotiations between academia and the NHS when establishing collaborative research projects. This is deterring industry from pursuing such opportunities. The establishment of the Health Research Authority has gone so far in improving the regulation and governance of health research centrally.[134,135] Now, NHS R&D offices and HEI research offices need to play their part to introduce further efficiencies to avoid delays and overly bureaucratic processes in setting up research projects. This will be essential to ensure the UK remains a world leader in, and a 'go to' place for, health research.

To achieve this, greater integration of academic and NHS research office functions is urgently needed to streamline processes, and mechanisms to provide a single function should be explored. Such integrated research offices could support the award of honorary academic appointments described in section 2 and subsequent establishment of contracts, as well as intellectual property negotiations. A number of joint research offices have already emerged across the UK (Box 10[136]), and they are establishing a network to share best practice. We recommend that HEIs and NHS organisations adopt this approach, and monitor the impact on their ways of working and ability to undertake collaborative research projects.

Box 10: Example of the Newcastle Joint Research Office (NJRO) – *further examples from UCL, Oxford, Imperial, Sheffield and Liverpool can be found in the full version of this box.*[137]

The NJRO was established in 2006 between The Newcastle upon Tyne Hospitals NHS Foundation Trust (Trust) and Newcastle University (University) to support researchers in the development, implementation and delivery of world-class experimental, translational and clinical research.[138] Through the partnership, the Trust acts as sponsor for all University research requiring access to its patients. The NJRO team interfaces with colleagues across the Trust and University to support researchers through funding development, governance and regulatory compliance, application submission, post-award contracting and intellectual property, and post-award project management. The Systems Leadership approach to research is essential in ensuring the partnership delivers the best research for patient outcomes.

Conclusion

The actions set out in this report are critical if we are to sustain the UK's position as a world leader in health and care research with the associated benefits for the health and wealth of the nation. The implementation of our recommendations will only be successful with appropriate funding and resources, and with the support of current and future leaders across the biomedical research landscape – in particular in academia and the NHS, including the Secretary of State for Health and Social Care, University Vice-Chancellors, the Chief Executives of NHS and public health organisations, and the Chief Executives of the bodies that lead the NHS across the UK. We look forward to working with these leaders and others across the sector to turn our vision into reality. We commit to reconvening the project Steering Group and further key stakeholders in three years' time to evaluate the implementation and impact of our recommendations.

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