RAND EUROPE

FROM RESEARCH TO REALITY

Research and innovation in the NHS as key to enabling the 10-Year Plan

Extended summary

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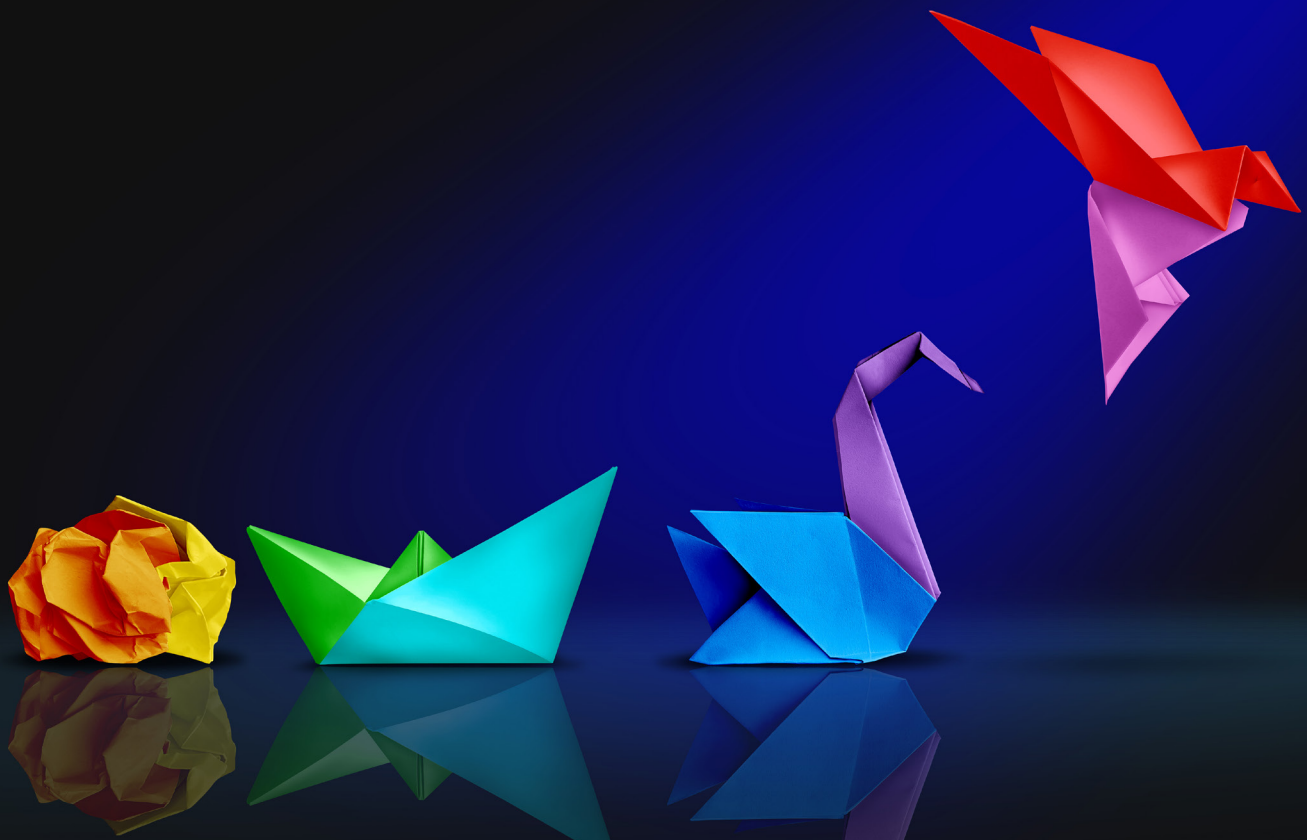

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Preface

This extended summary highlights key findings from a Wellcome-supported study delivered by RAND Europe to help inform a vision for research and innovation in the NHS.

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Why research and innovation is the key platform for the NHS 10-Year Plan

Mainstreaming research and innovation is the fourth big shift needed to underpin wider NHS changes

Embedding research and innovation throughout the NHS is the 'fourth shift' that will underpin the 10-Year Plan. NHS-wide research and innovation is the platform that will catalyse service-wide improvements in care quality, patient outcomes and experience, productivity and the sustainability of the NHS. Healthcare is a knowledge-intensive sector, and if research and innovation are not actively supported and enabled, the gap between what is possible to achieve and what materialises in practice will grow. The government's focus on developing a ten-year plan for health and care aims to respond to serious challenges to NHS sustainability and performance. The government is emphasising three big shifts: (1) from hospital to community, (2) from sickness to prevention, and (3) from analogue to digital. These three shifts depend on the capacity to learn, innovate and embed change throughout the NHS. This fourth shift, from seeing research and innovation as a 'nice to have' to seeing it as essential, is central to efforts to transform the NHS and make it fit for the present and the future. We call this shift: from research to reality.

Lord Darzi's independent investigation of the NHS in England indicates that research and innovation have a key role to play in enabling a more sustainable NHS. Research and innovation should not be seen as second-order priorities. The UK has a strong base in health research,

ranging from basic and applied biomedical research and clinical trials to evidence on how best to reorganise and reform the delivery of health services. From a health policy perspective, research and innovation should provide the evidence, insights and skills to support change and improvement throughout the NHS. However, this potential has not yet been realised.

Research and innovation in the NHS remains fragmented, beset by systemic inefficiencies, with insufficient opportunity and incentive for NHS staff to engage, and weak links between NHS policy priorities and wider industrial strategy. Overcoming these challenges and embedding research and innovation throughout the NHS will be pivotal to achieving the aims of the 10-Year Health Plan and bringing wider societal and economic benefits.

This summary report highlights key insights from a study commissioned by Wellcome and delivered by RAND Europe to help inform a vision for research and innovation in the health system, with a particular emphasis on the NHS. This work was part of a wider collaborative project between Wellcome, RAND Europe and Nesta. RAND Europe's work focused on:

An analysis of evidence on the impacts of health research and innovation in and around the NHS.

Case studies in five key areas of strategic importance to the NHS: genomics, artificial intelligence, digital innovation in mental health, participatory research and tech-enabled remote monitoring (please see the Appendix at the end of this document, p.19).

An analysis of the ecosystem of support mechanisms needed to enable a research-and-innovation-powered NHS that can deliver benefits for patients and the public, the NHS and wider health system, the economy and society.

The study began in November 2024 and was informed by desk research, literature review, case studies and stakeholder engagement through interviews and a workshop. The study has also benefited from a long-standing body of work on research, innovation and health systems transformation by the RAND Europe research team. The full report detailing the evidence and learning will be available in early March 2025, alongside all references that support the analysis and inferences made.

Key findings

Health research and innovation are key drivers of benefits to the NHS, patients, the economy and society, and they should be seen as a core part of wider efforts to put the NHS on a more stable footing

Box 1 summarises the diversity of benefits from a research-and-innovation-powered health system in and around the NHS. Figures 2-5 in the appendix to this report illustrate current impacts and future potential through examples in five case study areas.

Box 1. The impacts of research and innovation on the NHS, patients, economy and wider society

Research and innovation in and around the NHS lead to a wide range of benefits. These span:

Improving care quality, safety and productivity: Participating in research and clinical trials is linked to better NHS adherence to evidence-based practice, improved treatment protocols and high-quality care, as well as greater openness to innovation.

Enabling job satisfaction and workforce retention: Research activity can make NHS organisations more attractive as employers and contribute to job satisfaction.

Improving patient health outcomes and experience: Research and innovation give patients early access to novel, potentially life-saving treatments. Research activity is linked to reduced mortality rates and increased patient confidence in healthcare professionals.

Contributing to health systems resilience: Research was key to the public health response to the COVID-19 pandemic, and surveillance research, pathogen genome sequencing, data modelling and vaccine innovation all have key roles to play in pandemic preparedness. Research also informs adaptations in health service delivery that support resilience.

Supporting economic benefits: Health research and innovation not only help saves lives, but also creates jobs and revenue and contributes to productivity. New treatments also improve people's quality of life, enabling them to remain employed and reducing absenteeism.

Enabling wider societal benefits and the UK's reputation as a global research leader: The UK is recognised as a clinical research leader, which helps attract international collaborators, increases research reach and impact and creates spillover benefits (e.g. patents).

Research and innovation should provide the evidence, insights and skills that enable change and improvement throughout the NHS. Although the UK has a strong base in health research and innovation to build on in NHS transformation efforts, the full potential to achieve impact has not yet been realised

Commercially sponsored clinical trials are a visible example of where collaborative action to address current obstacles would bring both health and economic benefits. However, the potential of research and innovation to support NHS transformation extends beyond trials alone and is key to delivering the three shifts identified by the government. Research and innovation capacity and skills for learning and improvement throughout the NHS are critical to seeing those shifts happen in practice. To illustrate:

Understanding health and disease: Basic research can help us understand the mechanisms underpinning health and disease, which is a prerequisite for efforts to identify successful prevention and treatment approaches.

Preventing ill-health and providing the right care in the right place and time: Applied research informs new prevention, diagnosis and more personalised treatment approaches. Such research also feeds into the development of innovations (often in collaboration between the NHS, academia and industry), including technologies that can facilitate early diagnosis and timely treatment to prevent unnecessary hospital admissions and digital health innovations to facilitate care in the community and help reduce waiting lists and backlogs.

Embedding evidence-based best practice in the NHS: Health services research and evaluation provide actionable insights into how innovations can be implemented and services improved in practice, across neighbourhoods and communities in the UK.

Delivering NHS reforms and supporting high-quality and sustainable healthcare cannot happen without an ecosystem of support mechanisms to nurture a research-and-innovation-active NHS

The new government presents a fresh opportunity to embed research and innovation at the heart of the NHS as part of wider efforts to deliver NHS reforms and societal benefit. We identify seven support mechanisms for mainstreaming research and innovation throughout the health service and achieving the fourth shift: from research to reality. The support mechanisms are summarised in **Figure 1.**

Figure 1. Support mechanisms for a research-and-innovation-powered NHS

We describe below why each support mechanism matters for achieving the fourth shift (from research to reality) and success in NHS transformation efforts. We also describe how each support mechanism can be enacted in a vision for 'what good looks like' in the future.

1 A research-and-innovation-active NHS workforce is critical to achieving sustainable, high-quality, cost-effective healthcare.

IN TEN YEARS, THE FOURTH SHIFT WILL HAVE EMPOWERED NHS STAFF TO HELP TRANSFORM THE NHS BY ENSURING EVIDENCE-BASED AND INNOVATIVE PATIENT CARE.

The NHS workforce will be motivated, skilled, rewarded and accountable for engaging with research and innovation to deliver sustainable, high-quality healthcare. A cultural change will ensure that research and innovation are no longer seen as 'nice to have' but as part of the core fabric of the NHS and its commitment to care excellence. Staff will be given the time, permission and headspace to engage with research and innovation and will be trained to do so throughout their education and careers. As a result, they will understand and appreciate its potential to improve care quality, safety and value for money.

In this vision for the future, the potential of a research-and-innovation-active workforce to make NHS service transformation a reality is enabled because:

- **Committed leadership and wider NHS staff skills and capacities support a culture of innovation and improvement:** Local, regional and national NHS leadership across clinical, managerial and administrative functions champion and promote NHS cultures in which staff understand and appreciate how research and innovation can support high-quality care and are incentivised to engage. Staff are exposed to training about research and innovation early in their careers through reform in education curricula and have relevant skills updated over time through continual professional development. As a result, there is a critical mass of research-and-innovation-active staff who understand the value of research and innovation and can engage with it, including in professions with historically limited opportunities (e.g. mental health and nursing).
- **Incentives and accountabilities enable research and innovation at the needed scale to deliver excellence in patient care:** Research and innovation are embedded in the identity of the NHS. Innovation is not mandated, but NHS organisations need to provide compelling evidence of why proven innovations or research-based practice are not taken up (if that is the case) through accountability and monitoring practices and inspection regimes. This helps tackle unwarranted variation across different healthcare providers. Incentives and rewards give NHS staff the time, permission, job roles, flexibility, recognition and career pathways to enable meaningful contributions.
- **The NHS workforce is motivated, and staff well-being is improved through job satisfaction and pride for high-quality care delivery:** Alongside wider NHS workforce reforms, greater engagement with research and innovation makes NHS staff feel motivated, rewarded and proud to deliver world-leading healthcare.

2 Improved access to data, information and evidence is essential for translating research and innovation into evidence-based NHS practice and responding to unmet needs in timely ways.

IN TEN YEARS, THE FOURTH SHIFT WILL HAVE BOLSTERED EFFORTS TO MAKE THE MOST OF DATA, INFORMATION AND EVIDENCE AS A KEY NHS ASSET AND DRIVER OF CARE EXCELLENCE, EFFICIENCY AND COST-EFFECTIVENESS.

Data, information and evidence will be more easily accessible to researchers and innovators and used, shared, combined and analysed safely and securely. Without this shift, patients and the NHS would not be able to deliver on the needs for high-quality, safe and cost-effective healthcare. A mix of technical, regulatory, public engagement and national strategy measures will enhance public trust in data sharing and use. Patients will have a key say in what data they choose to share, when and how, enabled by existing tools, such as the NHS App. Investments in data as a key national asset and in enabling infrastructure (quality control, data linkage and systems interoperability) will support more proactive and personalised care. Training will enable the NHS workforce to better engage with data and to critically assess evidence. Coupled with better signposting to sources of information and evidence in the health system, this will support timelier decisions about adopting, spreading and scaling innovation. Advances will reach patients quicker and be more effective, informed by better data and evidence.

In this vision for the future, the potential of research and innovation to make NHS service transformation a reality is enabled through better production, sharing and use of data, information and evidence because:

- **Public support for data access, sharing and use for research and innovation significantly improves:** Public trust and buy-in for data use and sharing is enhanced through a combination of *technological solutions* (e.g. safely accessible federated data sets), *regulation* (e.g. clear data standards, accreditation for secure data environments), *improved communications and public engagement* (e.g. policy transparency, better dialogue with the public facilitated by charities, better engagement about why industry access to data is essential for developing new diagnostics and treatments) and *a coordinated national strategy* to guide data access and use (e.g. informed by learning from prior efforts and enacted through the support of a national data service that facilitates engagement and interaction with local health systems). Patients control what data they choose to share, when and how, enabled by existing tools, such as the NHS App.
- **A national data infrastructure enables research and innovation to make ambitions for more preventative, personalised and innovative care a reality:** Investments in data as a key national asset result in individual and linked/linkable data sets and interoperable IT solutions supported by clear standards and demand-signalling that bolsters interoperability and improves data flows. Advances in Artificial Intelligence (AI) and quantum computing support

better use of data for more predictive and proactive care and better health decisions. These advances are complemented by investments in training and workforce development in data science skills (e.g. via an expanded NHS Digital Academy training offer and public-private collaboration in training and on-the-job learning) and critical appraisal skills. In turn, these enable high-quality and efficient translation of data into information and innovation so that advances reach patients quicker and are more effective.

- **Improved signposting to sources of information, evidence and advice makes it easier for NHS staff to do and use research and innovation to deliver best practice in care:** NHS staff find it much easier to access the information, evidence and support they need to pursue research and innovation, whether to develop new solutions or adopt best practice. Repositories of evaluative evidence are linked to regional hubs and healthcare boards, ensuring that clinicians can easily access up-to-date information. This accessibility helps streamline the adoption of innovations, reducing the time lag between discovery and implementation. NHS staff are also more aware of and make greater use of existing support services (e.g. Health Innovation Networks, NHS Innovation Service and National Institute for Health and Care Excellence (NICE) Advice).

3 Upgrades to basic physical infrastructure alongside investments in key high-tech facilities are crucial for the NHS to provide safe care, and for patients to access global scientific advances and not be left behind.

IN TEN YEARS, THE FOURTH SHIFT WILL HAVE MOBILISED IMPROVEMENTS IN THE NHS ESTATE ESSENTIAL FOR RESEARCH AND INNOVATION TO SUPPORT SAFE AND EXCELLENT CARE.

Facilities, equipment and IT systems will be updated and maintained to support excellence in research, innovation and patient care. Strategic and prioritised investments will ensure the 'basics' are in place, reducing contradictions between world-leading facilities in some settings and dilapidated buildings and out-of-date equipment, hardware and IT systems in others. This will enable more distributed and fairer opportunities for NHS staff across the UK to undertake and benefit from research and innovation in delivering care. NHS staff will be less concerned than they used to be because they will no longer be working in environments that could compromise patient safety and the efficiency of care delivery. A long-term funding settlement will support the necessary upgrades to the NHS estate, with some budget ring-fenced for adapting to emergent opportunities and needs.

In this vision for the future, a revitalised physical infrastructure in the NHS enables the potential of research and innovation to make NHS service transformation a reality because:

- **Basic facilities, computer equipment and IT systems are improved, making it more feasible for NHS staff to utilise existing modern high-tech infrastructure for research and patient care:** Strategic and carefully considered capital investments reduce the disparities and contradictions between 'bells and whistles' world-leading facilities in some settings (e.g. for genomics, AI and machine learning, advanced imaging, synthetic biology) and unmet needs for 'nuts and bolts' basics (e.g. restoring dilapidated buildings, modernising computing equipment and basic IT systems, ensuring reliable Wi-Fi and sufficient diagnostic imaging scanners) that need to be in place across the UK, and not just in the 'golden triangle'.
- **Staff well-being is improved because they have greater trust in the ability to deliver care in safe environments, supported by better facilities where research-informed practice can thrive:** Staff feel they are delivering safe patient care without limitations imposed by outdated infrastructure. Standards for quality control and compliance are monitored and followed.
- **A longer-term capital funding settlement enables the NHS to balance planned investments with an ability to respond to emerging opportunities:** NHS leaders can access and use capital to make necessary and planned investments into upgrading, maintaining and modernising facilities, equipment and IT infrastructure. They also have some ring-fenced flexible resource in anticipation of emergence and the need to adapt to science and technology developments (improved genomic lab infrastructure, data storage, processing and analytics infrastructure). Part of this strategy also considers the workforce that must be trained and in place to operate requisite facilities and equipment.

4 More strategic prioritisation of funding, commissioning and procurement of research and innovation is crucial for reducing resource wastage and inefficient and ineffective care.

IN TEN YEARS, THE FOURTH SHIFT WILL HAVE ENABLED RESEARCH AND INNOVATION FUNDING TO BETTER RESPOND TO UNMET NEEDS, WITH FEWER BOTTLENECKS PREVENTING SOLUTIONS FROM REACHING PATIENTS.

Investments in research and innovation will be better prioritised to help align supply with areas of demand and willingness to pay, and in consideration of the need to address short- term priorities associated with waiting times and backlogs) and long-term needs. This approach will support improvements across prevention, diagnosis and treatment and the shift in emphasis from hospital care to care in the community. It will be easier to attract industry and international investments in research and innovation because of clearer demand-signalling, the impetus of more strategic public funding for research and innovation, and greater clarity and reduced bureaucracy in funding processes and pathways from research and development through to the adoption of novel solutions in the NHS. Both financial and non-financial incentives will encourage research and innovation activity in NHS organisations.

In this vision for the future, the potential of research and innovation to make NHS service transformation a reality is enabled by more fit-for-purpose funding, commissioning and procurement approaches because:

- **Strategic demand-signalling supports well-prioritised investments in research and innovation that patients need and the NHS can afford:** Collaborative decision-making on research and innovation priorities takes place through engagement between local and national health system levels and is informed by consulting patients, NHS staff, policymakers and payers and by horizon-scanning to stay abreast of new developments. This approach supports a health system where the supply of research and innovation aligns better with areas of demand and willingness to pay, enabling clearer and more stable funding flows. Efforts are made to reduce the bureaucracy in the funding process and pathway. Coupled with clearer research and development funding and product, technology and service commissioning and procurement pathways, this makes the UK a more attractive market for national and international innovators and investors. A greater focus on real-world implementation testing for promising innovations helps inform better decisions about adoption, scale and spread.
- **Balancing short and longer-term research and innovation priorities helps the NHS deliver on immediate needs to reduce waiting lists while sustainably supporting key shifts to more preventative, personalised and community-based care:** NHS investments into research and innovation help the NHS catch up on the backlog associated with the Covid-19 pandemic. Health services research and evidence help implement service delivery changes, including supporting more technology-enabled remote care. Longer-term investments enable research and innovation to continue bolstering shifts towards prevention, community and the spread of digitally-enabled care.
- **Industry and international investors scale up support for research and innovation in the UK, enhancing service sustainability and the provision of excellent, modern healthcare:** The health system benefits from public and not-for-profit sector funding leveraging further private sector and international investments in research and innovation, alongside other fiscal, policy and regulatory incentives. This improves patient care through trial participation and access to global developments in timelier ways.

5 Clear and streamlined R&D governance and regulation underpins the ability of research and innovation to benefit the NHS, patients and economy at scale.

IN TEN YEARS, THE FOURTH SHIFT WILL HAVE ENABLED REGULATION TO BETTER MEET RESEARCHER AND INNOVATOR NEEDS. IN TURN, PATIENTS WILL BENEFIT FROM AN NHS THAT IS MORE ACTIVE IN RESEARCH AND TRIALS AND FROM QUICKER ACCESS TO NOVEL SOLUTIONS.

Researchers and innovators will see the UK R&D governance and regulatory environment as leaner, more efficient, robust and innovation-friendly than it used to be whilst still being compatible with international regulatory developments. Unwarranted variation in R&D approvals practices will be reduced as processes are streamlined across the UK. Regulatory agencies will be well-connected to international counterparts to help ensure timely approaches and responses to emerging science and technology areas. There will be closer collaboration across bodies involved in research governance, innovation regulation and health technology assessment to support a more efficient pathway from lab to NHS practice. These developments will increase commercial and non-commercial research and clinical trials and enable faster access to advances by the NHS and patients.

In this vision for the future, regulatory advances catalyse the potential of research and innovation to make NHS service transformation a reality because:

- **A more standardised R&D governance landscape reduces the bureaucracy that complicates and disincentivises researchers and innovators:** Research activity levels scale, including attracting more commercial trials. More efficient R&D governance and regulation enables studies and trials to start quicker and recruit patients quicker, supported by a national recruitment infrastructure well-connected to local and regional health systems. More centralised processes alleviate past inefficient behaviours associated with concerns over legal liabilities and risk-avoiding over risk-managing cultures in some NHS R&D offices and governance functions.
- **Regulatory efficiency improvements make the UK a more attractive market for testing innovations, and more patients benefit through timelier access to novel advances:** Regulatory disincentives related to lack of clarity and bureaucracy are reduced, especially concerning emerging technologies. Information is also better signposted, leading to a regulatory landscape that is easier for innovators in academia, industry and the NHS to navigate. UK regulatory agencies also become more 'fleet of foot' in supporting regulatory approval submissions in ways compatible with regulation in key international markets, better supporting the NHS's full potential as both a testing lab and a market.
- **Regulation keeps apace with science and technology advances making the NHS better able to confidently and in timely ways make the best use of innovation for excellence in patient**

care: Coupled with national public and expert dialogue, connectedness to international debates in emerging technology areas allows regulation to keep up to date with pace of science and technology advances in some key areas (e.g. AI, quantum, synthetic biology, *omics). This helps support a better balance between risk management and pro-innovation regulation. There is also closer collaboration and better alignment across the R&D approval pathway, regulatory approvals and health technology assessment pathway.

6 Closer collaboration and coordination between local, regional and national bodies is pivotal for more efficient and effective progress with research and innovation and its translation into best practice in NHS care.

IN TEN YEARS, THE FOURTH SHIFT WILL HELP ENSURE THAT COLLABORATION AND COORDINATION OF RESEARCH AND INNOVATION ACTIVITY SUPPORT THE EFFECTIVE SPREAD, SCALE AND SUSTAINABILITY OF INNOVATIVE AND EVIDENCE-BASED PATIENT CARE.

Organisations orchestrating research and innovation activity will be given clearer roles and remits, reducing unnecessary duplication and optimising the use of skills, capacities and resources. Closer working between localities, regions and central government will help prevent unnecessary duplication of effort and mitigate the unintended consequences of the 'not invented here syndrome' in accessing to proven innovations. Patients, the NHS and the economy will benefit from a landscape in which industrial policy and health policy initiatives reinforce each other, and the UK will be a key partner in global health research and innovation discoveries and developments. The government will make a concerted effort to create a favourable wider policy environment for international collaboration, and the UK will strengthen its role as a global leader in healthcare.

In this vision for the future, substantially improved collaboration and coordination of efforts bolster the potential of research and innovation to make NHS service transformation a reality because:

- **Joined-up thinking across industrial strategy and health policy spheres benefits health service delivery, patient outcomes and experience as well as industrial strategy and economic competitiveness:** Research and innovation better support benefits for patients, the NHS and the economy due to close, government-facilitated collaboration and coordination across decision makers in industrial and health policy spheres. This makes it easier for the fruits of UK-led industrial strategy investments to enter into the NHS and benefit the UK population.
- **Closer working and engagement between national and regional research-and-innovation initiatives leads to clearer remits for organisations with roles in fostering collaboration and coordination:** Resources devoted to supporting research and innovation are better

coordinated between regional and national decision makers and orchestration bodies, with a greater focus on priority efforts of appropriate scale (over short-term pilots). There is also a growing number of individuals with boundary-spanning roles in the NHS who enable collaboration. Improved engagement between localities, regions and central government drives this improved strategic coordination. As a result, unnecessary overlap and duplication are reduced, limiting 'initiativitis' and the unintended consequences of the 'not invented here syndrome' and supporting the adoption of best practices, regardless of their origins. The risks of multiple, overlapping and short-term initiatives wasting resources and compromising opportunities for sustainable and scalable impact are thus minimised.

- **International embeddedness supports UK efforts to benefit from global advances, industrial and economic competitiveness, and its reputation as a global leader:** UK patients and the public benefit from international health research and innovation advances in timely ways. The government makes a conscious effort to ensure the UK is an active participant in EU and global research and innovation collaborations, with key national bodies enabling efficient international collaboration in terms of governance of R&D, visa arrangements for researchers and other factors.

7 More inclusive patient and public involvement, engagement and participation in research and innovation are essential for the UK population to have a fair and meaningful say in shaping what the NHS does and how.

IN TEN YEARS, THE FOURTH SHIFT WILL ENABLE DIVERSE PATIENTS AND THE PUBLIC TO HAVE MORE SAY AND INPUT INTO SHAPING THE CARE THEY NEED AND RECEIVE BASED ON EVIDENCE AND CONTINUAL INNOVATION AND IMPROVEMENT.

Patients and the public across diverse communities will be better enabled to engage in research, innovation and NHS service improvement efforts in inclusive ways and have more awareness of and trust in opportunities to do so. This will be achieved through communication and public engagement approaches that ensure research-active staff in and around the NHS are appropriately trained and held accountable for enabling meaningful patient and public contributions. Investment will also be made in significantly improving awareness-raising about research and innovation (including clinical trial) opportunities through national signposting platforms (recruitment services), community outreach and existing tools (e.g. the NHS app). This will help ensure that research outputs and innovations in prevention, diagnosis and treatment are more inclusive of the needs of diverse communities, supporting wider government efforts to ensure a fairer UK.

In this vision for the future, meaningful and diverse patient and public contributions to research and innovation help make NHS service transformation a reality because:

- **Recruitment into research and trials is scaled so that patients and the NHS both contribute to global innovation and benefit from timely access to it.** Better awareness of clinical trials and other opportunities to engage with research and innovation is enabled through more considered communication strategies, information signposting (nationally, regionally, digitally and through direct community mobilisation, utilising existing platforms and apps), transparency and more active outreach. This increases the number of trials and the diversity of participants in trials. This also supports better public trust in research and innovation, including industry-led. There is an active effort for trusted organisations (nationally and in local communities) to champion efforts to build public trust and ensure responsible practices.
- **More diverse patients contribute to research and innovation, and this inclusiveness leads to advances that help tackle inequalities towards a fairer UK:** Barriers to engagement for underserved groups are lowered through efforts to enable more flexible participation approaches, addressing issues such as digital exclusion and supporting culturally appropriate outreach. Communities have more significant input and impact on research and innovation agendas and better access to resulting solutions. Advances better address the needs of marginalised and underserved communities as part of wider government policy efforts to achieve a fairer country.
- **A better coordinated infrastructure for engagement in research and innovation makes it easier for patients and the public to play a key role in shaping the future of NHS care:** Those driving research, innovation and NHS service delivery efforts find it easier to secure the input they need from patients and the public, and patients and the public feel that they are making a meaningful contribution reflected in the research outputs and design and implementation of innovative products, technologies and services. Closer collaboration between research, innovation and quality-improvement efforts facilitates better use of existing patient and public involvement and engagement capacity in the system – both lay and expert. Local initiatives are well-connected to national patient engagement, involvement and study recruitment efforts. Local health systems know their patients best and can help ensure the right people are involved in terms of the needs of specific studies. Good practice guidelines mitigate against the unintended consequences of researcher-service user power dynamics. NHS staff and academic researchers are better trained to engage with participatory research effectively and are accountable for demonstrating meaningful and not tokenistic engagement, reducing some of the power imbalances of past practices.

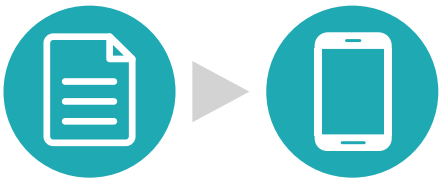
Conclusion

Prioritising actions in each of the support mechanism areas we have laid out will enable a feasible approach to translating the potential of research and innovation to support NHS reforms and the 10-Year Plan into practice. A coordinated national strategy informed by dialogue between actors in the research, innovation, health policy and industrial strategy landscape can help achieve this

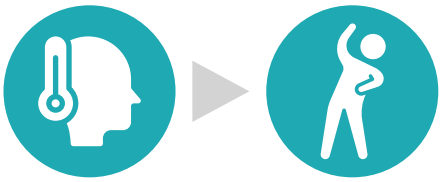
Only an NHS that embraces research and innovation can transition to meet current and future needs in a sustainable way. Realising this means linking multiple actors across the NHS, academia, industry, policy, regulatory and health technology assessment experts, and patients and the public. We have outlined seven support mechanisms to help ensure research and innovation deliver on their potential and summarised what needs to happen to make the transition. As shown in **Figure 2** below, these support mechanisms are backed by evidence on key health system building blocks outlined by the World Health Organisation.

The ecosystem of the support mechanisms is fundamental to delivering the shift from seeing research and innovation as 'nice to have' to essential and the three big shifts signalled by the government. More specifically:

The shift from **hospital to community** needs to be informed by health services and public health research and innovation that can support feasible, effective, evidence-based policies. This shift also needs to be supported by patient access to innovative diagnostics, treatments and cures that can help avoid unnecessary hospital admissions.



The shift from **analogue to digital** will require innovation in technology and data infrastructure, as well as research and evaluative evidence on workforce, service user, industry supplier and regulatory system determinants of implementation success.

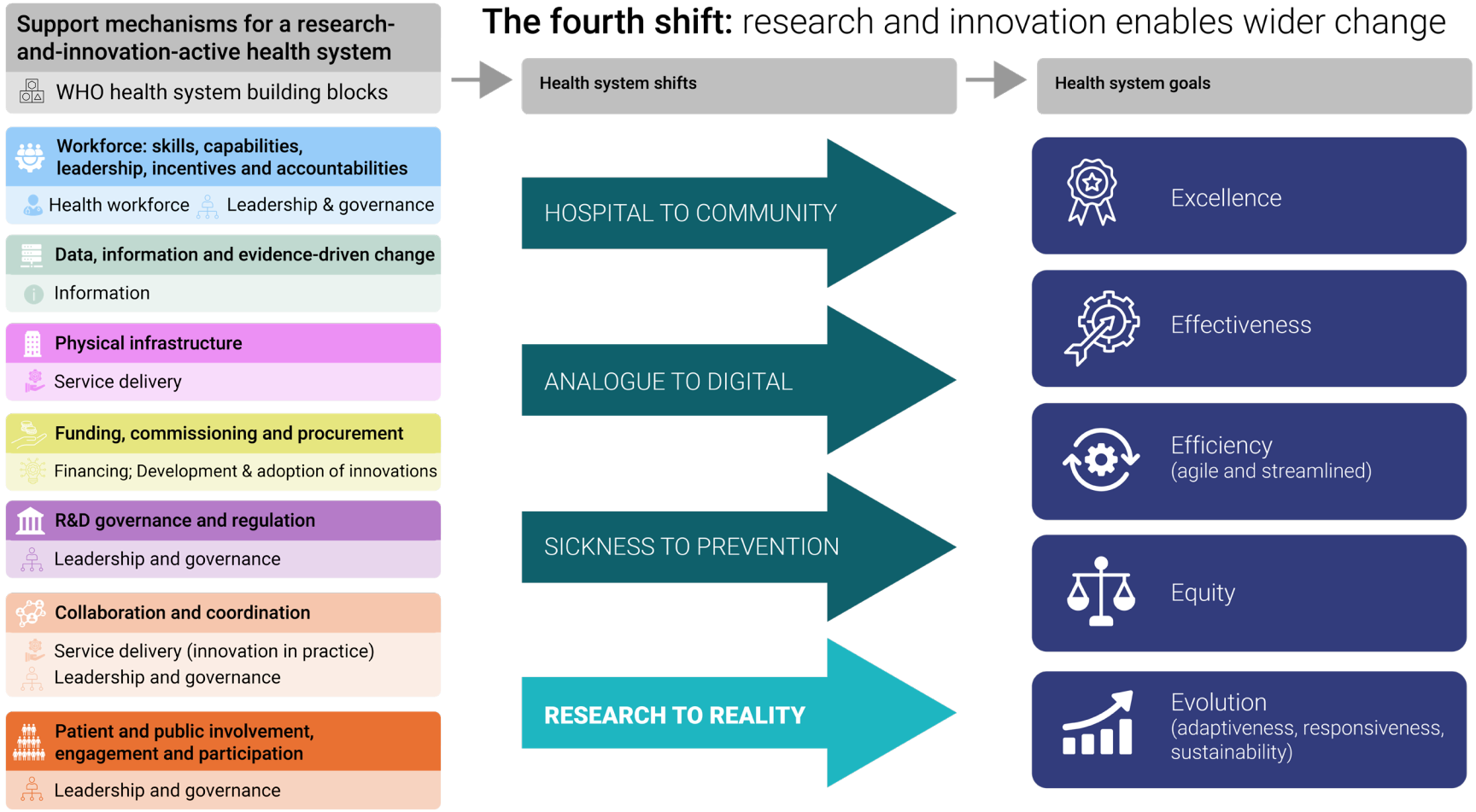


The shift from **sickness to prevention** will need to be informed by public health, health services and biomedical and life sciences research and innovation that can help keep people healthy while at the same time responding to pressing needs to reduce waiting times and address the post-Covid backlog.

The support mechanisms outlined are also key to achieving the core values of modern health systems. We conceptualise these as being rooted in notions of **excellence** in care, **effectiveness** (including cost-effectiveness), **efficiency, equity** and supporting an **evolving health system** that is responsive, learning and adaptive. This includes proactively addressing the growing burden of chronic diseases and comorbidities, ageing populations, growing health system costs related to the increasing and changing nature of demand for health services and emerging infectious disease threats.

A fourth shift to a research and innovation powered NHS needs to be a foundational building block of the 10-Year Plan

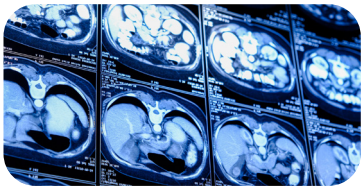
Figure 2. The fourth shift: research and innovation enable a wider change



Appendix: The impacts of transformative research and innovation on the NHS: examples of current benefit and future potential in five areas

Figures 3-6 **below exemplify health research and innovation's current impact and future potential in five areas of transformative science and innovation in the NHS as case examples.** They illustrate the strategic importance of health research and innovation for patients and the public, the NHS and wider health system, the economy and broader society, and highlight a vision for 'what good would look like' in the future, reflecting the opportunity the NHS can seize and what is needed to translate the opportunity into practice. The examples relate to:

Genomics testing and screening in the NHS



Artificial intelligence applications in cancer screening and diagnosis

Digital and data-enabled innovation in mental health

Technology-enabled remote monitoring in the NHS

Participatory research.

Genomic screening and testing in the NHS

Since the discovery of DNA's structure in 1953, the UK has played a key role in advancing research and innovation in genetics and genomics. The NHS has been a key partner in these efforts, providing patient samples for research and trials, clinical data, expertise, infrastructure and care pathways for genomic medicine. Examples of flagship UK initiatives:

- The Human Genome Project
- Wellcome Sanger Institute and Wellcome Genome Campus
- Genomics England and the related 100,000 Genomes Project and Genomic Medicine Centres
- UK Biobank
- The Genomics Medicine Service
- The National Genomics Board
- Our Future Health
- NHS Genomic Networks of Excellence.

IMPACTS

Impacts on patients and population health:

- Genomics research and innovation has improved the diagnosis and treatment of cancers, rare diseases and developmental disorders, informed disease prevention and management approaches in areas like Parkinson's disease, dementia, diabetes and heart health and helped inform public health decisions and medical innovation during the Covid-19 pandemic.

Impacts on the NHS and wider health system:

- NHS transformation efforts have been bolstered by a Genomics Medicine Service that is directly informed by genomic data and research, enabling evidence-based practice.
- Genomics England, as a government-owned company, enabled national research programmes in high-risk areas that would not have otherwise been possible, such as newborn screening.
- Genomics research provided the impetus for establishing governance and oversight frameworks enabling genomic sequencing to be made available in the NHS for diverse indications.

Impacts on the economy and wider society:

- The genomics sector brings revenue and supports enterprise creation and jobs. According to government data, the UK genomics sector had a turnover of £3.6bn in 2021/2022, and the British Industry Association estimates that the sector could reach a market capitalisation of £50bn by 2040.
- The Association of British Pharmaceutical Industries points to the number of genomics-related jobs doubling between 2016/2017 and 2021/2022, from 3,200 to 6,800.

FUTURE VISION

Workforce

A critical mass of well-trained NHS and health system staff and interdisciplinary teams will help ensure that scientific advances in genomics and related disciplines reach the health service and patients across the UK to improve care quality, patient outcomes and experiences, and wider economic and societal benefits.

Data, information and evidence-driven change

Better data access, sharing and linkage, and the convergence of technologies (e.g. genomics, quantum, synthetic biology, AI) will enable new application areas, such as improving patient care and population health throughout the life course through better prediction of needs, timelier intervention and better health system resource allocation.

Funding, commissioning and procurement

Organisations contributing to genomic science and genomic medicine will have more clarity on funding, commissioning and procurement flows, reducing uncertainty about rewards for their efforts and helping foster healthy collaboration.

R&D governance and regulation

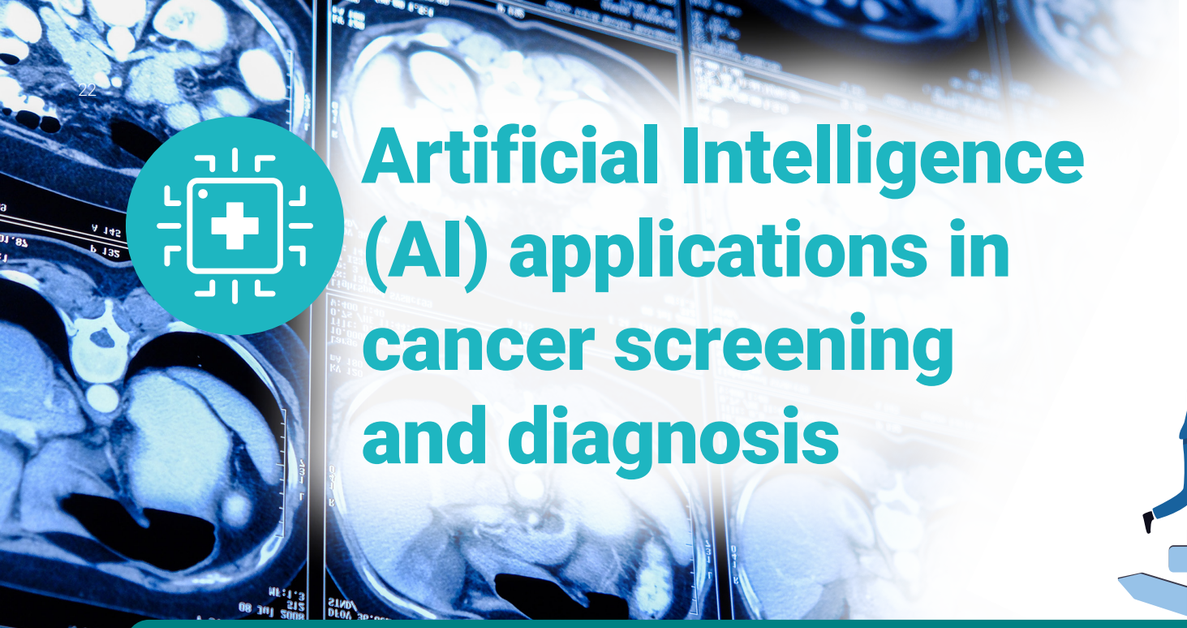
Research and development (R&D) governance and regulatory requirements for data access, sharing, use and reuse will be more streamlined and simpler to navigate, supporting greater efficiency in genomic research, innovation and adoption in the NHS.

Collaborations and coordination

More localised genomic medicine in the community will be enabled via access to long-read sequencing technology in primary care, shortening turnaround times to results for patients (30–60 min) and enabling better collaboration and coordination between local and national genomic medicine efforts.

Patient and public involvement, engagement and participation

Active public engagement and outreach, coupled with transparency in ways of working of genomic initiatives, will support more diverse participants in research and innovation efforts, increasing the accuracy of genomic testing, reducing inequalities, improving the relevance of genomic medicine for diverse populations and enhancing public trust.



Artificial Intelligence (AI) applications in cancer screening and diagnosis

IMPACTS

Impacts on patients and population health:

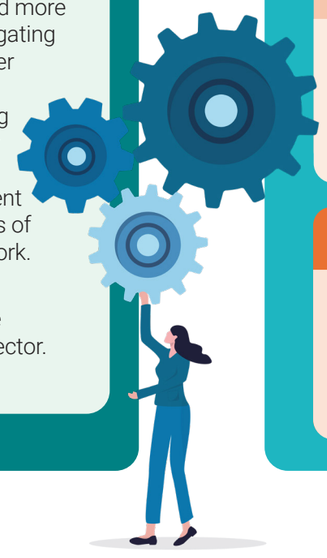
- AI supports accurate cancer detection and diagnosis and can improve detection rates and access to timely diagnosis. Early results from the deployment of an AI tool for breast cancer detection (Khieron's Mia) identified 12% more cancer cases than traditional detection methods.
- AI can also reduce waiting times for access to diagnosis and associated patient anxiety. Skin Analytics provides simple-to-access mobile-phone-enabled technology to enable rapid melanoma diagnosis.
- AI can help protect cancer patients from unnecessary tissue radiation by better targeting where radiation is delivered, e.g. using OSAIRIS' auto-segmentation technology.

Impacts on the NHS and wider health system:

- AI can potentially enable efficiency gains by reducing clinician workload and enabling faster cancer diagnosis. AI can help rule out patients with a very low risk of cancer and accurately identify patients at high risk, enabling clinicians to prioritise these for review.
- While the evidence base on impact is still evolving, AI-enabled tools complement clinical decision making. They can save specialists time and improve care quality (e.g. OSAIRIS for targeted radiotherapy, DERM for skin cancer detection, Pinpoint blood test for screening multiple cancers, Annalise.ai tool for interpreting tissue images).

Impacts on the economy and wider society:

- AI-enabled innovation could reduce healthcare costs, with earlier and more accurate cancer diagnoses mitigating the need for more expensive later treatments. A study using retrospective data and modelling of AI applications in lung cancer detection identified a £6,000 healthcare cost benefit per patient and economic productivity gains of £2.4m related to the ability to work.
- Investment in AI for cancer diagnosis also helps to promote growth in the UK life sciences sector.



Since the 2010s, the UK has placed significant policy focus on the potential of AI to support cancer screening, detection and diagnosis, and the NHS has played a key role in facilitating progress:

- The 2019 NHS Long Term Plan established the NHS AI Lab and the UK AI in Health and Care Award. The NHS has provided patient samples, data, infrastructure and clinical input.

FUTURE VISION

Workforce

NHS staff will be trained to engage with AI for cancer detection and diagnosis effectively, safely and with good balance with clinical judgement. A greater understanding of the benefits, limitations and risks that need managing will help increase trust in using AI in routine care to facilitate early cancer diagnosis and inform prevention measures.

Data, information and evidence-driven change

Technological advances and better data quality from more diverse populations will improve the accuracy and relevance of AI tools, helping mitigate inequalities. Data and evolving evidence will ensure AI algorithms and tools are regularly updated to optimise performance.

Funding, commissioning and procurement

Investments in developing explicit regulatory regimes and innovation enabled by technological advances (e.g. synthetic data and digital twin technology) will improve the UK's attractiveness as a location for developing and testing AI solutions. The resulting increase in trial activity will support faster patient access to innovation.

Collaborations and coordination

Collaborations between academia, industry and the NHS will enable technological advances in areas such as quantum computing to benefit the quality and speed of AI-enabled cancer diagnosis and the ability to analyse more complex data sets.

Patient and public involvement, engagement and participation

More inclusive patient and public involvement, engagement and participation in developing and implementing AI tools for cancer diagnosis will increase public confidence that AI is being used ethically and transparently and trust in the quality of care they receive.

Digital and data-driven innovation in mental health

Since the Mental Health Act of 1959, the UK has continued making gradual progress in understanding mental health (MH) conditions and improving care:

- Research and innovation has played a key role in improving mental health care, with notable examples being digital and/or data-driven innovations such as Talking Therapies and AVATAR therapy using computer-assisted visualisations and communications for people who hear voices.

IMPACTS

Impacts on patients and population health:

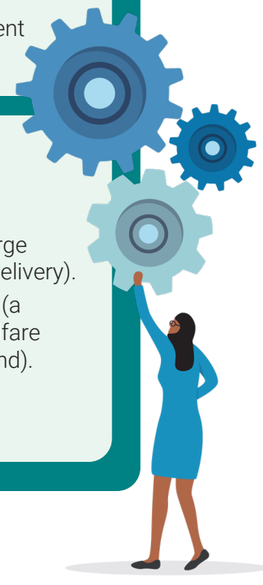
- Talking Therapies increased access and reduced waiting times for evidence-based psychological therapies (1.83m referrals in 2023/2024, and 90.5% people accessing treatment within six weeks).
- Many patients engaging with both Talking Therapies and AVATAR therapy show reductions in symptoms and increased quality of life (in the case of AVATAR therapy based on trial results).

Impacts on the NHS and wider health system:

- Talking Therapies have increased the capacity and skills of NHS mental health staff. Digital delivery formats have enabled NHS staff to see up to three times more patients, and current evidence supports their cost-effectiveness.
- Talking Therapies enabled a comprehensive data set on NHS service provision and patient outcomes, which is used to monitor and improve services.

Impacts on the economy and wider society:

- Digital innovations in mental health led to spin-out companies that develop treatments and health services tools and create jobs and revenue (e.g. Akrivia Health is creating large psychiatric datasets to inform service evaluation, clinical audits, research and service delivery).
- Talking Therapies can increase economic productivity by helping people return to work (a 7.92% increase in the probability of unemployed getting employment) and reducing welfare benefits (an estimated >£650 per person within two years of receiving therapy in England).
- Public health campaigns informed by research and media coverage increase public awareness and understanding of mental health conditions and help reduce stigma.



FUTURE VISION

Workforce

Investments in training a sufficient number and diversity of research and service delivery staff will enable innovative and evidence-based mental health services at scale, including through digitally enabled means. NHS trusts will be incentivised and enabled to engage with research and innovation in mental health.

Data, information and evidence-driven change

Fewer but better integrated, linked and interoperable datasets and IT platforms will be used to inform mental health services. Access to data will improve, making it easier to innovate and for more people to benefit.

Funding, commissioning and procurement

A policy push to collect output and impact data will enable a better understanding of mental health conditions, treatment effectiveness and links between mental and physical health.

R&D governance and regulation

More centralised and streamlined research governance and regulation will allow for more efficient progress. Clear standards and regulations for internet-based therapies will support high-quality service delivery of evidence-based mental health interventions. Simplified commissioning channels will enable greater use of digital innovations.

Collaborations and coordination

Closer working with communities coupled with enhanced public-private collaboration and incentives for NHS staff to engage will improve the appropriateness, diversity and effectiveness of mental health innovation and improve adoption in the NHS.

Patient and public involvement, engagement and participation

More diverse population groups will engage with research and innovation efforts, and the resulting advances will be more relevant to the mental health care needs of diverse people and better target inequalities (e.g. related to digital exclusion, children and young people's mental health needs, better consideration of culture and language). Blended care approaches (i.e. face-to-face and digital-access options) will help widen access.

Technology-enabled remote monitoring in the NHS

Since the early 2000s, the NHS has been leveraging digital technology for remote healthcare monitoring. For example:

- Major initiatives like the 2011 Whole System Demonstrator Programme examined the impact of technology-enabled remote care on chronic conditions like heart failure and diabetes.
- Scotland's 2014–2018 Technology Enabled Care Programme aimed to understand tech-enabled care's effectiveness.
- The 2019 NHS Long Term Plan emphasised digital health and the potential of remote monitoring for personalised care. Initiatives like BP@Home and MHF@Home apply tech-enabled remote monitoring to hypertension and heart failure management.
- Key evaluations such as those undertaken by the DECIDE Centre and NICE's Early Value Assessment programme also highlight the importance of evaluation in maximising the potential of remote monitoring technologies.

IMPACTS

Impacts on patients and population health:

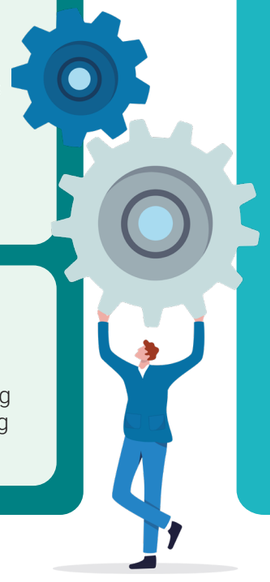
- Remote monitoring has improved some clinical outcomes. Examples include helping patients control their blood pressure, reducing infection-related complications of post-kidney transplantations by 65%, reducing anxiety associated with patients undergoing chemotherapy, and enhancing patient satisfaction and sense of control over their health.

Impacts on the NHS and wider health system:

- Evaluations of remote monitoring have shown some positive impacts on the NHS and the wider health system. For example, one longitudinal study found that admission to virtual wards reduced the length of hospital stay at NHS Wrightington, Wigan and Leigh Teaching Hospitals.
- A recent evaluation shows that virtual wards in Buckinghamshire, Oxfordshire, and Berkshire West ICS saved 46,685 bed days, significantly reduced emergency calls and readmissions, and reduced calls to 111 for adults and children by 58% and 85%, respectively.

Impacts on the economy and wider society:

- As an innovation sector, tech-enabled remote monitoring in health fosters enterprise and job creation. It can have wider societal benefits beyond the impact on patients, such as improving the well-being of carers, as shown in a study of parents of children with Type 1 diabetes using continuous glucose monitoring.



FUTURE VISION

Workforce

The NHS workforce will be trained to engage with tech-enabled remote monitoring and motivated to do so, supported by compelling evidence of its impact on care quality. Diverse clinical and non-clinical staff will have clear pathway delivery roles and collaborate within an efficient division of labour.

Data, information and evidence-driven change

The data and IT architecture will improve to enable better data collection on costs, clinical outcomes, and health service utilisation, as well as support real-time analytics to monitor and enhance care effectiveness. This will be enabled by streamlined data sharing, interoperable IT systems, a skilled workforce and AI use.

Funding, commissioning and procurement

Improved research and evaluation evidence will make it easier for tech suppliers' to convey the business case for adopting remote monitoring solutions and for commissioners to make evidence-based decisions. Better demand-signalling by policymakers will enhance transparent commissioning and reduce unwarranted variation in practices.

R&D governance and regulation

More efficient regulation will better support clinical practice. Greater regulatory clarity and less bureaucracy will make it easier to adopt innovative technology, including AI.

Collaborations and coordination

A community of practice will bolster collaboration between diverse stakeholders to share learning, adapt and improve practice. Better coordination between regional and national programmes and new roles (e.g. digital care coordinators) will support implementation.

Patient and public involvement, engagement and participation

Patients will be supported to onboard and engage with remote-monitoring technologies and trust the quality of care they receive. Clear communication channels between patients and NHS staff will bolster patients' trust in the quality of care they receive. Diverse patients (and carers) will contribute to service design and adaptation, including mitigating inequalities.

Participatory research in the NHS

The UK has been at the forefront of participatory research involving people who use and depend on health services to help design, implement and evaluate research and innovation efforts:

- Initiatives such as INVOLVE and the Public Involvement Standards Development Partnership paved the way for enabling participatory research.
- Programmes such as National Institute for Health and Care Research (NIHR) People in Research provide a wider support ecosystem for including patients and the public in health research.

IMPACTS

Impacts on patients and population health:

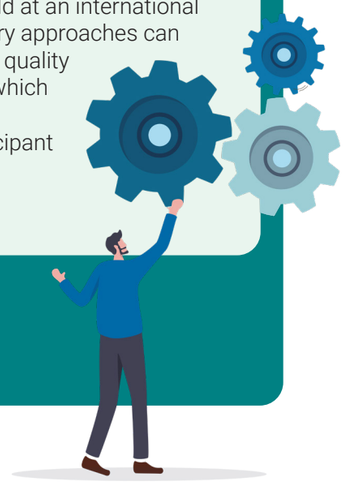
- Participatory research can improve the relevance and quality of research for patients and the public and, when carried out effectively, the experience of people contributing to research. For example, the Partner Priority Programme involved public advisors in evaluating new services aimed at reducing health inequalities and improving health and wellbeing.
- Engaging communities in the research process can also support more culturally appropriate services and improve the likelihood of target populations accepting services, increasing the potential for improved health outcomes and reduced health disparities.

Impacts on the NHS and wider health system:

- By focusing on local health issues, participatory research can help optimise the use of NHS resources. It allows for the identification of cost-effective solutions tailored to specific populations.
- Collaborative research structures involving academia, the NHS and other organisations, such as the Applied Research Collaborations, provide a distinctive structure for academic and clinical academics that lead research to engage with end users, and this can improve the pathway from research to implementation in practice.

Impacts on the economy and wider society:

- Commercially sponsored clinical trials are a key area of health research and a competitive field at an international level. Participatory approaches can help improve the quality of trial designs, which can impact the success of participant recruitment and retention efforts.



FUTURE VISION

Data, information and evidence-driven change

The UK will remain a global leader in participatory health research, leveraging its historical expertise in developing participatory research methods and evidence in this field. The evaluation of participatory research efforts will inform innovative participatory research practices.

Funding, commissioning and procurement

A national institute for participatory health research will provide leadership, funding for capacity building, evidence generation and training to advance participatory research methods and support their scale-up and spread throughout the research landscape. It will also embody participatory approaches in its governance.

Collaborations and coordination

NHS professionals will scale up efforts to engage patients, the public and communities in health research. This will be enabled by skills and capacity-building in participatory research via tailored education and continual professional development opportunities.

Patient and public involvement, engagement and participation

There will be an increasing focus on engaging communities (as opposed to individual patients or public members) in research to address wider social, economic and environmental determinants of health through research, particularly targeting minority groups. This is important because community-based participatory research is pivotal to regional, place-based NHS services that can respond to the needs of their populations. Community-based participatory approaches will aid in identifying local health priorities, engaging communities in decision-making regarding their health services, and mobilising broader resources. This will also help evolve the evidence base on how place-based participatory research can be conducted most effectively.