Innovating for improved healthcare

Policy and practice for a thriving NHS

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Preface

This report is independent research funded by the National Institute for Health Research (Evaluation of strategies for supporting innovation in the NHS to improve quality and efficiency, PR-R7-1113-22001) through its Policy Research Programme, and developed in close collaboration with the Department of Health and Social Care, NHS England and the Office for Life Sciences. The views expressed are those of the authors and not necessarily those of NHS England, the National Institute for Health Research, the Department of Health and Social Care or the Office for Life Sciences.

This report’s primary audiences are policymakers and decision makers concerned with designing and implementing health innovation-related policies and programmes at national, regional and local levels. However, the insights are also intended to be of practical relevance for a wider set of actors who contribute to, engage with and are influenced by policy developments and by national, regional and local health and innovation programmes. This includes healthcare professionals, managers and executives in the NHS, patients and the public, charities, innovation and improvement networks, the private sector, regulators and the research community.

The study draws on and enriches the current knowledge base and literature on innovation in health systems. It provides readers with a comprehensive assessment of the experiences of diverse actors working within the innovating health system in England, and locates these experiences within the wider research literature and policy context. It concludes with practical recommendations for further improvements in this highly dynamic field of policy.

More specifically, in Chapter 1 we describe the background and context to the research and provide a brief overview of the study design and methodological approach. Chapter 2 introduces key developments in the health innovation policy landscape in England and provides a brief overview of the key literature that has informed the conceptual approach to our study, reflecting our interest in better understanding how innovation can contribute to health system performance and how the policy environment can support an effective and efficient health innovation landscape. Chapters 3 to 11 present the main findings of the study, looking at the current landscape for innovation and providing recommendations for improving this landscape. More specifically, Chapters 3 to 9 provide findings related to six key drivers of health innovation: skills, capabilities and leadership (Chapter 4); motivations and accountabilities (Chapter 5); the information and evidence environment (Chapter 6); relationships and networks (Chapter 7); patient and public involvement and engagement with innovation (Chapter 8); and funding
and commissioning (Chapter 9). Chapter 10 presents cross-cutting findings pertaining to the need to better align policy design with a consideration of implementation requirements and success criteria. Chapter 11 discusses key findings related to improved ways of measuring innovation uptake and impact. Chapter 12 offers a reflection on the study findings and outlines key areas for action and associated recommendations. A set of annexes is provided as a separate document. These annexes present the detailed analysis of the individual work streams, with Annex C presenting the 14 case vignettes developed for this study and Annex H describing the methodological approach of each individual work stream.

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Study context, purpose and methods

The NHS faces increasing pressures to meet rising and changing demand for healthcare services, driven in part by an ageing population and increasing numbers of people living with chronic conditions, and it confronts these demands in the context of limited resources. Innovation offers opportunities to help respond to the challenges the NHS faces and to support high-quality, efficient and effective healthcare. Policymakers are increasingly recognising the potential of innovation to help support a thriving health and care system (Department of Health 2018; NHS England n.d.-a). However, both policymakers and wider stakeholders often lack appropriate information and data to inform policy and practice, and the development, commissioning and use of innovations remains patchy across England. Some proven innovations swiftly spread while others get limited traction.

To address this evidence gap, RAND Europe and the University of Manchester were commissioned by the National Institute for Health Research (NIHR) Policy Research Programme – in close collaboration with the Department of Health and Social Care, NHS England and the Office for Life Sciences – to conduct a multi-year study to examine the potential of innovation to respond to the challenges that the health system in England faces, and to help the system deliver more efficient and effective services. The aim of the study is to provide actionable evidence to help policymakers and wider stakeholders to effectively engage with the opportunities (and manage the challenges) that innovation presents for supporting the quality, efficiency and effectiveness of the health system.

The study adopted a systems approach to understanding healthcare innovation. We defined health innovation as any product, technology or service that is new to the health system, or applied in a way that is new to the health system, and is aimed at delivering improved or more efficient care. Our perspective is premised on the conceptualisation of innovation and of innovating as the process and result of dynamic ‘innovation systems’ and ‘socio-technical regimes’ in which many institutions, individuals, organisations, networks, ideas, capabilities and practices interact (see e.g. Freeman 2008; Geels 2004; Geels & Schot 2007; Lundvall 1992; Nelson 1993). These interactions occur amidst shifting government and policy priorities, economic and other resource constraints, varied research perspectives and cultures, and, crucially for the purposes of this study, the dynamics of healthcare systems. An innovation systems perspective recognises that the pathways through which innovations develop are
Innovating for improved healthcare

typically non-linear and usually involve multiple stakeholders, organisations and institutions.

An innovation systems approach also implies a research perspective that looks at the complex interactions across development pathways (from health research to health provision and care systems), and considers how innovation activities influence and are influenced by the healthcare system. This approach helped us examine how these interactions affect the impacts and outcomes of policies, initiatives and interventions on the quality, safety and cost-effectiveness of healthcare.

The study proceeded in two stages. Stage 1 examined the implementation and outcomes of the Innovation, Health and Wealth strategy (Department of Health 2011), which set out the Department of Health’s (now Department of Health and Social Care) delivery agenda for spreading innovation throughout the health system in England at the time. We explored the role of the Innovation, Health and Wealth strategy in the national health innovation landscape and its key associated initiatives for taking forward innovation in health (Bienkowska-Gibbs et al. 2016), with a view to capturing empirically informed and practical lessons in addition to informing more in-depth work in Stage 2 (Marjanovic et al. 2017a, 2017b). This report focuses and reports on insights from Stage 2, bringing in learning from Stage 1 into the discussion and conclusions, but not repeating findings that have already been reported elsewhere.

To examine the potential of innovation to respond to the challenges that the health system in England faces, and to help deliver affordable, efficient and effective services, Stage 2 of the study examined four interrelated research questions:

1. How do organisations working in and closely with the NHS perceive and understand innovation, and how does this influence their actions?

2. Who drives and contributes to innovation and how might successful innovation have greater scale, scope and impact?

3. What practical changes to policy, culture and behaviour can support system-wide improvements to innovation pathways?

4. How can we measure the contributions of innovation to the social and economic performance of the healthcare sector?

It is important to highlight that in our analysis, we do not assume that innovation is inherently and always beneficial, but we have chosen to focus on cases where evidence suggests likely benefit.

Different stakeholders may have a mix of complementary and conflicting interests, and proper governance and due process are needed to manage the spread and adaptation of new and promising approaches. However, what are thought to be helpful innovations may not always prove to be as beneficial as first hoped. Under such circumstances, the policy challenge is not to understand how to drive innovation forward at all costs, but to identify likely failures, improve innovations or manage them out of the system in a timely manner.

Stage 2 of the study was implemented in two phases, and the work streams for each phase are summarised in Table 1 below.
Table 1: Work streams of this study

<table>
<thead>
<tr>
<th>Work stream and data source</th>
<th>Purpose</th>
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<tbody>
<tr>
<td><strong>Phase 1</strong></td>
<td></td>
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<tr>
<td>Work stream 1: Six regional workshops with 101 participants across diverse stakeholder communities</td>
<td>Explore a shared understanding of how innovation works in four regional health economies (East of England; Greater Manchester and North West Coast; the South West; and University College London Partners (UCLP) and related actors), gain a better understanding of individuals’ experiences and perspectives, and share individuals’ perspectives on best practice for supporting innovation activity in their regions.</td>
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<tr>
<td>Work stream 2: In-depth interviews with 120 individuals</td>
<td>Understand and explore regional dynamics found in the workshops in more depth.</td>
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<tr>
<td>Work stream 3: A review of the Small Business Research Initiative (SBRI) Healthcare programme</td>
<td>Review the aims and activities of the programme, its outcomes and impacts, as well as the opportunities and challenges it faces, and explore how the programme contributes to innovation processes and how this could be improved in the future.</td>
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<tr>
<td><strong>Phase 2</strong></td>
<td></td>
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<tr>
<td>Work stream 1: Prioritisation survey of 256 stakeholders across different groups in the health system</td>
<td>Identify highest impact and priority actions for enhancing health system performance through innovation, and recommendations to be considered in future policy developments.</td>
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<tr>
<td>Work stream 2: 77 semi-structured thematic interviews with representatives of innovation and improvement networks, healthcare providers and commissioners, charities and patient and public involvement organisations, the private sector, academics and policymakers</td>
<td>Better understand how distinct stakeholders can engage with health innovation most effectively – given their interests, roles and capacities in the health system, including in relation to policy developments. The interviews also aimed to inform learning about how the policy landscape may be improved to more effectively contribute to an innovative health system, and more specifically to identify areas for policy intervention and associated practical actions.</td>
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<tr>
<td>Work stream 3: 14 case vignettes of selected health innovations</td>
<td>Learn about the intricacies of innovation pathways, adoption processes and associated enablers.</td>
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<td>Work stream 4: Seven stakeholder-specific workshops with 71 participants</td>
<td>Mobilise participants’ unique expertise and experiences to explore solutions for strengthening the innovating health system across the innovation pathway – from development to adoption and diffusion.</td>
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<tr>
<td>Work stream 5: A review of scholarly literature and policy-related documents</td>
<td>Identify issues of interest for further exploration in the interviews and workshops, and enable triangulation of primary evidence against the existing knowledge base.</td>
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<tr>
<td>Work stream 6: Analysis of indicators for evaluating innovation performance</td>
<td>Identify improved ways of measuring diverse types of impact from innovating in the health system.</td>
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<tr>
<td>Work stream 7: Analysis of the population-level factors associated with the uptake of innovative medicines</td>
<td>Identify whether variation in uptake of innovative medicines is determined by population characteristics or clinical commissioning group (CCG) attributes.</td>
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<tr>
<td>Work stream 8: Continual engagement with policymakers and wider stakeholders</td>
<td>Ensure timely learning and exchange of information and ideas.</td>
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Note: Data within specific work streams were coded and analysed thematically. Data were triangulated across methods and data sources, and across stakeholders involved with the research to arrive at final conclusions.
Key findings: innovating for improvement in health

We present our findings about the current health innovation landscape and associated recommendations as they relate to:

- Six key drivers of innovation (identified in Stage 1): (1) skills, capabilities and leadership for innovation; (2) motivations and accountabilities; (3) information and evidence; (4) relationships and networks; (5) patient and public involvement and engagement with innovation; and (6) funding and commissioning.

- Two cross cutting themes (identified in Stage 2): (a) the need to align policy design with implementation and success criteria; and (b) an analysis of potential metrics that could be used to measure the outputs, outcomes and impacts of innovation across the healthcare innovation pathway.

Boxes 1 to 8 outline the 30 key recommendations identified. More detail on the individual actions associated with each recommendation area is given in Section 12.2 of the report.

1. Strengthening skills, capabilities and leadership for innovation

- Diverse social and technical skills and leadership capabilities are needed to engage with an innovating health system.

Essential social skills to help drive innovation include: leadership capabilities to manage risk and navigate innovation-related activity across professional boundaries and hierarchies; networking, brokerage and relational skills to create connected communities; and business skills related to establishing a compelling business case for innovation.

Essential technical skills include: needs assessment and problem articulation; interpreting innovation-related evidence; implementing (and adapting) innovations and implementing innovation policies in organisations; economic analysis and evaluation skills that measure performance of products, technologies and services in the real world over time and at the level of the health system (rather than in organisational silos); and intellectual property literacy.

Historically, the innovating health system in England has emphasised the supply side of the innovation pathway (e.g. the Clinical Entrepreneurs Training Programme; training and mentorship provided through enterprise and Innovation Hubs; Small Business Research Initiative (SBRI) health economics skills support; and others) somewhat more than skills required for adoption, spread and scale-up on the demand side. Recently, programmes such as the NHS Innovation Accelerator and the refreshed Academic Health Science Networks (AHSNs) are seeking to address this imbalance by creating receptive and connected environments for innovation across the entire health innovation pathway – from idea generation and innovation development through to adoption, diffusion and spread.
Box 1: Recommendations pertaining to skills, capabilities and leadership

1. Policymakers and NHS leadership should identify, mobilise and embed Innovation Champions and brokers into the health system more widely than is currently the case. To prevent these being tick-box roles, individuals need to be trusted leaders across professions, and have clear responsibilities and accountabilities for supporting innovation (including for developing innovation-relevant social and technical skills amongst staff through formal and informal training, mentoring and knowledge exchange opportunities).

2. To change attitudes towards innovation (and highlight the risks of not innovating, when appropriate) policymakers should work with (1) professional communities to embed innovation-related training into continual professional development, and (2) Medical Royal Colleges and Health Education England to introduce innovation-related skills training into medical education.

3. Policymakers, medical education communities, innovation practitioners and healthcare service providers should work together to establish programmes for the private sector on effective engagement with the NHS and on developing compelling business cases.

2. Ensuring appropriate motivations and accountabilities

- Although there has been recent progress in the evolution of policy initiatives that emphasise the uptake of health innovation, the current system of incentives and accountabilities for engaging with innovation needs strengthening.

Motivations and accountabilities shape how people engage with both the development and uptake of innovations. Motivations involve: personal beliefs about the value of innovation for improving care; leadership support and organisational values; and norms related to innovating, reputational, financial and career-related drivers.

For people working in health innovation, key incentives can influence their engagement with innovation, including: permissive environments with leadership support for such activities, as they pertain to both development and to uptake; leadership and organisational communication about the risks of not innovating for patient safety and quality of care; effective organisational policies and practices for managing the risks associated with innovation; targeting incentives and accountabilities for innovation uptake; and further support for entrepreneurial activity. In the health system in England, the incentives for uptake of innovation have historically been weaker than those that influence entrepreneurial activities (e.g. funding for innovation development, programmes focused on skills for entrepreneurship) to develop new innovations. We have recently witnessed progress with the evolution in performance evaluation systems for initiatives such as AHSNs, with metrics that seek to incentivise the roles these initiatives can play in facilitating uptake.
Finding the right balance of incentives and accountabilities mixed with culture, comprehension, collaboration and leadership within any particular setting is a matter of judgement informed by the context and the requirements of the intended innovation. More specifically, identifying the anticipated benefits for patients, accruing financial and reputational benefits for individuals and organisations, finding opportunities for professional advancement, and aligning the aims of innovating with organisational norms and values can all be motivators for individuals and organisations to engage with innovation-related activities. Other motivating factors that could help change innovation-related behaviour include: releasing resources (time, funding) to incubate ideas and pursue innovation-related activity; sharing evidence about the benefits of innovations to encourage uptake; and identifying performance-related incentives associated with career development and promotion pathways. Many of these incentives and motivations seek to connect to and align individual interests with organisational objectives.

Stakeholders we engaged with during the course of this study generally did not support mandating the uptake of innovation. However, they did express agreement that strengthened accountabilities are needed and that a mix of carrot- and stick-based mechanisms would likely be most effective.

**Box 2: Recommendations pertaining to motivations and accountabilities**

4. Executive leadership, middle management and clinical leaders in healthcare provider organisations need to assume more responsibility for raising awareness and disseminating information about innovation.

5. Support the buy-out of programmed activities for health professionals to engage with innovating (where feasible).

6. Stronger monitoring of accountabilities is justified and can help tackle unwarranted variation (e.g. through requiring more compelling evidence of why proven innovations are not taken up in some contexts). Accountability for innovation could be embedded into national regulatory and improvement schemes. Individual accountability can be promoted through clear role specifications and performance management initiatives.

7. NHS leadership and policymakers could reward innovation by establishing ‘innovating with impact’-type awards (for entrepreneurial activity or uptake) for individuals and organisations.
3. Improving the information and evidence environment

- Current sources of information and types of evidence about specific health innovations and about opportunities to engage with innovation initiatives in the health system are multiple and diverse, but also fragmented, and the communication and targeting of such information could be improved.

Decision makers across the health system have differing needs for information and evidence to inform decision making. NHS decision makers need evidence on the impact of innovation, on the business case for investing in innovation, on how to implement and support innovation, on potential decommissioning needs, on training needs and on financing innovation activities. Private sector and clinical entrepreneurs need information on health system demand – namely on innovation needs, push and pull funding schemes, points of contact for support on legal and intellectual property issues and for adoption discussions and commercial negotiations, and institutions that can help broker networks. Patients and the public need to be given the opportunity to help identify innovation needs and be alerted to information sources on innovations they could access and benefit from. In relation to information about need and demand, the quantitative analysis conducted as part of this study found that the effect of population-level factors (e.g. prevalence of health conditions, age of population) and clinical commissioning group (CCG) features on the uptake of innovation varies across different medicines, and indeed throughout the qualitative work streams of our research, it is system-level factors that seem to weigh more heavily on the propensity for engaging with innovation and with uptake.

Stakeholders use many different types of evidence and consult varied and fragmented sources for information. Key sources include institutional websites (e.g. NICE guidelines and NHS England portals such as NHS Choices), AHSNs, Knowledge Transfer Networks, Innovation Hubs, quality improvement networks, conferences, trade shows, journals, and direct communication with peer and personal networks. An improved information and evidence landscape requires better signposting of information to a range of actors. Although progress has been made in enhancing the information and evidence infrastructure on innovation and on improvement-related data in recent years (e.g. through the Innovation Scorecard, GIRFT, NHS RightCare and NHS Choices), significant gaps in awareness of, access to, and user-friendliness of information and evidence sources persist.

While there is no ‘one size fits all’ approach to evidence requirements, we identified a range of information priorities in the system that inform decision making and should comprise the information and evidence landscape. First among these is a national framework and infrastructure for information and evidence that focuses on shared learning for all stakeholders. This framework could substantially improve the information and evidence environment. A system focused on learning could provide a shared data and evidence platform for disseminating information and exchanging knowledge to identify successful innovations, provide evaluations of innovations to support embedded knowledge in the system, and prevent reinvention of the wheel for each innovation.
Over the past decade, there has been an abundance of initiatives to support collaboration for an innovating health system (e.g. AHSNs, Vanguards, Test Beds, Innovation Hubs, Knowledge Transfer Networks, Catapults, Collaborations for Leadership in Applied Health Research and Care (CLAHRCs), Sustainability and Transformation Partnerships (STPs), quality improvement initiatives and various other regional networks and organisations). Many of these are governed nationally but implemented regionally. They support relationships that span multiple actors: healthcare professionals, academics, innovators in the private sector and in the NHS, patients and the public, and the third sector.

These initiatives play a role in coordinating organisations in the system; however, there is scope for strengthening their capacity to better align activity at the regional and national levels in order to support impact at pace and at scale. Strengthening the alignment between existing initiatives could also help prevent ‘initiavititis’ – i.e. introducing initiatives that duplicate effort and waste resources by ‘reinventing the wheel’ rather than developing a consistent rhythm of learning and improvement that builds on existing capacity.

4. Nurturing effective relationships and networks regionally and nationally

The diversity and gradual maturation of initiatives that promote collaboration for an innovating and improving health system create opportunities for coordination, shared learning and impact at scale. However, there is a need to improve the alignment of different initiatives with each other and across different actors.

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8. Create a national framework and infrastructure for overseeing and coordinating information and evidence flows. Support for this effort could entail:
   - Appointing national data leads and evidence and information flow champions at regional and organisational levels.
   - Collating and structuring evidence from diverse sources on a national integrated data platform that would serve as central repository of key analytics and a signposting platform to other information sources.
   - Supporting national initiatives and bodies across innovation and improvement spaces to collaborate, share and signpost information.

9. Create a framework for evaluating innovations both to inform adoption decisions and establish clearly defined principles for good evaluation practice and clear evidence standards. Apply evaluation to both innovations and incumbent offerings.

10. Invest in consensus processes amongst regional and national stakeholders to identify priority innovation needs for the NHS so that innovators can respond to more stable and clear demand, in consideration of finite resources.

Box 3: Recommendations pertaining to the information and evidence environment
In addition, although the innovating health system in England offers a range of formal and informal networks and networking opportunities, it is unclear if the system and its actors have the capacity to take full advantage of them. There was a perception among stakeholders that NHS organisations relevant to innovation in the health system often operate in relative silos and that the system is fragmented, which can hinder effective mutual collaboration and sharing of experiences and learning across networks. Ensuring that networks support and involve actors across the system, including at local levels, can help make the most of efforts across the system.

Box 4: Recommendations pertaining to nurturing effective relationships and networks

11. Improve the design of the innovating health system to align and better coordinate existing innovation-relevant initiatives, organisations and relationships. To achieve this, policymakers could work with wider stakeholders to:
   - Ensure that organisations and initiatives understand their roles and remits and the scale and timing of funding commitments.
   - Ensure that wider actors in the health system are more aware of the skills, capabilities and services on offer related to the remits of specific organisations.
   - Evaluate initiatives against progress and delivery on clear remits and roles.
   - Pursue cross-organisational representation on committees.
   - Support collaborative projects and tasks to help create a shared vision of success.
   - Consider prospects for shared posts, secondments and placements.
   - Appoint individuals with broker roles into initiative structures.

12. Develop guiding principles for private sector innovators on effective engagement with the NHS, and establish receptor roles in the NHS at clinical, managerial and executive levels with responsibility for engaging with innovators and decision-making authorities.

5. Facilitating meaningful patient and public involvement and engagement with innovation

The current landscape for patient and public involvement has evolved and is recognising the value of experiential evidence. However, a systemic and coordinated strategy for patient and public involvement and engagement (PPIE) with innovation in the health system in England is yet to be developed.

There is growing recognition that an effective, innovating health system benefits from patient and public involvement and engagement throughout the innovation pathway, from
idea generation through to design, feedback and evaluation. Patient input can enrich and energise the innovation process. For example, if patients experience the benefits of a particular innovation and advocate for its adoption to health professionals, those professionals are more likely to adopt it. The system therefore needs to create opportunities for PPIE across the entire pathway. Moreover, national policy and regional practice need to be based on evidence about what value PPIE can add and how it can best be mobilised.

PPIE occurs through a broad range of activities. Examples include: identifying innovation needs; providing input into design and testing; establishing educational activities and materials for patients about new innovations; advocating for uptake; generating evidence for innovation and disseminating it; supporting implementation of innovations in hospital change programmes; participating in evaluations; and recruiting PPIE contributors from peer communities.

However, engaging patients and the public can be challenging, sometimes resulting in merely token involvement and highly variable PPIE practices. For PPIE to have value, it has to be meaningful in relation to the quality, relevance, efficiency and impact of the innovation effort. Patients and the public should have a positive experience of engagement, which comes from them having clear engagement goals, clear roles and remits, feedback on their impact and on progress with the innovation effort, and training to support effective contributions.

Box 5: Recommendations pertaining to patient and public involvement and engagement

13. The innovating health system needs to create opportunities for PPIE across the entire innovation pathway while mitigating the unintentional risks of tokenistic involvement that mandatory engagement can create.

14. Build on current developments with a national strategy and implementation plan for PPIE in innovation, with a clearly defined set of principles (detailed in the full report).

15. Invest in coordinating PPIE activities and resources among local, regional and national stakeholders and across improvement, innovation and research efforts.

16. Signpost information that is important for patients and the public (e.g. on opportunities to engage with innovation and on available innovations and their impact), and make use of information sources that patients and the public consult (e.g. social media platforms, peer support groups and websites, charities, NHS websites such as NHS Choices, and health professionals). These information sources should feed a national information platform and inform the PPIE activities of AHSNs, healthcare provider organisations and charities.
6. Developing a funding and commissioning landscape to support innovation across the pathway

- A variety of funding schemes support innovation in the health system, but there is a need to improve the coordination, sustainability and stability of funding flows.

Funding for health innovation comes from multiple sources at the national, regional and local levels, with individual schemes detailed in the full report. Although some diversity helps to promote a competitive innovation landscape, the current system is too fragmented. As a result, funding efforts are often unable to achieve the critical mass required to support innovations across the pathway. While fragmentation may be the natural by-product of an accretion of separate policies over many years, it raises concerns about the sustainability of any one effort.

Historically, a greater number and variety of schemes have focused on innovation development funding (e.g. Innovate UK and SBRI Healthcare funding; NIHR Invention for Innovation; NHS England funding including for the Clinical Entrepreneurs Programme; various accelerator, catalyst and catapult funds; philanthropic funding; Health Foundation support; medical charity funds; private sector investments; and funding via various European programmes) than on financial support to enable the adoption and diffusion of innovation in the health system. However, more balanced funding is needed across the pathway, as is now increasingly recognised with initiatives such as the Innovation and Technology Tariff (ITT), the Innovation and Technology Payment (ITP), the NHS Innovation Accelerator programme and outcome-based commissioning programmes.

Balancing efforts across innovation development (supply) and adoption and diffusion (demand) raises two central challenges: (1) supporting a coordinated funding approach across the entire innovation pathway; and (2) ensuring funding sustainability. We have seen a greater focus recently on coordinated funding, but there is more to be done. A key risk in the current environment is that each funding mechanism addresses a specific need, but does not affect the wider innovation system (or potentially weakens that system by confusing decision makers and distracting from strategic goals).

As a first step towards supporting a more coordinated and sustainable funding landscape, the Department of Health and Social Care, Office for Life Sciences and NHS England recently worked on mapping the innovation landscape and have identified a range of schemes supporting health and care innovation across six organisations. This effort will help stakeholders to identify and navigate funding opportunities. Further actions are needed to build on this development.
17. Policymakers should support a whole-systems approach to an innovation funding portfolio to achieve scale and complementarities and to ensure promising innovations progress through the entire pathway. Specifically:

- Enhance collaborative working between government departments, arms-length bodies and other funders (e.g. through joint funding programmes, shared posts for individuals).
- Take stock of existing funding schemes, their roles, remits, complementarities or overlap and where they sit in relation to NHS innovation needs and priorities. Efforts to better coordinate the allocation of innovation funding will need to recognise that different types of innovations, and different activities along the innovation pathway, may be associated with different costs.
- Raise awareness and provide clarity to stakeholders about available funding schemes and how funding schemes are related and/or complementary.
- Revisit and refresh the push and pull funding mechanisms in the system to ensure that they support the development and uptake of innovations with diverse cost and quality benefit profiles over time. A policy focus on cost-neutral or cash-saving innovations alone will not incentivise or sustain an innovating NHS.
- Enable an innovation portfolio strategy that balances short- and long-term considerations about upfront investments, short-term returns and longer-term cost and quality gains through a de-politicised structure (cross-party and cross-departmental committee). Portfolio management techniques can support transparent and robust decision making on portfolio investments.
- Complement pull mechanisms that respond to the supply of existing innovations (e.g. ITT and ITP) with new pull mechanisms that are more responsive to demand (e.g. pre-commercial procurement commitments for innovations that respond to an articulated demand or meet quality and cost criteria, scalable and sustainable outcome-based commissioning, and adaptive commissioning models).
- Explore and evaluate the effectiveness and scalability of adaptive risk-sharing agreements between private sector innovators and the NHS (e.g. agreements that cover the upfront costs of testing products for small and medium-sized enterprises (SMEs), flexible and adaptive pricing arrangements dependent on real-world performance or guaranteed market access and price-volume agreements, conditional reimbursement, and deferred payments).
7. Aligning policy design with implementation and success criteria

• Policies that appear sound and rooted in evidence may have limited uptake because they do not integrate implementation requirements into policy design or make their criteria for success explicit.

To support the effective rollout and uptake of policies, there is a need to consider policy design in the context of implementation requirements, design specifications and success criteria. Our stakeholders identified a need for those involved in policy design to consider the financial, skills, infrastructure and informational requirements needed for policy initiatives to get buy-in from potential adopters. For example, stakeholders identified gaps in knowledge about what funds are available, how funders select projects, and whom to contact for information. In addition, they also reported a lack of upfront notice about implementation timelines and a lack of implementation capacity, both in terms of financial and human resource skills, for innovations and innovation-related initiatives.

These challenges to uptake can be tackled through more coordinated upfront design of policy and alignment with existing infrastructure, along with proactive information dissemination and engagement of interested communities. This does not necessarily always mean building extra capacity and providing additional resources to support new policy initiatives, but rather more thoroughly considering the capacity that exists and how it can be mobilised.

Box 7: Recommendations pertaining to better aligning policy design with implementation requirements

18. When designing new policy interventions, assess how they relate to the existing policy infrastructure to avoid unnecessary duplication, in order to identify opportunities for coordination and for harnessing complementarities.

19. Ensure that innovation, improvement and research policy bodies collaborate more closely around deciding on the needs for and design of new policy initiatives.

20. Place greater focus on identifying areas where joint funding of innovation efforts can mitigate against piecemeal and fragmented investments and support scale.

21. Specify what financial and human resources will be required for implementation.

22. Identify and communicate the relationships that are needed for successful implementation (e.g. between individuals, professions, stakeholders and parts of the health system).

23. Be clear about the physical and informational infrastructure required for implementation.


25. Identify sources of implementation support that stakeholders could access and contact.

26. Communicate and raise awareness about innovation policies and associated schemes by considering the information needs, incentives and accountabilities of stakeholders.

27. Provide sufficient notice for stakeholders to be able to engage.
8. Innovation metrics: what does success look like?

- Assessing the innovation process and its outputs and impacts is critically important for understanding the effect of innovation on the health service, healthcare organisations, patients and the economy, as well as assessing where future policy efforts might need to focus across the health innovation pathway and system. Better metrics are needed to understand innovation outputs and impacts.

Measuring innovation in the NHS has become an important subject in recent years and there have been some efforts to make improvements on this front. The NHS Innovation Scorecard is attempting to capture data on uptake and dedicated institutions have been set up across the NHS with the specific aim of supporting the diffusion of innovation. However, there are no standardised approaches, and there has been comparatively little consideration of metrics for digital and service innovations. Nevertheless, measuring the impacts and outputs of health innovation is critical for understanding the effect of innovation on the health service, the economy, healthcare organisations and patients.

Box 8: Recommendations pertaining to innovation metrics

28. We propose four types of indicators to consider when measuring innovation performance (elaborated on in the full report): (1) indicators of the progression of an innovation across different stages of health innovation pathways; (2) indicators of the adoption and diffusion of innovations through the healthcare system; (3) indicators that track the impact on patients, the population, the health system and the wider economy; and (4) indicators of capacity for innovating in the healthcare system.

29. Indicators should reflect concerns for assessing health innovation relevance, efficiency, effectiveness, impact and sustainability. Stakeholders evaluating health innovation performance need to balance concerns for the relevance of specific indicators with data availability and feasibility.

30. The establishment of appropriate indicators may need to happen in parallel with capacity-building in the health system, in particular as it relates to data and evidence infrastructure, as indicators are only as useful as the quality of the data that supports them.
Conclusions

The innovation system to support the NHS has been substantially strengthened in recent years but more needs to be done to maximise potential benefits. It is evident from our research that further actions to strengthen the innovating health system should be premised on four core principles.

Firstly, innovation strategies and innovation policy should be rooted in a whole care-pathway approach, rather than focused exclusively on solutions for a siloed part of the pathway. This means identifying needs across care pathway(s) and supporting the development and uptake of combinations of solutions (be they high- or low-tech products, technologies or service models) that can yield the required improvement in quality and cost. Care pathway thinking is already part of the Five Year Forward View (NHS England 2014), but is not always connected to innovation strategies. The Prime Minister's funding settlement for the NHS announced on 18 June 2018 (Prime Minister's Office 2018) and the associated NHS Long Term Plan (NHS England 2019) create an opportunity for embedding innovation into the culture, structure and function of the health system.

Secondly, success requires balancing shorter-term, 'quick-win' actions with longer-term transformational interventions. Thirdly, it is critical to assess how new policies and interventions relate to the existing policy infrastructure to avoid wasteful duplication, enable coordination and exploit existing capacity and complementarities in the system.

Finally, transformative change in healthcare requires targeting both the structures and funding that support innovation, as well as cultural and behavioural change. The need for cultural and behavioural change is critical if innovating is to happen at scale and sustainably. In practical terms, this means health innovation policy needs to simultaneously address the diverse and interdependent drivers of an innovating health system.

Policymaking has a crucial role to play in realising a vision for a health system where innovating contributes to the quality and efficiency of delivering care and to improved patient outcomes. But policymakers can neither make innovations nor spread them, nor is compliance with mandates guaranteed. A balanced and 'hybrid' model of governance and leadership for innovating in the health system – which supports both top-down and bottom-up actions – is already emerging, and the possibility of a truly innovative health and care system is achievable. We hope that the research evidence and recommendations set out in this report can help deliver this.
# Table of contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preface</td>
<td>i</td>
</tr>
<tr>
<td>Executive summary</td>
<td>iii</td>
</tr>
<tr>
<td>Study context, purpose and methods</td>
<td>iii</td>
</tr>
<tr>
<td>Key findings: innovating for improvement in health</td>
<td>vi</td>
</tr>
<tr>
<td>Conclusions</td>
<td>xvii</td>
</tr>
<tr>
<td>List of figures</td>
<td>xxii</td>
</tr>
<tr>
<td>List of tables</td>
<td>xxiii</td>
</tr>
<tr>
<td>List of boxes</td>
<td>xxv</td>
</tr>
<tr>
<td>Abbreviations</td>
<td>xxvii</td>
</tr>
<tr>
<td>Acknowledgements</td>
<td>xxxi</td>
</tr>
</tbody>
</table>

1. **Introduction**
   1.1. Innovating in the health system: the need for research     1
   1.2. Study context and aims: how best to nurture receptive and connected innovation environments? 3
   1.3. Study design and methodology                                   5

2. **Supporting an innovating health system: insights from the broader landscape** 15
   2.1. Policy context                                                15
   2.2. Enabling effective health innovation environments: a transformational approach to innovation 24

3. **Study findings: presentation and overview**                      27

4. **Strengthening skills, capabilities and leadership for innovation** 29
   4.1. Summary                                                       30
   4.2. The current landscape for skills, capabilities and leadership for innovation: reflecting on issues and developments 32
   4.3. Analysis to support the areas for action                      35

5. **Ensuring appropriate motivations and accountabilities**           43
   5.1. Summary                                                       44
   5.2. The current motivations and accountabilities landscape: reflecting on issues and developments 46
   5.3. Analysis to support the areas for action                      48
List of figures

| Figure 1: | Stage 2 research questions | 4 |
| Figure 2: | The innovating health system | 7 |
| Figure 3: | Study design and three-tiered approach | 8 |
| Figure 4: | Evolution of health innovation policy initiatives in the UK over the past ten years (examples of key developments) | 16 |
| Figure 5: | Health innovation pathways – overview | 130 |
## List of tables

| Table 1: | Work streams of this study | vi |
| Table 2: | Breakdown of contributions by stakeholder group (Phase 1 and Phase 2) | 12 |
| Table 3: | Health innovation pathway performance indicators for pharmaceuticals and vaccines | 136 |
| Table 4: | Health innovation pathway performance indicators for medical devices and in vitro diagnostics | 138 |
| Table 5: | Health innovation pathway performance indicators for digital health | 139 |
| Table 6: | Health innovation pathway performance indicators for service innovation | 141 |
| Table 7: | Potential indicators of uptake (adoption and diffusion) by patients, the wider population and the health and care system | 142 |
| Table 8: | Indicators of impact on patients, the population and the health and care system and potential measures | 145 |
| Table 9: | Measures of innovation impact on patients, the population and the health and care system – illustrative examples by innovation type | 146 |
| Table 10: | Recommendations, and their time frames, to strengthen skills, capabilities and leadership for innovation | 160 |
| Table 11: | Recommendations, and their time frames, to ensure appropriate motivations and accountabilities | 161 |
| Table 12: | Recommendations, and their time frames, to improve the information and evidence environment | 162 |
| Table 13: | Recommendations, and their time frames, to nurture effective relationships and networks both locally and nationally | 163 |
| Table 14: | Recommendations, and their time frames, to facilitate meaningful patient and public involvement with innovation | 164 |
| Table 15: | Recommendations, and their time frames, for creating a funding and commissioning environment that supports innovation across the pathway | 165 |
| Table 16: | Recommendations, and their time frames, to better align policy design with implementation requirements and success criteria | 166 |
| Table 17: | Recommendations, and their time frames, related to measuring innovation uptake and impact | 166 |
## List of boxes

| Box 1: | Recommendations pertaining to skills, capabilities and leadership | vii |
| Box 2: | Recommendations pertaining to motivations and accountabilities | viii |
| Box 3: | Recommendations pertaining to the information and evidence environment | x |
| Box 4: | Recommendations pertaining to nurturing effective relationships and networks | xi |
| Box 5: | Recommendations pertaining to patient and public involvement and engagement | xii |
| Box 6: | Recommendations pertaining to the funding and commissioning landscape | xiv |
| Box 7: | Recommendations pertaining to better aligning policy design with implementation requirements | xv |
| Box 8: | Recommendations pertaining to innovation metrics | xvi |
| Box 9: | Overview of the UK government’s support for implementing Accelerated Access Review recommendations | 17 |
| Box 10: | Five Year Forward View new care models | 19 |
| Box 11: | Digitisation aims of the Five Year Forward View and Next Steps on the NHS Five Year Forward View | 20 |
| Box 12: | Examples of key health research and innovation action points from the NHS Long Term Plan | 22 |
| Box 13: | Examples of skills initiatives in England mentioned by our stakeholders | 33 |
| Box 14: | Case vignette examples of effective leadership supporting the adoption of innovation in the health system | 37 |
| Box 15: | Case vignette examples of engaging frontline clinical staff with innovation | 39 |
| Box 16: | Case vignette examples of successful and effective practical implementation support | 41 |
| Box 17: | Case vignette examples of how adoption can be positively influenced when an innovation aligns with existing processes and with wider NHS goals of quality, productivity and quality improvement | 51 |
| Box 18: | Examples of activities to recognise and reward engagement with innovation | 52 |
| Box 18 | Case vignette examples of healthcare professionals taking measured risks in adopting innovations | 53 |
| Box 19 | Case vignette examples of how innovators were able to satisfy health system needs | 67 |
| Box 20 | Examples of how to signpost and utilise information and evidence | 68 |
| Box 21 | Variation in the uptake of innovative medicines and the influence of population factors and CCG attributes | 71 |
| Box 22 | Criteria for a standardised evaluation framework | 73 |
| Box 23 | Case vignette examples of how high-quality evidence can drive adoption | 74 |
| Box 24 | Case vignette examples of the importance of networks for enabling innovation adoption and spread | 81 |
| Box 25 | Examples of cases where PPIE activities were deemed to be meaningful and reflective of core principles and values | 95 |
| Box 26 | Case vignette examples of successful patient and end user engagement in innovation development | 100 |
| Box 27 | Examples of national and regional funding schemes | 104 |
| Box 28 | Case vignette examples of when funding schemes have successfully supported innovation development, adoption and diffusion across the pathway | 106 |
| Box 29 | Key issues related to the funding landscape | 108 |
| Box 30 | NHS Scotland’s Realistic Medicine approach | 113 |
| Box 31 | Examples of where innovation push and pull work together to support innovation | 114 |
| Box 32 | Example of where a longer-term funding strategy has worked well | 117 |
## Abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>A&amp;E</td>
<td>Accident and emergency</td>
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<tr>
<td>ABHI</td>
<td>Association of British HealthTech Industries</td>
</tr>
<tr>
<td>ABPI</td>
<td>Association of the British Pharmaceutical Industry</td>
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<tr>
<td>AHSC</td>
<td>Academic Health Science Centre</td>
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<tr>
<td>AHSN</td>
<td>Academic Health Science Network</td>
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<tr>
<td>AIMDD</td>
<td>Active Implantable Medical Devices Directive</td>
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<tr>
<td>BIA</td>
<td>BioIndustry Association</td>
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<tr>
<td>CBT</td>
<td>Cognitive behavioural therapy</td>
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<tr>
<td>cCBT</td>
<td>Computerised cognitive behavioural therapy</td>
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<tr>
<td>CCG</td>
<td>Clinical commissioning group</td>
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<tr>
<td>CIO</td>
<td>Chief Information Officer</td>
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<tr>
<td>CHC</td>
<td>Continuing Healthcare</td>
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<tr>
<td>CHC2DST</td>
<td>Continuing Healthcare Checklist and the Decision Support Toolkit</td>
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<tr>
<td>CHMP</td>
<td>Committee for Medicinal Products for Human Use</td>
</tr>
<tr>
<td>CQCC</td>
<td>Care Quality Commission</td>
</tr>
<tr>
<td>CQUIN</td>
<td>Commissioning for Quality and Innovation</td>
</tr>
<tr>
<td>CT</td>
<td>Computed tomography</td>
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<tr>
<td>EAMS</td>
<td>Early Access to Medicines</td>
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<tr>
<td>Abbr.</td>
<td>Description</td>
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<tr>
<td>GDE</td>
<td>Global Digital Exemplar</td>
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<tr>
<td>GIRFT</td>
<td>Getting It Right First Time</td>
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<tr>
<td>HEE</td>
<td>Health Education England</td>
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<tr>
<td>HSCA</td>
<td>Health and Social Care Act</td>
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<tr>
<td>HSCIC</td>
<td>Health and Social Care Information Centre</td>
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<tr>
<td>HTA</td>
<td>Health technology assessment</td>
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<tr>
<td>i4i</td>
<td>Invention for Innovation</td>
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<tr>
<td>ICT</td>
<td>Information and communication technology</td>
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<tr>
<td>IP</td>
<td>Intellectual property</td>
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<tr>
<td>ITP</td>
<td>Innovation and Technology Payment</td>
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<tr>
<td>ITT</td>
<td>Innovation and Technology Tariff</td>
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<tr>
<td>IVD</td>
<td>In Vitro Diagnostic</td>
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<tr>
<td>JLA</td>
<td>James Lind Alliance</td>
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<tr>
<td>LEP</td>
<td>Local Enterprise Partnership</td>
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<tr>
<td>MARSI</td>
<td>Medical adhesive-related skin injury</td>
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<td>MCP</td>
<td>Multispecialty Community Provider</td>
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<tr>
<td>MDD</td>
<td>Medical Devices Directive</td>
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<tr>
<td>MHDE</td>
<td>Mental Health Digital Exemplar</td>
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<tr>
<td>MHRA</td>
<td>Medicines and Healthcare products Regulatory Agency</td>
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<td>NAO</td>
<td>National Audit Office</td>
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<tr>
<td>NHSBT</td>
<td>NHS Blood and Transplant</td>
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<tr>
<td>NIC</td>
<td>NHS National Innovation Centre</td>
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<tr>
<td>NICE</td>
<td>National Institute for Health and Care Excellence</td>
</tr>
<tr>
<td>NIHR</td>
<td>National Institute for Health Research</td>
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<tr>
<td>NIHRIO</td>
<td>NIHR Innovation Observatory</td>
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<tr>
<td>NOAC</td>
<td>Novel oral anticoagulant</td>
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<tr>
<td>NTAC</td>
<td>National Technology Adoption Centre</td>
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<tr>
<td>OSNA</td>
<td>One-step nucleic acid amplification</td>
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<tr>
<td>Abbreviation</td>
<td>Full Form</td>
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<tr>
<td>PACS</td>
<td>Primary and Acute Care Systems</td>
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<tr>
<td>PPIE</td>
<td>Patient and public involvement and engagement</td>
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<tr>
<td>PROM</td>
<td>Patient-reported outcome measure</td>
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<tr>
<td>QALY</td>
<td>Quality-adjusted life year</td>
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<tr>
<td>SBRI</td>
<td>Small Business Research Initiative</td>
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<tr>
<td>SME</td>
<td>Small and medium-sized enterprise</td>
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<tr>
<td>STP</td>
<td>Sustainability and Transformation Partnership</td>
</tr>
<tr>
<td>UCLP</td>
<td>University College London Partners</td>
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This research would not have been possible without the generous contribution of many individuals including healthcare professionals as well as those from research, patient and public representation, policymaker, innovation and improvement network, and private sector innovation communities. Without the expertise and time these study participants devoted to workshops, interviews, a survey and meetings over the past few years, we would not have been able to obtain as comprehensive a picture of the overall innovating health system as we have managed to achieve.

We are also immensely grateful for the support and input provided throughout the course of this study by members of the project working group, including individuals from teams across the National Institute for Health Research Policy Research Programme, the Department of Health and Social Care, the Office for Life Sciences and NHS England.

We are thankful to our colleagues at the University of Manchester (Prof Ruth McDonald, Prof Matt Sutton and Dr Rachel Meacock) for all their help, and specifically for their work on quantitative analyses of factors correlated with medicine uptake. Particular thanks go to Prof Ruth McDonald for her collegiality and support, which helped to ensure the effective operation of collaborative working.

Last but not least, we thank colleagues and alumni from RAND Europe: Prof Joanna Chataway, Talitha Dubow, Megan Sim, Emma Harte, Calum MacLure and Jennie Corbett for their assistance and contribution to this study, and Dr Sue Guthrie and Jon Sussex and for their quality assurance roles.
1.1. Innovating in the health system: the need for research

‘Innovation’ in this study refers to any product, technology or service that is new to the health system, or applied in a way that is new to the health system, and is aimed at delivering improved or more efficient care. In terms of health innovation policies we are mainly interested in those that have improved health innovation as their primary goal, but we are also interested in other policies (for example on regulating healthcare quality and safety) that might be relevant for innovation, even if they do not have improving innovation as their primary purpose. In adopting a consciously broad definition of innovation, we are aware that the word itself exerts a powerful attraction in health policy debates and this can lead to either its over-use or to poorly defined use (Page 2014). We consistently use the definition given above but we recognise that the intention to deliver improved or more efficient care might fail.

Health innovation might have as its goal either improved health outcomes or improved economic outcomes (or some combination of the two). Different stakeholders may have a mix of complementary and conflicting interests, and proper governance and due process is needed to manage the spread and adaptation of new and promising approaches. On the other hand, what are thought to be helpful innovations may not always prove to be as beneficial as first hoped. Under these circumstances the policy challenge is not to understand how to drive innovation forward at all costs, but to identify likely failures at an early stage and improve them or manage them out of the system. Understanding and acting upon the interests of patients and the public in the context of both uncertainty and potentially conflicting benefits is at the heart of this report.

This report is particularly timely given the growing importance of innovation in policymaking communities. For example, NHS England has made innovation central to its ambitions for improved quality, efficiency and effectiveness in healthcare (Department of Health 2018; NHS England n.d.-a), and the role of innovation is also evident in efforts to improve the technical efficiency of the NHS (including the Carter Review (2016) and the Naylor Review (2017)) and to help manage the pressures the NHS faces in light of the...
growing and changing nature of demand for health services at a time when resources are constrained. Furthermore, NHS England is also a major employer, investor and wealth creator, and there is an additional public interest in maximising the economic contribution of health and social care; in 2017, public spending on healthcare amounted to 7.3 per cent of economic activity in the UK (Luchinskaya, Simpson & Stoye 2017).

However, despite high-quality research in this area, policymakers and wider stakeholders often lack clear and usable evidence to inform policy and practice, and the development, commissioning and use of innovations remains patchy across health and care in England; some innovations swiftly spread while others, although equally promising, get limited traction. The aim of this study is to provide evidence to help policymakers to address this weakness. To this end, RAND Europe and the University of Manchester were commissioned by the Department of Health and Social Care to conduct a multi-year study to examine the potential of innovation to respond to the challenges the health system in England faces, and to help deliver more efficient and effective services.

The study comprised two stages. Stage 1 was a scoping stage and examined the implementation and outcomes of the Innovation, Health and Wealth strategy (Department of Health 2011), which had set out the Department of Health’s (now the Department of Health and Social Care) delivery agenda for spreading innovation throughout the health system in England. In Stage 1, we explored the role of the Innovation, Health and Wealth strategy in the national health innovation landscape and its key associated initiatives for taking forward innovation in the health system in England, with a view to capturing empirically informed and practical lessons in addition to informing the design and implementation of more in-depth work in Stage 2. Insights from the review of Innovation, Health and Wealth have been reported Bienkowska-Gibbs et al. (2016) and are not repeated here.

Given the evolution in the national policy landscape, particularly as associated with the Five Year Forward View (NHS England 2014), the Accelerated Access Review (2016), and the Carter Review (Lord Carter of Coles 2016), the Stage 2 design learned from Stage 1 but also focused on a more comprehensive and timely set of issues. The NHS Long Term Plan (NHS England 2019) was published post completion of the final draft of this report. We have included it in the policy context section of this report (Section 2.1) and interpreted our insights in light of it, but it did not impact on the nature of our data gathering.

Stage 2 was conducted in two phases (as described in Section 1.3). This report focuses and reports on insights from Phase 2 in particular, bringing learning from Phase 1 into the discussion and conclusions, but not repeating findings that have already been reported by Marjanovic et al. (2017a, 2017b).

In the sections that follow, we first describe the background and context to this work (Section 1.2), and then provide a brief overview of the study design and methodological approach (Section 1.3). Chapter 2 outlines the health innovation policy landscape in England, and discusses key examples of recent policies; it also provides a brief overview of the key literature that has informed the conceptual approach to our study. Chapters 3 to 11 present the main findings of the study. Chapter 12 offers a reflection on the key findings and areas for action. A set of annexes is provided as a separate document. These annexes present the detailed analysis of the individual work streams, with Annex C presenting the 14 case vignettes developed for this study and Annex H describing the methodological approach of each individual work stream.
1.2. Study context and aims: how best to nurture receptive and connected innovation environments?

The health and care system in England is currently responding to a number of challenges including an ageing population, more people living with complex and chronic diseases, a demand for healthcare to be more accessible, proactive and coordinated, and a wider context of public spending constraints. New and innovative technologies, products and services as well as ways of working provide promising opportunities to address these challenges. Responding innovatively to growing and changing demands must be accomplished in the context of: existing resources; the need for safety, effectiveness and efficiency; and what is organisationally possible given how healthcare is delivered (Appleby, Galea & Murray 2014). A particular feature of our research is the extent to which we have engaged with those with direct experience of creating and delivering innovation in healthcare settings, allowing us to complement more abstract accounts with analytically rich discussions based on perceptions from the frontline of innovation. However, we have always sought to triangulate these expert views with other sources of data, including a more historical understanding of the success of previous efforts to deliver improvement.

Until the early 2000s, very few UK healthcare policies were specifically focused on innovation, and only from the mid-1990s onwards was there an explicit focus on the ‘innovation system’ as something that could be influenced and improved by policymakers (Edler & Fagerberg 2017). Innovation, Health and Wealth (Department of Health 2011), a health policy-related approach that was published in 2011, was a clear sign that innovation in health was of growing interest to policymakers. More recent policy reviews (key examples are discussed in Section 2.1) variously focus on improving quality or cost-effectiveness and all inform thinking about how best to support improvement and innovation. With the Accelerated Access Review (2016) we are seeing system-wide approaches being identified and acted upon.

In this context, a key research question is how policy might improve innovation in healthcare to achieve more efficient, fair and effective healthcare and greater prosperity for all. In the following chapters we identify ways in which policymakers might nurture receptive and connective innovation environments by maximising synergies among existing policies, strengthening innovation governance and capacities, achieving an optimal mix of policies, and strengthening the reflexivity and capabilities of policymakers.

To examine the potential of innovation to respond to the challenges the NHS in England faces, and to help deliver affordable, efficient and effective services, we examined four interrelated research questions in Phase 1 and Phase 2 of this study, which are presented in Figure 1 below. Phase 1 specifically focused on how organisations working in and closely with the NHS in England perceive and understand innovation as well as how this influences their actions (Question 1), and to some extent on the question who drives and contributes to innovation (Question 2). Phase 2 examined in depth the drivers of innovation and how successful innovation can have a greater scale, scope and impact (Question 2), what practical changes to policy, culture and behaviour can support system-wide improvements (Question 3), as well as how we can measure the contributions of innovation to the social and economic performance of the healthcare sector (Question 4).

This study was both practical and pragmatic, and identifies lessons on how to improve the
Innovating for improved healthcare

innovation process as well as its outcomes and impacts. Our research identifies and characterises the priority actions that stakeholders could take to catalyse more innovation-friendly environments in practice and in relation to different drivers of innovation. The study also aims to contribute to the wider academic literature on health innovation and to advance knowledge about innovating health systems.

The primary audiences for this study are policymakers and decision makers concerned with designing and implementing health innovation-related policies and programmes at national, regional and local levels. However, the insights are also intended to be of practical relevance for a wider set of actors who contribute to, engage with and are influenced by policy developments and by national, regional and local health and innovation programmes. This includes healthcare professionals, managers and executives in the NHS, patients and the public, charities, innovation and improvement networks, the private sector, regulators and the research community.

Although policymakers can neither make innovations nor spread them, policymaking and public bodies have a crucial role to play in realising a vision for a health system where innovating contributes to the quality and efficiency of delivering care and to improved patient outcomes. Amongst others, their roles can span: (1) clarifying system priorities, commissioning and procuring accordingly, and providing information to support steps along the innovation pipeline; (2) convening groups and individuals so they can share information, co-create innovations, and manage the introduction of novel approaches to health

Figure 1: Stage 2 research questions

PHASE 1

1. How do organisations working in and closely with the NHS in England perceive and understand innovation, and how does this influence their actions?

PHASE 2

2. Who drives and contributes to innovation and how might successful innovation have greater scale, scope and impact?

3. What practical changes to policy, culture and behaviour can support system-wide improvements to innovation pathways?

4. How can we measure the contributions of innovation to the social and economic performance of the healthcare sector?
and social care settings; and (3) building creative and inclusive settings to nurture new approaches, often building on emerging NHS practices and priorities but also, if appropriate, disrupting these practices with new, better ways of delivering healthcare.

1.3. Study design and methodology

1.3.1. The conceptual framework: a systems perspective on innovation in the health system

The idea of a systems perspective on innovation is now well established but the term is open to different interpretations, so it is important to be clear how we use it. In general, it is used to suggest that innovation flourishes (or otherwise) not because of the brilliance of the innovation or the individual and team alone, but because of the relationships (and their supporting structures and institutions) that are established between individuals, groups and organisations and which allow a flow of information, technology and practices that together help nurture new ideas and see them turned into a new service, product or approach, within a conducive policy and regulatory environment. We are specifically interested in the conditions that support and sustain innovation in healthcare and which see creative ideas (and their tangible manifestations in products, technologies, service models and ways of working) tested against the needs of the health service and of patients, before becoming a standardised part of how healthcare needs are met. These processes are often not linear and change may emerge slowly over time or be more sudden. To this systems perspective we also bring the ideas that systems have path dependencies and locked-in behaviours (from evolutionary economics), that innovations are socially produced (from science and technology studies), and that the implementation of policy is always constrained by dependencies and capabilities (from implementation studies). This provides the high-level conceptual underpinnings for this study (for a review of the literature that has informed this research, please see Annex E; the literature is also integrated into the findings presented in Chapters 4 to 10).

More specifically, innovation is now widely recognised as the product of highly dynamic ‘innovation systems’ in which different institutions, organisations, networks, ideas, capabilities and practices interact. These interactions occur amidst shifting government and policy priorities, economic and other resource constraints, varied research traditions and, crucially for the purposes of this study, the dynamics of systems. A more traditional ‘upstream/downstream’ approach to innovation would tend to compartmentalise analysis of suppliers, producers and government somewhat separately from consumers and end users. An innovation systems perspective, however, recognises that the pathways through which innovations develop are more often iterative than linear (see, e.g., Benoît 2006), and usually involve several stakeholders, organisations and institutions.

Whilst it is important to break down and understand different types of policy interventions and initiatives at play, an innovation systems approach implies a perspective that looks at the complex interactions across the development pathway, from health research right across to health
provision and care systems, and examines how those interactions affect the impact and outcomes of discrete initiatives and interventions (see, e.g., Freeman 2008; Geels 2004; Geels & Schot 2007; Lundvall 1992; Nelson 1993). Moreover, the approach requires an understanding of the interactions within and between innovation and health systems in order to identify potential and realised impacts on the quality, safety and cost-effectiveness of healthcare.

Within this system, diverse healthcare stakeholders interact in ways that cannot be tightly controlled, influencing innovation pathways and activities. Examples include NHS Trusts and acute care organisations (e.g. Teaching Hospitals, Specialist Hospitals, District General Hospitals), primary care organisations and general practitioners (GPs), clinical commissioning groups (CCGs), higher education and research institutions, private sector organisations, charities, patient and public involvement and engagement (PPIE) bodies, patient advocacy groups, local enterprise boards, regulators, funders and policymakers. Such institutions and organisations are not only shaped by innovation and healthcare policy environments, but also are influenced by healthcare and innovation institutions and networks (e.g. Academic Health Science Networks (AHSNs), Vanguards, the Small Business Research Initiative (SBRI), NHS Innovation Accelerator, Clinical Entrepreneur Training Programme, Test Beds, Innovation Hubs). Moreover, interactions between different stakeholders and organisations take place within and between different levels in the system (i.e. local, regional, national and international). Interventions (e.g. policy or strategic interventions) aiming to shape innovation processes and outcomes have both common and also unique and specific features across different types of innovations (e.g. medicines, medical devices and diagnostics, service innovations and interventions, digital innovations), different therapeutic areas (e.g. oncology, cardiovascular and metabolic diseases, neurological and neuropsychiatric diseases, infectious diseases, obesity), cross-functional areas (e.g. patient safety, self-care and patient management, data governance), different aspects of innovation and healthcare pathways (e.g. development, adoption, diffusion stages of innovation; primary, acute and community care settings), and different levels in the healthcare innovation environment (international, national and regional level; organisational/institutional and individual).

The initial research for this study found that innovation processes and interactions throughout the healthcare pathway are influenced by a series of six drivers that affect the relative success, or otherwise, of the actual development, adoption and uptake of an innovation (Marjanovic et al. 2017b). These drivers form the core of our analysis and the findings and conclusions of our study are organised largely (although not exclusively) around them:

- ‘Skills, [capabilities] and leadership for innovation (e.g. leadership arrangements; organisational capacities such as finance, staffing, information systems and working practices; individual skills and roles).
- Relationships and networks (e.g. involving diverse stakeholders at local, regional, national and international levels).
- Information, evidence and resources for innovation (e.g. information and evidence on: innovative solutions that exist; the impacts of innovation; the business case for innovation; guidelines for implementation; and available financial resources).
- Motivations and accountabilities (e.g. as they relate to performance management,
career-related factors, individual and professional identities). This will also bring into consideration policy and regulation.

- The landscape for public and patient [involvement and] engagement with innovation.

- Funding, commissioning and procurement environments’ (Marjanovic et al. 2017b, 5).

This systems perspective on the innovating health system, which frames and shapes our study, is illustrated in Figure 2.
Although we adopt a systems approach we fully recognise that the system functions because of the choices made by the people in it. We have engaged many of these people in and around the NHS in England to understand what they think are the barriers and facilitators to innovation and what policies might help them be more effective. While we critically assess these views against other sources of evidence, they are an important touchstone for this study.

1.3.2. Study design

The data collection and analysis for Stage 2, conducted over the 2015 to early 2019 period, of this study was guided by a three-tiered approach (see Figure 3):

- Understanding the health innovation landscape to discover what is happening and how people delivering health innovation work together.

- Identifying factors associated with successful innovation (and the nuances and granularity associated with them), and using these insights as a basis for identifying actions and decision making that can improve the innovation environment – across pathways – from idea generation and development through to uptake and spread of an innovation in the health system.

- Developing recommendations for how key drivers of receptive and connected innovation spaces can be supported in policy and practice, including recommendations of relevance for equipping, training and connecting local places to national mandates for successful innovation.

Stage 2 of this study was conducted in two phases. The approaches to both are briefly described in the following subsections. For more detailed descriptions of the design and method of Phase 1, see Marjanovic et al. (2017b); for Phase 2 see Annex H.3

The research received ethical approval from the Alliance Manchester Business School at the University of Manchester, where one of the study principal investigators is located, and HRA approval (IRAS 193979).

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3 The design, methodological approach and results of Stage 1 have been reported in Bienkowska-Gibbs et al. (2016).
Phase 1 methodology

Phase 1 focused on addressing the first two areas of the overall approach outlined above, namely (1) understanding the health innovation landscape and how people delivering innovation work together, and (2) identifying factors related to successful innovation development and uptake, especially the key issues that actors involved with health innovation face, and how they are trying to address them in different regions of England. More specifically, the focus was on identifying promising regional practices taking place ‘on-the-ground’ and key national programmes that are working to support each of the drivers of innovation in our conceptual framework (see Figure 2). Thus, this phase of the project was primarily concerned with achieving a detailed understanding of the current landscape and identifying efforts (and the specifics of gaps) that might improve one or more aspects of the innovating health system. The findings from Stage 1 brought additional nuance, empirical richness and explanatory power to existing knowledge about improving innovation in the NHS in England; they are reported in Bienkowska-Gibbs et al. (2016) and are not repeated here. The emerging learning from Phase 1 paints a picture of an evolving and dynamic system, but one where there is scope for prioritisation of activities and effort, for more coordinated collaboration within regions and across them, and to better account for national policy developments.

Data for Phase 1 were collected through:

- **Six regional workshops (with 101 participants in total),** each of which attracted participants from diverse stakeholder communities to exchange knowledge, perspectives and experiences.
- **In-depth interviews with 120 individuals** across four regional health economies.
- **A distinct review of the SBRI Healthcare programme.**

The regional workshops and Phase 1 interviews aimed to identify how different individuals perceive innovation (e.g. do they see it as part of their role; what is their perception of the capacity for innovating in the system?), and how different stakeholders, organisations and regions engage with key drivers of innovation in everyday practice. For a more detailed overview of the design and methods of Phase 1, see Marjanovic et al. (2017b), and for the review of the SBRI Healthcare programme see Lichten et al. (2017).

Phase 2 methodology

Phase 2 of the study aimed to establish recommendations for policy and practice. We built on insights from Phase 1 to identify priority actions that can be taken nationally and regionally to support receptive and connected places for health innovation. We mobilised the expertise and experiences of diverse stakeholders to refine what we had learned in Phase 1 about the types of practices and programmes that different actors felt were important, to elucidate both what needs to be done to support the various drivers of innovation (as described in our conceptual framework) and how that should be achieved, and to consider how different stakeholder groups can best engage with the evolving policy landscape – both to help shape it and to ensure that policy developments achieve desired impacts.

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4 The four regional health economies were (1) East of England, (2) Greater Manchester and North West Coast, (3) the South West, and (4) University College London Partners (UCLP) and related actors.
The data were collected through the methodology summarised below (see Annex H for more details):

- **Work stream 1: A prioritisation survey** to explore what stakeholders consider to be the most impactful and priority interventions for supporting an innovative health system, and to consider their sustainability and scalability. The aim of this work stream was to identify the highest impact and priority actions for enhancing health system performance through innovation, and recommendations to be considered in future policy developments. Overall, 256 individuals across different stakeholder groups in the health system responded to the survey (Annex H.2.1 provides a full description of the survey methodology; Annex A discusses the survey findings).

- **Work stream 2: 77 semi-structured thematic interviews** with different stakeholders in the health system: representatives of innovation and improvement networks, healthcare providers and commissioners, charities and PPIE organisations, the private sector, academics and policymakers (see Annex H.2.2 for the breakdown). The aim of these interviews was to better understand how distinct stakeholders can engage with health innovation most effectively – given their interests, roles and capacities in the health system, including in relation to policy developments. The interviews also aimed to inform learning about how the policy landscape may be improved to more effectively contribute to an innovative health system – more specifically to identify areas for policy intervention and associated practical actions (Annex H.2.2 provides a full description of the interview methodology; Annex B presents the analysis of this work stream).

- **Work stream 3: 14 case vignettes** of selected health innovations to learn about the intricacies of innovation pathways, adoption processes and associated enablers through the direct experience of innovators seeking to develop and introduce health innovations into the NHS and the wider health system in England and their collaborators in healthcare provider and commissioning organisations. The case vignettes helped to ‘bring to life’ some of the thematic learning from other work streams of this research and provided additional nuance and explanatory power. The cases were selected in collaboration with the project working group (including representatives from the Department of Health and Social Care, NHS England and the Office for Life Sciences), and aim to cover different types of innovations and ensure complementarity to existing studies, i.e. avoiding overlap with evaluations of programmes such as the NHS Innovation Accelerator innovators, and ensuring complementarities to case studies examined in recent reports by the King’s Fund and the Innovation Unit (The Health Foundation & The Innovation Unit n.d.; The King’s Fund 2018) (Annex H.2.3 provides a full description of the case vignette approach; the case vignettes themselves are presented in Annex C).

- **Work stream 4: Seven stakeholder-specific workshops with 71 participants** to mobilise their unique expertise and
experiences, in order to explore solutions for strengthening the innovating health system, across the innovation pathway – from development through to adoption and diffusion. The workshops examined how distinct stakeholders can engage with the evolving policy landscape and informed areas for future action (for a breakdown of stakeholders by workshop as well as a full description of the approach, see Annex H.2.4; workshop-specific findings are presented in Annex D).

- **Work stream 5: A review of scholarly literature and policy-related documents** to help identify issues of interest for further exploration in the interview and workshop elements of the study, as well as to enable triangulation of primary evidence collected through the study reported here against the existing knowledge base. Chapter 2 elaborates on the key insights. Overall, 132 documents from scholarly and grey literature were included in the review (see Annex H.2.5 for a detailed description of the review methodology; for the full literature review see Annex E).

- **Work stream 6: An analysis of indicators for evaluating innovation performance** to identify improved ways of measuring diverse types of impact from innovating in the health system (Annex H.2.6 provides a full description of the analysis approach; for findings on measuring impact, see Chapter 11 and Annex F).

- **Work stream 7: A quantitative analysis of the population-level factors associated with the uptake of innovative medicines**, which was conducted by the University of Manchester (Annex H.2.7 describes the methodology used; findings are presented in Annex F).

- **Work stream 8: Continual engagement with policymakers and wider stakeholders** to ensure timely learning and exchange. The project benefited from the input of a project working group with representatives from the National Institute for Health Research (NIHR) Policy Research Programme, the Department of Health and Social Care, the Office for Life Sciences and NHS England, as well as from the involvement of academic advisors and other experts from policymaking and research bodies. Data within specific work streams were coded and analysed thematically. Data were also triangulated across methods and data sources, across stakeholders involved with the research, as well as against Phase 1 learning to arrive at final conclusions. More detail on the analysis is provided in Annex H.2.9.

This approach enabled us to arrive at the most relevant, feasible, sustainable and likely highest-impact actions to improve the development, uptake and spread of innovation in the health system, as well as to develop pragmatic and actionable recommendations for future national and regional policy and its implementation.

### 1.3.3. Caveats

There are some methodological caveats to bear in mind when interpreting the results of this research, we highlight key limitations below (more detail on the caveats associated with each method is presented in Annex H).

The aim of the thematic stakeholder and case vignette interviews, the workshops and the online survey was to capture the views and experiences of different stakeholders in the health system. The results of those specific elements should therefore be interpreted as stakeholder perceptions. It is also worth noting that some participants wear multiple hats (e.g. they can be both clinicians and innovators) and that the views of a stakeholder...
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Innovating for improved healthcare

group may include the voices of individuals who have more than one group of belonging (although we tried to identify and focus on their primary affiliation and to identify what drove their experiences and views and to bring that to bear on our analysis, including in terms of how they might navigate multiple complementary or competing interests). We invested significant effort to gain a diversity of views and experiences, and to balance breadth and depth in enquiry through a combination of methods, data sources and triangulation. In line with social science research methods for sampling for data collection using qualitative methods in health (Bowling 2002), we followed a deliberately non-random approach to find participants for our interviews, the workshops and the online survey. We aimed to capture diverse views and experiences, but not a strictly representative sample. Participants were identified from diverse sources including document and literature review, snowballing, discussions with the project working group and our own professional networks. Findings from Phase 1 informed the issues to investigate in Phase 2 and the types of individuals and stakeholders to engage with. We incorporated theoretical sampling (as opposed to statistical sampling), and considered expected saturation points. Across Phase 1 and Phase 2 of the study, through the various methods, we had 670 contributions from a wide range of different stakeholders. Table 2 provides a breakdown of individual contributions by stakeholder group.

We aimed to engage with individuals from a wide range of sectors and professions and to provide opportunities for multiple voices to be heard (see Table 2). That being said, some professions were more difficult to engage with than others. For example, we found it particularly challenging to engage healthcare

<table>
<thead>
<tr>
<th>Stakeholder group</th>
<th>Total number of individual contributions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Innovation and improvement networksa</td>
<td>169</td>
</tr>
<tr>
<td>Healthcare providers and commissioners</td>
<td>232</td>
</tr>
<tr>
<td>Charities and patient and public involvement organisations</td>
<td>62</td>
</tr>
<tr>
<td>Private sector</td>
<td>77</td>
</tr>
<tr>
<td>Academics</td>
<td>67</td>
</tr>
<tr>
<td>Policymakers</td>
<td>39</td>
</tr>
<tr>
<td>Otherb</td>
<td>24</td>
</tr>
<tr>
<td>Total</td>
<td>670</td>
</tr>
</tbody>
</table>

Notes:

a Examples in this stakeholder category include individuals from institutions such as AHSNs, Vanguards, Innovation Hubs, Test Beds, Collaborations for Leadership in Applied Health Research and Care (CLAHRCs) and other regional network initiatives.

b Examples in this stakeholder category include individuals from local organisations (e.g. local councils), NHS Innovation Accelerator fellows, individuals matching more than one of the mentioned categories as well as interviewees who wished to remain anonymous.

6 In both Phase 1 and Phase 2, some individual stakeholders contributed to several work streams of the study.
providers with workshops (perhaps given competing demands on their time), and the pool of patient and public representatives we could engage with the workshops was limited. Similarly, the number of contributions from higher education and research institutions was low across work streams. As policymakers were not included in Phase 1 of the study, the overall number of contributions from this group is lower compared to other stakeholder groups.

We tried to ensure that each of our case vignettes benefited from the input of innovator, provider and commissioner perspectives; however, despite our efforts this was not always possible (Annex H.2.3 provides more information on sources for each case vignette and our approach to try to engage multiple stakeholders).

Although we made various attempts to engage representatives from diverse geographies in the research, to reflect region-specific ideas, experiences, problems and approaches, the recruitment of individuals from some areas proved particularly challenging (e.g. engagement of healthcare professionals from the North of England with workshops was low).

Some stakeholders’ views will unavoidably have been influenced by their individual roles, the views of their organisations, as well as their personal interests. Moreover, we acknowledge that there are other stakeholders and organisations in the system that were not consulted for the study, but which could have offered relevant insights. We are also aware that, as the participants in this study were often experts in their area, it can be difficult to assign them to one stakeholder group as they frequently overlap with others. We made a conscious effort to assign participants to the stakeholder group that was most relevant to their primary job role; however, we acknowledge that they may have also expressed views from the perspective of their other roles. Nonetheless, we think that the high number and diverse range of different stakeholders and organisations involved in this study provide multifaceted evidence as well as richness to the results. The evidence gathered helped us to develop an in-depth understanding of the wider innovating health system as well as to arrive at conclusions and recommendations addressing the needs and reflecting the views of a wide range of different individuals holding multiple regional and national roles. However, despite the richness and diversity of stakeholders engaged, we are aware that the individuals in our study are not fully representative of all stakeholders in the innovating health system.

Finally, stakeholders across different groups found it difficult to move beyond a nuanced discussion of the challenges of an innovating health system, and to translate their experiences into recommendations for concrete, practical, actionable solutions. This is reflective of the scale of pressures that the health system is under, and the focus on ‘firefighting’ to deal with short-term needs and priorities, which are not necessarily immediately and obviously aligned with innovation (which takes time to implement, and for which returns on investment can take time to accrue). Despite the difficulty of adopting a solutions-focused mindset, the combination of methods that allowed for individual-level discussions and contributions as well as group-based fora for different communities of practice to exchange ideas, experiences and evidence about what works (e.g. from the literature, guidelines and professional experience) allowed us to draw out a series of recommendations for actions that could support more receptive innovation spaces (see Chapter 12).

We have considered the above limitations in our analysis and mitigated them by combining and triangulating data from multiple work streams, data sources and the wider literature. A consequence of qualitative analyses of interactions with participants with direct experience of the ‘frontline’ of innovation is that
there will always be others who might have been included but were not. However, selection was not based upon typicality but upon having experiences of health innovation as it occurs in different parts of the system. Therefore, we are confident that the overall analysis provides robust results capturing the diverse views and experiences of stakeholders across the innovating health system. However, it cannot be ruled out that some of the caveats outlined above have not been resolved.
2.1. Policy context

Policies in the field of health innovation have developed significantly. Bason (2018) argues that ‘public leaders around the world are demonstrating how a significantly more conscious and systematic approach to creating innovative solutions can effectively address some of our most pressing societal challenges’ (2018, 4). This is evident in the healthcare system in England in response to increased pressure to deliver high-quality services while also responding to the growing and changing demand for care under significant financial and wider resource (e.g. staff) constraints. This has not, however, just been about controlling expenditure. Over recent years, we have seen an evolution and proliferation of policy initiatives that focus on addressing the innovation challenge in a variety of ways – for example through (see also Figure 4):

- Exploring ways of realising efficiencies and reducing unwarranted variation in care quality, safety, patient experience and cost, e.g. the Carter Review (Lord Carter of Coles 2016), Getting It Right First Time (Briggs 2012) and NHS RightCare (2009; see, e.g., NHS England n.d.-g).

- Supporting health innovation, e.g. the Accelerated Access Review (2016), the government’s response to it (Department of Health and Department for Business, Energy & Industrial Strategy 2017) and health-related elements of the Industrial Strategy (HM Government 2017a) and the Life Sciences Industrial Strategy (Bell 2017).

- Enabling a system that is committed to continuous improvement and innovation to address sustainability, excellence in quality, access and affordability of care, e.g. the Five Year Forward View (NHS England 2014), the Next Steps on the NHS Five Year Forward View (NHS England 2017a) and the NHS Long Term Plan (NHS England 2019).

Collectively we see this as marking a move towards a more ‘conscious and systematic approach’; a move that is not yet complete. It comprises, as anticipated by Bason (2018): a shift from random innovation to a systematic approach; a concern with building capacity within public bodies; greater attention to co-creation rather than solely delivering projects; and an understanding that a new style of leadership of public organisations is needed for these shifts to be successful.

We acknowledge that there has been a wide range of other policies and reviews in England focusing on improving quality, safety or cost-effectiveness of healthcare, and to some extent on health innovation, including the Kennedy Report (Kennedy 2009), the Berwick Review (Berwick 2013), the Keogh Review (Keogh 2013) and the Francis Enquiries (Francis 2013). Similarly, recent policies and reviews
Innovating for improved healthcare

in Northern Ireland (e.g. the Bengoa Report (Bengoa et al. 2016) or Health and Wellbeing 2026 (Department of Health Northern Ireland 2016)), Scotland (e.g. Health and Wealth In Scotland (Scottish Government 2012) or Scotland’s Digital Health & Care Strategy (Scottish Government 2018)) and Wales (e.g. A Revolution from Within: Transforming Health and Care in Wales (Hussey et al. 2018)) have addressed how to better harness health innovations and accelerate them across the pathway. In this study, however, we focus primarily on the health system in England, and on selected key examples of recent policy developments (Figure 4), which will be discussed in the following sections.

2.1.1. The Accelerated Access Review and the UK government’s response

In September 2014, the UK government asked Sir Hugh Taylor to lead a review of how patient access to innovative medicine and medical technologies could be accelerated in a cost-effective manner. The final report, the Accelerated Access Review (2016), set out a series of 18 recommendations addressing horizon-scanning needs, data collection and evidence generation, regulation, evaluation, commercial discussions and negotiations and unique pathway needs for different types of innovations (medicinal products, medical technologies and diagnostics, and digital products) (Accelerated Access Review 2016, 61–69).

In November 2017, the UK government published its response to the Accelerated Access Review (Department of Health & Department for Business, Energy & Industrial Strategy 2017) and outlined its plans to implement many of the review’s recommendations with a commitment to a package of support, as outlined in Box 9.

Figure 4: Evolution of health innovation policy initiatives in the UK over the past ten years (examples of key developments)
Box 9: Overview of the UK government’s support for implementing Accelerated Access Review recommendations

- **Academic Health Science Networks (AHSNs), Innovation Exchanges and Innovation National Networks**: £39m of funding to the 15 AHSNs to enable them to support uptake of proven innovations locally, address some of the causes of unwarranted variation, and broker relationships to support progression of innovations across the pathway. New Innovation Exchanges will facilitate greater connectedness and collaboration between the 15 AHSNs, and help to support innovations, clinicians, patients and innovation uptake, regardless of where proven innovations originate from. These exchanges will enhance the capacity of AHSNs to assess the local value of new innovations. The AHSNs and Innovation Exchanges will also work with NHS Innovation National Networks – thematic networks that will help connect local/regional activities and the AHSNs with national policy leads to support the innovation pathway.

- A £35m Digital Health Technology Catalyst for innovators, which will match fund development of digital technologies for use by patients and NHS England, and help small and medium-sized enterprises (SMEs) to establish the evidence needed for getting their products into the NHS.

- Up to £6m over three years to help SMEs with innovative medicines and devices get the evidence they need by testing in the real world, building on existing opportunities such as the Early Access to Medicine Scheme (EAMS).

- A £6m Pathway Transformation Fund, which will help NHS organisations integrate innovations into their everyday practices; the fund intends to overcome practical obstacles (e.g. training on equipment use).

- The Accelerated Access Pathway will help to streamline regulatory and market access decisions and enable a quicker and leaner route to market for transformative innovations (an anticipated five per year will be given breakthrough designations and be on this pathway based on potential for impact on patients and value for money, with bespoke case management). The Accelerated Access Pathway needs to be cost-neutral overall. Diverse innovation types are eligible. An Accelerated Access Collaborative will oversee the selection of products to the pathway and will involve the NIHR, the Medicines and Healthcare products Regulatory Agency (MHRA), National Institute for Health and Care Excellence (NICE), NHS England, NHS Improvement and the UK government, with input from patients, industry and clinicians. It will include functions such as horizon scanning for innovations, streamlining the pathway from market authorisation through to adoption and patient use, generation of real-world evidence on impact in addition to trial data, early price negotiation (including flexible and confidential commercial arrangements), support for adoption and diffusion through the AHSNs and pathway transformation fund, and bespoke case management for each product. It will build on and complement existing schemes (e.g. EAMS, the Cancer Drugs Fund, NICE fast-track approvals and the NICE/NHS England budget impact test). A new commercial function will be established in NHS England, working in parallel to the NICE commercial liaison team.

Source: Department of Health & Department for Business, Energy & Industrial Strategy (2017)
The government response also discusses existing practices in place to speed up the adoption and diffusion of innovations which will help reach the goals set out in the *Accelerated Access Review*. These include updates on schemes such as the Innovation and Technology Tariff (ITT), which aims to support medical technology uptake in England by funding the adoption of selected innovations. In April 2018, the Innovation and Technology Payment (ITP) began, which has a similar function to the ITT, in that it should reduce the financial and procurement barriers faced by innovators entering the NHS in England, but it is competitive and focuses on low-cost innovations able to deliver significant patient outcomes as well as cost savings (Department of Health & Department for Business, Energy & Industrial Strategy 2017, 10).

A key recommendation of the *Accelerated Access Review* also relates to the need for the NHS to identify priority innovation needs (and to involve patients in this process), to clearly communicate needs to innovators and to increase its capacity to conduct horizon scanning for needed innovations.

### 2.1.2. The Five Year Forward View

The *Five Year Forward View*, published in October 2014 and developed by the partner organisations that delivered and oversaw health and care at that time (NHS England, NHS Health Education England (HEE), Monitor, Care Quality Commission (CQC), Public Health England and the Trust Development Authority), outlines how the NHS needs to evolve to overcome some of the challenges it faces (NHS England 2014).

The *Five Year Forward View* highlights two main streams of work to focus on: the relationship between patients and the community (including through a greater focus on prevention) and the development of new care models, which include the services presented in Box 9.
To achieve these goals, the *Five Year Forward View* highlights the need for aligning local and national leadership, ensuring those on the frontline are supported with regards to skills, resources and values, making better use of information and communication technology (ICT) and big data, accelerating access to innovations and providing additional funding (NHS England 2014).

In November 2017, NHS England released an update on the *Five Year Forward View*: the *Next Steps on the NHS Five Year Forward View* (NHS England 2017a). This document reports on progression towards the *Five Year Forward View*’s goals, as well as on the steps for the final two years. It also outlines the next steps needed across nine areas, including cancer, mental health and taking advantage of technology/innovations for self-management (NHS England 2017a).

The *Five Year Forward View* and the *Next Steps on the NHS Five Year Forward View* highlight the need to digitise the health and care system in England in order to ensure cost savings and better care, with the *Next Steps on the NHS Five Year Forward View* building on the recommendations set out in the *Wachter Review* (2016), which had laid the foundation for the Digital Exemplar initiative. The specific digitisation aims of these policy schemes are summarised in Box 10.

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**Box 9: Five Year Forward View new care models**

- **Multispecialty Community Providers (MCPs):** GP practices should be able to group together to form federations, networks or a single organisation to reduce the burden on hospitals and manage community care more effectively.
- **Primary and Acute Care Systems (PACS):** single organisations, mental health services and community services should be able to provide NHS GP and hospital services (e.g. a hospital providing its own GP surgery).
- **Urgent and emergency care networks:** organising and simplifying urgent and emergency care, e.g. by ensuring that patients access the correct type of care that they need, which may not be provided in urgent care centres.
- **Viable smaller hospitals:** adapting the way smaller hospitals are managed and funded to ensure these local hospitals are kept running.
- **Specialised care:** transitioning certain centres to be specialised in one disease, such as cancer or rare diseases.
- **Modern maternity services:** ensuring maternity units are efficient and safe, e.g. by increasing midwife numbers and supporting women’s choices.
- **Enhanced health in care homes:** improving quality of life and reducing hospital stays by ensuring care homes have greater support and are subject to additional reviews.

*Source: NHS England (2014)*
Box 10: Digitisation aims of the *Five Year Forward View* and *Next Steps on the NHS Five Year Forward View*

- The *Five Year Forward View* commits to including fully paperless electronic health records, transfers of care, decision support, medicines management and optimisation, asset and resource optimisation, remote care and interoperability of systems.

- The *Next Steps on the NHS Five Year Forward View* outlines specific aims regarding the simplification of patient access to care and self-management of their health. Specific digitisation objectives include:
  - Measures to support patients’ management of their own health: e.g. through mental health and diabetes apps provided in the NHS Digital Apps Library, parents’ access to their children’s online health record, further rollout of personal health records and free wi-fi in GP practices.
  - Digitising hospitals: e.g. Global Digital Exemplar (GDE) Acute Trusts and Mental Health Digital Exemplars (MHDEs).
  - Implementation and further rollout of technologies to support NHS priorities: e.g. NHS 111 Online for tailored advice, extension of the NHS 111 Telephone service, extension of patient data access for healthcare institutions, standardisation of appointment booking systems, electronic GP advice from hospital specialists, extension of the NHS e-Referral Service, use of NHS-generated data for research purposes.
  - Further introduction and expansion of innovation advances: e.g. rollout of new treatments, research and development support; an increase of GP practice registrations on the Clinical Practice Research Datalink system (CPRD); introduction of new innovations; and strengthening the role of AHSNs.

- The *Wachter Review* lays the foundation for the Digital Exemplars initiative and more broadly outlines how to make better and more efficient use of health information technology in the English healthcare system. Digital Exemplars are acute sector providers championing the use of digital technology and information and establishing a blueprint for others. The *Next Steps on the NHS Five Year Forward View* builds on *Wachter Review* recommendations, and more specifically:
  - Looks at how Digital Exemplars should be implemented and pushed forward.
  - Focuses on capacity-building: plans for a GDE Learning Network and the NHS Digital Academy to train new Chief Information Officers (CIOs) and Chief Clinical Information Officers (CCIOs) as well as aspirant leaders.
  - Outlines a commitment to an NHS Apps Library, which is really about innovation to support patient/public management of their own health.

2.1.3. The Carter Review

The Carter Review, published in February 2016, was an independent review for the Department of Health (now Department of Health and Social Care), chaired by Lord Carter of Coles. It provides an overview of operational productivity and performance across NHS acute hospitals in England and identifies areas of unwarranted variation (Lord Carter of Coles 2016). Unwarranted variation was identified across a range of areas, from those specific to care provision, such as the cost of treatments, to those related to management and administration, such as the number of staff sick days. As a result of these findings, the review presents 15 recommendations to reduce unwarranted variation across acute hospitals in England and gives suggestions as to how innovation can contribute to meeting these recommendations, including as related to introduction of electronic staff records and ensuring that all Trusts introduce digital information systems. In response to the Carter Review, NHS Improvement outlined the ways in which it will adhere to the 15 recommendations. This involves assigning an NHS Improvement lead to each recommendation and the creation milestones for each, with assessments to ensure they are being met.

2.1.4. The NHS Long Term Plan


- How NHS England’s increased revenue funding of an average of 3.4 per cent per year until 2023/2024 (in real terms) – as announced by the Prime Minister in June 2018 – will be spent.

- Action points related to the prevention and management of key population health challenges (in relation to areas such as smoking, obesity, alcohol, air pollution, antimicrobial resistance and health inequalities).

- Steps on how to make further progress on care quality and outcomes, specifically focusing on measures to tackle some of the most prevalent health conditions in England (including cancer, cardiovascular disease, stroke, diabetes, respiratory disease and mental health).

- Key actions to address workforce-related issues.


The plan specifically acknowledges the importance of health research and innovation in driving medical advances and improving health outcomes; some of the key related action points set out in the plan are summarised in Box 11.

It is worth highlighting that this plan was published after the research phases of our study were completed, but we take note of it in light of its relevance in the future and in terms of the potential of our study recommendations to help inform its detailing, especially pertaining to its innovation-related elements.
Innovating for improved healthcare

Healthcare UK is a joint initiative of the Department of Health and Social Care, UK Trade and Investment, and NHS England (GOV.UK n.d.).

Box 11: Examples of key health research and innovation action points from the NHS Long Term Plan

- Acknowledging that patients benefit from research and innovation, the plan commits to stronger linking of different types of data (e.g. genomics, clinical data, patient data) to develop new treatments as well as enable patients to make informed decisions about their care.

- NHS England outlines its support and commitment to contributing to the Life Sciences Sector Deal (HM Government 2017b) (see Section 2.1.5).

- The plan states that by 2023/24, NHS England aims to increase the number of people available to participate in health research (e.g. by registering their interest using the NHS App).

- Building on the NHS England Board Paper 12 Actions to Support and Apply Research in the NHS (NHS England 2017c) and to speed up health research in the NHS, NHS England commits to streamlining trial set-up processes and prices.

- NHS England aims to have targeted investment in transformative areas of innovation, prominently highlighting genomics. This will include offering whole genome sequencing to patients, in the first instance in 2019 to children with suspected rare genetic disorders or cancers as well as adults with rare conditions or cancers; as well as increasing the number of whole genomes sequenced by the NHS Genomic Medicine Service to 500,000 in 2023/24.

- The plan highlights that the pathway to developing innovations (in particular medtech and digital) in the NHS should be accelerated. This includes creating a new advisory service for innovators (in collaboration with AHSNs), streamlining horizon-scanning efforts, simplifying health innovation programmes, and supporting the government and industry joint voluntary scheme for branded pharmaceuticals pricing and access.


- The plan notes that a new medtech funding mandate should speed up the uptake of clinically and cost-effective health technologies (positively assessed by NICE). This includes increasing the number of NICE evaluations, a stronger focus on assessing digital products and individualised support for positively assessed innovations, which would be coordinated by NHS England and NHS Improvement.

- The plan notes that funding for AHSNs should help them work more closely with regional efforts such as NHS RightCare and GIRFT (see Section 2.1.5) and spread proven innovations more widely across the system, harnessing the benefits of improved coordination.

- NHS England performance metrics, assessment systems and benchmarking efforts will incorporate new elements on performance on adopting clinically and cost-effective innovations; these will need to be further detailed.

- Together with Healthcare UK, NHS England will create an NHS Export Collaborative, which should help the global export of proven innovations.


7 Healthcare UK is a joint initiative of the Department of Health and Social Care, UK Trade and Investment, and NHS England (GOV.UK n.d.).
2.1.5. Other policies and initiatives of relevance to innovation and improvement in the health system

In addition to the policies discussed above, there are a variety of other policies and strategic initiatives relevant for an innovating and improving health system, of which we highlight here four examples of particular relevance for our work:

• **Getting It Right First Time (GIRFT)**, in a similar way to the Carter Review, aims to reduce unwarranted variation in the NHS. This scheme began in 2012 and uses data from a range of NHS sources to highlight variation in specific areas of practice and to develop approaches to address unwarranted variation (Abercrombie 2017). The programme of 30 medical work streams collects and analyses publicly available data (e.g. Hospital Episode Statistics, registry or professional body data) in combination with questionnaire inputs submitted by reviewed Trusts to assess unwarranted variation as well as to develop and share good practice examples and recommendations to improve the reviewed area (Getting It Right First Time n.d.-b).

• **NHS RightCare**, introduced by NHS England, aims to ensure patients have access to ‘the right care, in the right place at the right time’ (NHS England n.d.-g). The scheme has three streams of work: intelligence (use of data to highlight areas of variation and differences in performance), innovation (developing and testing new innovative concepts and influencing innovation policy) and implementation (supporting implementation of NHS RightCare with information resources and working with delivery partners) (NHS England n.d.-g). Within the innovation stream, NHS RightCare has also developed a new nursing, midwifery and care staff framework for reducing unwarranted variation, as well as a medicines optimisation programme (NHS England n.d.-c, n.d.-d).

• **The NIHR Innovation Observatory (NIHRIO)** has been set up through a collaboration between the NIHR, the National Innovation Centre for Ageing, the National Institute for Smart Data Innovation and Newcastle Academic Health Partners. It conducts horizon scanning into health technologies as they are evolving and which are envisaged to be ten years away from being public (National Institute for Health Research n.d.). The observatory is primarily involved in three activity areas: providing technology briefings to a variety of stakeholders, developing advanced tools to conduct horizon scanning were planned to be tested end of 2018, and involving patients in their work through an online platform where they can provide their opinion (National Institute for Health Research n.d.).

• **The UK Industrial Strategy**, published in 2017, is the government’s plan to boost productivity and industrial competitiveness across the UK. Within this strategy is a focus on investment in technology and innovation, including specifically for challenges associated with health, including the development of the *Artificial Intelligence Sector Deal* (Hall & Pesenti 2017) and the *Life Sciences Sector Deal* (HM Government 2017b). The *Life Sciences Sector Deal* aims to support production of innovative medical treatments and technologies in the UK, involving investment from private companies and charities and heavy involvement of government research and development departments, universities and research organisations (HM Government 2017a).
2.2. Enabling effective health innovation environments: a transformational approach to innovation

Our approach is not about theory but, based on Carol H. Weiss’ advice that there is ‘nothing as practical as a good theory’ (Weiss 1995), we have consciously drawn on theories of innovation to help structure the argument and recommendations. In particular, we reflect a growing policymaker interest in how innovation can play a role in the performance of the healthcare system and in addressing wider social and economic challenges. There is a wide body of literature that could be brought to bear on what enables an effective, innovating health system. We have conducted a review of a selection of this literature, as discussed in Annex E. This review was directly focused around the six drivers of innovation that were identified in the Phase 1 of the study, and so the insights gained are integrated throughout our main findings and results, as presented in Chapters 4 to 9.

What is most crucial to take from our broader review of the literature, though, is the grounding of the whole study in the idea that whatever actions are taken, they must be done within the context of supporting a sustainable innovating health system. However, innovating health systems are complex and any analysis and resulting actions will necessarily reflect this. Innovating health systems involve multiple aims and they reflect the multiple interests of patients, professionals, citizens and corporations, and these interact in often unpredictable ways that change over time (Plsek 2003); this complexity has been referred to often by study participants. Health systems are not only complex but also heterogeneous (or ‘messy’). As outlined in Section 1.3.1 and Figure 2, health innovations and their associated developmental pathways need to be viewed in the context of the wider systems within which healthcare is provided. To identify how best to support the translation of health innovations into practice, the study uses a whole-systems perspective and draws also on insights from both innovation systems and socio-technical regimes thinking, with the latter placing more emphasis on the user perspective than traditional innovation systems schools of thought (see, e.g., Freeman 2008; Geels 2004; Geels & Schot 2007; Lundvall 1992; Nelson 1993). Adopting a systems perspective for the study enables us to analyse health innovation performance, impacts and associated influencing factors within a context-sensitive framework, which takes the dynamics of different phenomena into account (OECD 2010). The processes of development, adoption, spread and scale-up of innovations happens across the healthcare pathway, i.e. crossing over the organisational boundaries of primary, specialist (acute and tertiary), social and community care, diagnostics and emergency services.

Understanding the interactions within and between innovation system and health system structures and processes is imperative in identifying opportunities for impact on healthcare quality, safety and cost-effectiveness. However, in health research and innovation, existing literature shows that new conceptual approaches are built on the experiments and experiences of those who forge new patterns of interaction between the way innovations are produced and the organisational and institutional infrastructures to which they relate (Chataway et al. 2010; Nelson & Sampat 2001). This means that

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For further discussion of the health innovation pathway see Chapter 11.
the adoption of health technologies and innovations and their potential to improve health will be influenced by aspects of the health system such as service delivery, financing, leadership and governance. But the scale of transformation that is required is great and extends beyond simply examining organisational and institutional relationships which enable translation and impact. Increasingly innovation theorists are looking to new theories of transformative innovation policy (Schot & Steinmueller 2017), especially when it is clear that research needs to link to innovation in such a way that underlying challenges in the wider system can be addressed. Both socio-technical regimes thinking and innovation systems thinking have helped to inform new lenses on transformative innovation policy, and to shed light on how transformative change can be achieved.

Socio-technical regimes thinking emphasises the influence of wider social groups beyond the innovators themselves (e.g. users, special interest groups, policymakers) on technological trajectories and on the nature of an innovating system, highlighting the importance of alignment and coordination between different actors in determining the practices, norms and rules in a given system. Socio-technical regimes can serve to stabilise particular patterns of technology and innovation development and diffusion through various cognitive routines, regulations, standards and infrastructures (Geels & Schot 2007). However, novelties and change can also emerge through initially niche disruptions in the socio-technical landscape that can serve to incubate innovations in practice, often involving initially small networks of individuals and organisations (Geels & Schot 2007). With time, niche innovations can gather momentum and spread, facilitated by factors such as learning and information exchange, cost-related or quality-related benefits, advocacy and changes in relations and power dynamics in the landscape that can create pressures on existing socio-technical regimes. Depending on the level of coordination of such change processes and resource availability, the mainstreaming of innovation will be more or less emergent versus planned, purposive and orchestrated (Berkhout, Smith & Stirling 2004), and can have more radical or incremental effects on the nature and pace of transition in the wider innovation landscape.

In highly complex socio-technical landscapes, such as that of the healthcare system in England, change and transformation need to occur in a way that does not disproportionately destabilise and have unintended consequences on access to and continuity of care. Thus, change and transformation are less likely to dramatically and immediately disrupt an existing socio-technical regime and existing innovation system. Changes to the ‘status quo’ are likely to require gradual adjustments and adaptations in existing policies, structures and practices that are informed by evidence accumulated through the implementation and exchange of experiences from initially niche experiments (often disruptive at the local level) that through time gain scale. The gradual accumulation of evidence and information from niche experiments (e.g. pilots, innovation incubators or new institutional forms such as AHSNs and Test Beds), pressures on the existing system, and more coordinated networks of initiatives and adjustments in policy and regulatory environments, coupled with the mobilisation of user and wider stakeholder awareness and buy-in and resources, are likely to be instrumental in achieving sustainable transformative change. Whereas the vision for change may be bold and more radically transformative in design, the complexity of socio-technical regimes implies that transformation in practice is likely to be more gradual and incremental.
Innovating for improved healthcare

Bringing together insights from innovation systems and socio-technical schools of thought is particularly suitable to address the challenge of transforming health and social care so that it might bridge the growing gap between what is technically possible and what is delivered in practice. For example, with this lens, future innovation policy could:

• Give more attention to end users as more central and influential actors in shaping the health innovation landscape.

• Place more focus on the pursuit of not only structural but also behavioural policy interventions, as critical for success.

• Recognise at its core that translation and impact requires contribution from multiple sectors and multiple interdependent actors (e.g. health and social care).

• Gradually shift power dynamics in the innovation system to pursue more joined up governance, planning and accountability for health outcomes and impacts (quality of care, safety, cost-effectiveness), between sectors (e.g. health and social care) and between parts of healthcare pathways (primary, acute and community care).

For the purposes of our research, then, our analysis is rooted in the idea that we must integrate and pay attention to the dynamics of health systems and innovation systems, but that for innovation to be sustainable, future policies must adopt a transformative way of thinking. This means engagement of a wider range of stakeholders across all stages of research and innovation pathways and a stronger shift to a culture of co-production of research funding decisions, agendas, implementation and impact. The policy challenge is therefore how to act in an environment with many legitimate but possibly conflicting interests, and how to steer a system towards defined public goals when the system is in places challenged by fragmentation or misalignment.

In taking an innovation systems perspective that strongly considers how innovation plays out with the health system architecture, we recognise that health systems are complex socio-economic and socio-technical structures involving many different people, organisations and actions concerned with promoting, restoring or improving health. Moreover, awareness of the fact that these interactions may occur amidst shifting government priorities, socio-economic, political and cultural contexts, and in evolving policy environments, is crucial. These insights and the broader policy landscape are embedded and integrated throughout the presentation of our results, findings and final recommendations for policy action.
3 Study findings: presentation and overview

The following chapters present the findings of this study, which draw on the cross-cutting results of the work streams discussed in Section 1.3, specifically from the prioritisation survey, semi-structured thematic interviews, stakeholder-specific workshops, case vignettes and the review of scholarly literature. The findings are organised into chapters corresponding to the drivers of innovation identified by Marjanovic et al. (2017a, 2017b):

- Skills, capabilities and leadership (Chapter 4).
- Motivations and accountabilities (Chapter 5).
- The information and evidence environment (Chapter 6).
- Relationships and networks (Chapter 7).
- Patient and public involvement and engagement with innovation (Chapter 8).
- Funding and commissioning (Chapter 9).

Chapter 10 presents cross-cutting findings on better aligning policy design with a consideration of implementation requirements and success criteria. Chapter 11 provides cross-cutting findings relating to measuring innovation uptake and impact. Finally, Chapter 12 offers a reflection on the key findings and outlines areas for action relating to the six key drivers and the two cross-cutting themes of better aligning policy design and how to use metrics to measure the outputs, outcomes and impacts of innovation across the healthcare innovation pathway.

More specifically, Chapters 4 to 10 each start with a summary of the key messages from the analysis. They then provide an overview of the current health innovation landscape – i.e. the status quo – relating to the discussed driver. This overview draws on findings from the literature as well as issues identified by stakeholders consulted through interviews, in workshops and through the prioritisation survey. Finally, the chapters each discuss the specific areas for action that have emerged from our research, and present key good practice examples from our case vignettes (highlighted in boxes).

In each chapter, we reference workshops, survey responses and interviewees associated with a particular statement in footnotes. References to workshops include information on the stakeholder group of the participants linked to a statement (see Annex D for more details on the specific workshops):

- Academics workshop: with representatives of academia and the research community.
- Charities and PPIE workshop: with representatives of charities and PPIE organisations.
- Networks workshop: with representatives of innovation and improvement networks.
• **Policymakers workshop**: with representatives of policymaking bodies.

• **Private sector workshop**: with representatives of private companies, industry associations, etc.

• **Providers and commissioners workshop**: with representatives of healthcare provider organisations and commissioning organisations (e.g. CCGs).

Where findings reflect the views of interviewees, interview codes are provided. Each interview was coded by the interviewee’s stakeholder affiliation and a consecutive number (see Annex B for more details on the type of stakeholders interviewed):

• **Academics_INT**: representative of academia and the research community.

• **Anonymous_INT**: representative of any of the stakeholder groups mentioned who wished to remain anonymous.

• **CCG_INT**: representative of a commissioning organisation (e.g. CCG) interviewed for a case vignette.

• **CharityPPIE_INT**: representative of a charity or PPIE organisation.

• **Innovator_INT**: representative of a company developing an innovation selected for a case vignette.

• **Networker_INT**: representative of a networking organisation interviewed for a case vignette.

• **Networks_INT**: representative of an innovation and improvement network.

• **Policymaker_INT**: representative of a policymaking body.

• **Private_INT**: representative of, for example, a private company or an industry association.

• **Provider_INT**: representative of a healthcare provider organisation interviewed for a case vignette.

• **ProviderCCG**: representative of a healthcare provider organisation or a commissioning organisation (e.g. CCG).
4 Strengthening skills, capabilities and leadership for innovation
4.1. Summary

Current landscape: issues and developments

• A diverse set of technical and social skills is needed from all innovation actors for successful engagement with an innovating and evolving health system. While not all stakeholders require all skills, acquiring the necessary skills each stakeholder needs for their participation in the innovation system requires training, mentoring and learning through exposure, experience and networking. Key areas for capacity-building span:
  - Social skills related to: leadership capabilities to manage risk and navigate innovation-related activity across professional boundaries and hierarchies; networking, brokerage and relational skills to create connected communities; and business skills related to making a compelling business case.
  - Technical skills related to: clear needs assessment and problem articulation; the interpretation of innovation-related evidence; implementing innovations and innovation policies in organisations; economic analysis and evaluation skills (including data analytics) that consider performance of products, technologies and services in the real world over time and at the level of the health system (rather than in organisational silos); and intellectual property literacy.

• Historically, the innovating health system in England has focused more on building capacity on the supply side of the innovation pathway (e.g. the Clinical Entrepreneurs Training Programme; training and mentorship provided through enterprise and Innovation Hubs; SBRI health economics skills support; and CLAHRc and AHSN programmes) over skills required for adoption, spread and scale-up on the demand side. Recently, programmes such as the NHS Innovation Accelerator are seeking to address this imbalance.

Key areas for action to support effective leadership and build future capacity to drive innovation through the health system

• Integrate innovation-related training into continual professional development opportunities for senior managers, executives and clinical leaders in the NHS by raising awareness and encouraging participation in such programmes.

• Policymakers should work with the Medical Royal Colleges and Health Education England to introduce innovation-related skills training into educational curricula, learning from the experiences of how this was achieved for research training and exploring the scope for coordinating with research training modules.

• Establish a training programme for the private sector on how to effectively engage with the NHS. This will help encourage cross-sector learning and needs to be designed by experts who can include both private sector and NHS needs and cultures into the training programme. The expertise available across the NHS Leadership Academy programmes and Health Education England, the NHS Innovation Accelerator, and entrepreneurial support schemes (e.g. Clinical Entrepreneurs Training Programme, Innovation Hubs, SBRI) could be helpful for designing courses.

• Create and sustain informal training and knowledge exchange opportunities,
particularly around the implementation of innovations in provider organisations. Train-the-trainer approaches could be used, where leaders in implementing an innovation are trained to share their learning with others in their teams and organisations over time.

- Clarify priority areas of skills capacity-building for existing institutions to focus on (e.g. including AHSNs – these should relate to priority skills gap areas as outlined above).

- Identify, mobilise and embed Innovation Champions and brokers into the health system who are leaders across different professions and hierarchies, are trusted staff and have influence across multiple professional communities. This is already happening in some regions, but could be scaled up.

- Introduce clear responsibilities and accountability structures for innovation in organisations and across hierarchies so that individuals ensure that development of new skills is an element of their roles.
4.2. The current landscape for skills, capabilities and leadership for innovation: reflecting on issues and developments

Delivering successful innovation in the health system requires a diverse set of skills across the innovation pathway, the health system, geographic regions and organisations. Moreover, as policymakers develop new approaches to improving innovation, and as the organisational landscape evolves, new skills and capabilities will be needed. Processes that may have been well suited to earlier approaches will need to be adapted and, in some cases, radically changed. Achieving these capacities requires both training and mentoring, and learning through exposure, experience and networking (Blasinsky, Goldman & Unützer 2006; Goetz et al. 2009; Hoelscher et al. 2004; Hogg 1996; Massatti et al. 2008; Rollins et al. 2010; Swain et al. 2010; Woltmann et al. 2008; Cox et al. 2018).

Historically, the innovating health system in England has focused more on building capacity on the supply side of the innovation pathway rather than on skills required for adoption, spread and scale-up on the demand side. In recent years, though, there has been increasing recognition of the need to address the skills, capabilities and leadership for innovation not only as they relate to developing new products, technologies and services but also as they relate to appreciating innovations that can make a difference to services and engaging with their adoption, diffusion and spread. More specifically, we have identified that there is a need for further capacity-building across a range of areas, including skills and capabilities for: 10

- Leadership, to encourage and enable innovating and innovation-supportive cultures across hierarchies (and not only at senior levels), including the skills and capabilities needed to take risks and better manage risks.
- Needs assessment and problem articulation, including interpretation of evidence and research literacy to understand the needs and behaviours of service users.
- Networking, brokering and relationship building, to create connected communities with sufficient knowledge management capacity to access and use innovation-related information and evidence for responding to service improvement challenges.
- Understanding and harnessing innovation opportunities in health service settings, for example through better access to and awareness-raising of information sources and through engaging with networks and broker institutions (e.g. AHSNs and others and through implementation support; it is also important to recognise that innovations

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9 Evidence for this point is also supported by research from Phase 1 of this study, which was summarised in the interim report (Marjanovic et al. 2017b). Henceforth in this chapter, references to evidence that was summarised in that report will be provided in footnotes to reflect the fact it is part of the broad evidence base of primary research conducted for this study (as opposed to being a part of the wider literature on the topic of health innovation).

10 See evidence including: interview analysis in Annex B, specifically evidence given by Academics_INT8, CharityPPIE_INT2, CharityPPIE_INT3, CharityPPIE_INT9, CharityPPIE_INT14, Networks_INT8, Networks_INT9, Networks_INT10, Policymaker_INT2, Policymaker_INT3, Policymaker_INT5, Policymaker_INT6, Private_INT6, Private_INT7, Private_INT7, ProviderCCG_INT14, ProviderCCG_INT15, ProviderCCG_INT16, ProviderCCG_INT18, ProviderCCG_INT19, ProviderCCG_INT21, ProviderCCG_INT22; workshop analysis in Annex D, specifically the academics workshop, networks workshop, policymakers workshop, private sector workshop, providers and commissioners workshop; evidence from Phase 1, presented in Marjanovic et al. (2017b). There is also support for some of these areas in other evaluation studies, in particular from the evaluation of the NHS Innovation Accelerator as detailed in Cox et al. (2018).
are often adapted to local contexts during the implementation process (Horton, Illingworth & Warburton 2018)).

- Economic analysis and evaluation, to consider performance of products, technologies and services in the real world and over time (i.e. post health technology assessments). A particular emphasis on cost-effectiveness across the healthcare system rather than analysis at the level of only a specific part of the system (e.g. acute) is needed.

- Business case development, to make more compelling cases for decisions related to innovation uptake, including health economics analyses.

- Data analytics, to support ongoing evaluations of innovations.

- Implementation of new policies.

- Intellectual property (IP)-related issues, to support health service providers and innovators.

The need to refresh existing skills and develop new ones is recognised and at present the health landscape in England offers a variety of initiatives, as well as organisations and networks at both national and local levels, which aim to strengthen innovation-related skills and capabilities (see Box 12). Though these initiatives are strengthening skills in some areas, they are not comprehensive and there is a need to reflect on how they can be evaluated to assess performance, and how to ensure a coordinated capacity-building offer, both regionally and nationally.  

Box 12: Examples of skills initiatives in England mentioned by our stakeholders

Examples frequently mentioned by participants in our workshops, interviews and survey include:

- The NHS Innovation Accelerator, which focuses on skills and networks for supporting innovation uptake, diffusion and spread.

- The Clinical Entrepreneurs Training Programme, which offers opportunities for healthcare professionals to develop their entrepreneurial goals.

- The SBRI Healthcare programme, which brings together business, health, technology and government partners to tackle healthcare challenges.

There are also various regional innovation training programmes focusing on leadership, communication, entrepreneurship, legal and IP-related issues, influencing and other skills, and supported by institutions such as AHSNs (and their wide set of innovation initiatives), Innovation Hubs, Academic Health Science Centres (AHSCs), universities and research institutes, CLAHRCs, other clinical networks and institutions (such as Health Enterprise East, Health Innovation Manchester, NHS Innovations South West, DigitalHealth.London, Vanguards, and various clinical networks in hospitals and universities).  

See evidence including: interview analysis in Annex B, specifically evidence given by Academics_INT1, Academics_INT5, Academics_INT8, Academics_INT9, Academics_INT11, CharityPPIE_INT2, CharityPPIE_INT3, Networks_INT3, Networks_INT4, Networks_INT5, Networks_INT8, Networks_INT9, Networks_INT10, Policymaker_INT2, Private_INT2, ProviderCCG_INT11, ProviderCCG_INT15, ProviderCCG_INT16, ProviderCCG_INT18, ProviderCCG_INT19, ProviderCCG_INT22; workshop analysis in Annex D, specifically the charities and PPIE workshop, networks workshop, private sector workshop, providers and commissioners workshop; survey analysis in Annex A; evidence from Phase 1, presented in Marjanovic et al. (2017b).
Creating an innovation-supportive culture will require continuous investment in training and development across sectors. For healthcare professionals, training and education about how to engage with, identify, adopt and sustain innovation needs to happen throughout their career, from the initial education curricula through to continuing professional development (CPD). It needs to include information on the reasons for innovation and its potential to contribute to quality of care, patient safety and organisational performance.\textsuperscript{12} For the private sector, training is needed to help develop skills ranging from needs assessment and problem articulation, to networking and the ability to make compelling business cases, all to help them develop the skills to work with stakeholders within the NHS.\textsuperscript{13} Small businesses in particular often do not have the capacity to acquire the expertise and skills required to engage with the NHS, create a business case, and work collaboratively to embed innovations.\textsuperscript{14} Recent evaluations have found that in particular a combination of ‘soft’, personal traits of innovators, alongside ‘hard’ skills such as developing a business case, are enabling factors for the scaling-up of innovations. Softer skills include an entrepreneurial spirit, openness to new ways of working, good communication and relational skills, and knowing the ‘inside workings’ of the NHS (Cox et al. 2018).

Stakeholders across the healthcare system require skills related to practical implementation support. Skills in this area have been shown to be particularly beneficial to sustainability of innovations, as is training by manufacturers of a technology or other external agency to help support adoption (Hoelscher et al. 2004; Fleuren et al. 2004, quoted in Robert et al. 2009; Swain et al. 2010; Ulucanlar et al. 2013).\textsuperscript{15} The Pathway Transformation Fund, which was announced in the UK government’s response to the Accelerated Access Review (Department of Health & Department for Business, Energy & Industrial Strategy 2017), should also help to overcome barriers related to implementation by providing dedicated training for staff and other measures supporting the integration of innovations in everyday practice.

Effective leadership goes hand in hand with skills and capacity-building. It is important for endorsing an innovating organisational culture, releasing necessary resources to support innovation activities, acting as a focal point for information sharing about innovation needs and opportunities, providing expertise and credibility for innovation activities locally and nationally, and helping to manage complex organisational and political environments (Fitzgerald et al. 2002; Wallin et al. 2003; Länsisalmi et al. 2006; Helfrich et al. 2007; Owen 2010; Swain et al. 2010).
While it is recognised that there is some strong leadership for innovation ‘at the top of the NHS’, and some willingness to engage with innovation at the frontline (such as NHS Innovation Accelerator fellows, clinical entrepreneurs, Innovation Champions and Innovation Scouts), there is a need for scaling up and spreading leadership capacity for innovation across the NHS hierarchy, at both organisational and national levels. This is because it is not just the commitment from the top that matters in delivering strong leadership for innovation: it is essential that leaders at different organisational, professional and hierarchical levels work in teams, not in silos, and that these teams have a diverse set of skills and expertise, such as marketing knowledge, change management experience and service improvement experience (Collins 2018).

Part of effective leadership also entails effective risk management, as well as the ability to recognise the risks that not innovating can present to patient safety and the quality of care. Studies have shown that a culture of risk aversion is deeply embedded in NHS organisations (see, for example, The Policy Institute at King’s College London 2018).

Modifying established aversion to risk, without exposing patients and organisations to new and unnecessary risks, requires a deliberate change in how leaders behave. This will require supporting leaders to act as role models in how they manage risks; providing them with a higher degree of flexibility in their approach to be open to new sources of risk (including the risk of not innovating); enabling frontline staff to innovate and providing them with the resources, skills and capabilities needed to manage risks while harnessing opportunities for innovation; and actively maintaining the relationships required to sustain new innovations once in place to address the risk of reverting back to established practice.

4.3. Analysis to support the areas for action

From our analysis of the evidence, a number of areas for action were identified to help strengthen leadership, skills and capabilities across the health innovation landscape. Three main themes emerged: supporting effective leadership, including establishing Innovation Champions, to drive innovation through the...
Innovating for improved healthcare

health system; embedding innovation thinking and training into educational curricula and professional development; and encouraging cross-sector learning by providing training to business and small and medium-sized enterprises (SMEs) on how to effectively engage with the NHS.

4.3.1. Supporting effective leadership to drive innovation through the health system

Effective leadership is needed to drive innovation through the system and establish innovative cultures. This will require:

- Dedicated learning opportunities and training for senior managers, executives and clinical leaders to help them foster the required entrepreneurial mindset and skills.
- Financial and non-financial strategic support for leadership, including strategic support for NHS chief executives in taking managed risks.
- Identification, mobilisation and embedding of intermediaries across the system who can act as innovation brokers and Champions. They should be trusted by staff – i.e. leaders with influence across multiple professional communities – and have responsibility for inspiring, enabling and coordinating the involvement of frontline clinical staff with innovating activities. Such roles already exist in some regions and some AHSNs, but could be scaled up.
- The introduction of clear responsibilities and accountability structures for innovation in organisations and across hierarchies.

Effective leadership can help drive innovation through the system and our research and the wider literature outline a range of actions that can be taken to enable this. Primarily, an innovation mindset needs to become embedded in leadership roles. While dedicated learning opportunities and training for senior managers, executives and clinical leaders could help foster the required entrepreneurial and more innovation-open attitudes that are required, this must be complemented by strategic support at the national level. Such support to NHS executives could enable them to effectively manage risks, as well as to appreciate the risks that not innovating can present. The support can take the form of: empowering executives to use financial and non-financial means to enable an innovative environment, for example by providing a dedicated percentage of a Trust’s budget to innovation (provided there is accountability for expenditure); providing dedicated time for staff to spend on engaging with innovation; celebrating and rewarding success; and recognising and allowing for the fact that not all innovations will be successful. A more innovative culture will require supporting experimentation and taking calculated risks when there is a degree of uncertainty about what works best to improve services and treatments, as long as patient safety is not compromised. Similarly, the evaluation of the NHS Innovation Accelerator highlighted the fact that the level of disruption to an organisation and/or the level of complexity required in implementing across the adoption pathway could prove to be difficult barriers to overcome when scaling innovations (Cox et al. 2018), but are nevertheless crucial to overcome. Innovative organisational cultures can and

21 See evidence from the interview analysis in Annex B, specifically evidence given by Academics_INT5, Academics_INT7.
22 See evidence from the workshop analysis in Annex D, specifically the policymakers workshop.
23 See also the discussion on incentives in Chapter 5.
should embrace and learn from how they tackle
and manage this inherent uncertainty. Box
13 highlights some examples of how effective
leadership can support the introduction of
innovations.

Box 13: Case vignette examples of effective leadership supporting the adoption of innovation in the health system

The Continuing Healthcare Checklist and the Decision Support Toolkit (CHC2DST) software enables the assessment of funding for social care for individuals with complex, long-term health conditions to be conducted electronically. Individual commissioners in the Cheshire CCG were able to view the benefits of CHC2DST as outweighing the risks because of their individual willingness to take risks. This CCG paved the way and their success has encouraged other CCGs to take the risk in adopting the software.

SecurAcath is a single-use device to secure and stabilise central venous catheters. The innovation decreases accidental dislodgements during dressing changes in comparison to incumbent products, and reduces the risk of medical adhesive-related skin injury (MARSI). Specialist nurses acted as Innovation Champions in this case and were given autonomy in decision making, including over budgets. This enabled the early and fast introduction of SecurAcath in some Trusts, thereby allowing the benefits of this innovation to be demonstrated in practice early on. An interviewee from one Trust noted that ‘The fact that I’m allowed some autonomy in my role and I’m in charge of the service, that was an enabler. The fact that I didn’t have to put it through some kind of bureaucratic system, that was [also] an enabler’. Moreover, they thought that if they had needed to go through official procurement processes, an introduction at this stage would have been very unlikely.

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24 See evidence including interview analysis in Annex B, specifically evidence given by Academics_INT8, Academics_INT10, Academics_INT11, CharityPPIE_INT1, CharityPPIE_INT9, Networks_INT10, Policymaker_INT3, Policymaker_INT5, Policymaker_INT6, Policymaker_INT9; workshop analysis in Annex D, specifically the networks workshop, providers and commissioners workshop. See also the wider literature, for example Trapp (2014).


26 A central venous catheter is a catheter placed into a large vein and used to deliver medication.

27 See evidence from case vignette interviews in Annex C, specifically evidence given by Provider_INT11.
Once these mechanisms are in place, the introduction of clear and embedded responsibilities and accountability structures for innovation in provider organisations, commissioning and procurement activities, and across hierarchies at clinical, managerial and executive levels, could help to cement the effects of strong leadership. One way to make this happen is to embed innovation leadership responsibilities at the Board level, in job role specifications, and as a means of performance management, whilst ensuring these are not just a tick-box exercise (The Policy Institute at King’s College London 2018). Identifying and mobilising intermediaries and brokers trusted by staff across the NHS system, such as leaders with influence across multiple professional communities (e.g. clinical leads in primary and acute care), can help weave innovation mindsets vertically and horizontally through the system (Albury et al. 2018; Dopson et al. 2002; The Policy Institute at King’s College London 2018; Rye & Kimberly 2007). Stakeholders across our study and the wider literature support the idea of embedding these so-called ‘Innovation Champions’, individuals who are responsible for spearheading efforts to adopt and sustain innovations, throughout organisations and at different hierarchical levels.

The presence of respected Innovation Champions is positively associated with adoption and sustainability (Aitaoto, Tsark & Braun 2009; Collins 2018; Dopson et al. 2002; Goodson et al. 2001; Jacobs 2002; O’Loughlin et al. 1998; Plsek 2003; Savaya, Elsworth & Rogers 2009; Scheirer 1990; Swain et al. 2010; Wisdom et al. 2014; Wright 2009). A Champion’s role is to be actively supportive of innovations and to help embed them in practice. They must have the skills and relevant expertise to assess the evidence of innovations and see the benefits for patients (e.g. quality of care), healthcare professionals (e.g. improved service) and managers (e.g. cost-effectiveness), and should have a degree of passion about innovation as this will help them communicate the benefits of an innovation and articulate how it matches specific patient needs. Our case vignette examples show that autonomy and the involvement of clinical staff in innovation-related processes can enable stronger frontline support and quicker uptake of innovations (see Box 14). However, this kind of autonomy and engagement will require giving frontline staff dedicated time to think about how to improve the NHS and engage...
with innovation, including time to plan for introducing new innovations (see also Chapter 5). However, there is some evidence that the effects of Champions may be relatively short lived (Hendy & Barlow 2012; Kislov, Hyde & McDonald 2017) and that influential individuals can act to block change as much as they promote it (Dopson & Fitzgerald 2005). The careful selection of Champions as well a clear definition of their roles could help make them sustainable and effective.

4.3.2. Embedding innovation thinking and training into educational curricula and continuing professional development for clinical and management staff

Embedding innovation thinking and training for clinical and management staff can be achieved by:

- Working with the Medical Royal Colleges to introduce innovation-related skills training into educational curricula, incorporate ongoing innovation training into CPD programmes, and explore the scope for coordinating with research training modules.
- Ensuring that training programmes reflect the dynamic nature of innovation itself and are flexible in their design, allowing for adaptations.
- Creating and sustaining informal training and knowledge exchange opportunities, particularly around the implementation of innovations.

Box 14: Case vignette examples of engaging frontline clinical staff with innovation

The NHS Blood Donor Chair, an innovative chair that improves donor comfort and safety, was developed in a participatory and iterative design process, involving clinical staff and the public. This process helped to ensure the product’s relevance and user-friendly specifications, reducing the number of donors fainting and being easier to transport and clean.

Early uptake of SecurAcath, a single-use device to secure and stabilise central venous catheters, was enabled by the innovators’ engagement with NHS specialist nurses. The latter were given autonomy to attend conferences in Europe where they could get to know innovations able to address relevant health system needs and engage with the innovators.34

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34 See evidence from case vignette interviews in Annex C, specifically evidence given by Innovator_INT16, Provider_INT11.
35 See evidence including: interview analysis in Annex B, specifically evidence given by Academics_INT8, Academics_INT10, Academics_INT11, CharityPPIE_INT1, CharityPPIE_INT9, Policymaker_INT3, Policymaker_INT5, Policymaker_INT6, Policymaker_INT9; workshop analysis in Annex D, specifically the policymakers workshop, providers and commissioners workshop; survey analysis in Annex A.
In order to embed innovation in the NHS, clinical and management staff need to be able to learn innovation-related skills on an ongoing basis and to be sensitised to the potential benefits and risks of innovation. As the responsible bodies for providing training, Medical Royal Colleges should be more strongly involved in providing training on innovation at an early stage – i.e. for undergraduates – and should continue offering dedicated innovation training throughout postgraduate and continuing education courses. In addition to Medical Royal Colleges, the NHS should work more closely with other bodies that have a key role in medical education curricula and CPD, such as the General Medical Council, the Faculty of Public Health and Health Education England. Opportunities to coordinate with the development of research training modules should also be explored.

Delivering these programmes will require adaptability and flexibility to take account of the dynamic nature of innovation itself. Current educational programmes are often too structured and do not allow for the adaptability needed; more flexibility within education curricula could help new healthcare professionals adapt within a changing world and feel able to implement new innovations and approaches as they emerge. As one interviewee noted, it is necessary to ‘enable clinicians to feel that there is the ability to be flexible and move into a different area’. There should also be an ability to continually take stock of when upskilling or new skills are needed. For example, the current lack of legal support may put off some Trusts and CCGs from adopting an innovation through their fear of legal opposition and they would thus need central legal support from NHS England to address issues around IP and patents.

In addition to formal training, informal knowledge exchange and learning should be encouraged. Several stakeholders identified the need to involve frontline staff in writing ‘how to’ guides for innovation and to share experience from past successes. Train-the-trainer approaches, where leaders who have experience in implementing innovations can share their learning with others in their teams and organisations, could be a powerful approach. Evidence from our case vignettes suggests that close collaborations between frontline staff – i.e. those using innovations – and innovators can be a key enabler of successful innovation implementation. Several healthcare provider interviewees specifically highlighted how helpful it was to have continuous support from innovators and training on how to use the innovations (see Box 15).

36 See evidence including: interview analysis in Annex B, specifically evidence given by Academics_INT2, CharityPPIE_INT3, Networks_INT1, Policymaker_INT2, Policymaker_INT10, ProviderCCG_INT8, ProviderCCG_INT16, ProviderCCG_INT18, workshop analysis in Annex D, specifically the academics workshop.

37 See evidence from the interview analysis in Annex B, specifically Networks_INT2, Networks_INT6, Networks_INT8, Networks_INT9, ProviderCCG_INT19.

38 See evidence from the interview analysis in Annex B, specifically ProviderCCG_INT19.

39 See evidence from the workshop analysis in Annex D, specifically the providers and commissioners workshop.

40 See evidence including: interview analysis in Annex B, specifically evidence given by Policymaker_INT3, Policymaker_INT11, workshop analysis in Annex D, specifically the charities and PPIE workshop, networks workshop, providers and commissioners workshop, policymakers workshop.
4.3.3. Encouraging cross-sector engagement and learning opportunities by supporting and providing training to the private sector

Cross-sector engagement and learning opportunities can help to identify innovation opportunities and enable a more sustainable set of innovation activities to take place, particularly in the private sector. Offerings should include dedicated training for the private sector on how to engage with the NHS and scaling up of the mentorship and brokerage functions of AHSNs and other network initiatives. The expertise available within the NHS Leadership Academy programmes, the NIHR Leadership Programme, Health Education England, the NHS Innovation Accelerator and entrepreneurial support schemes could be helpful for designing appropriate courses.

Cross-sector engagement and learning can facilitate a broader and deeper understanding of the context in which different actors in the health system operate. Many stakeholders in the workshops and interviews, half of respondents to the prioritisation survey and 75 per cent of private sector respondents (see Figure A.26 in Annex A) indicated that initiatives facilitating cross-sector learning between the private, NHS, public and third sectors can help to identify where innovation may offer new perspectives or solutions to health service challenges.

Crucially, support for businesses – and in particular for SMEs – to engage with the NHS and identify and respond to healthcare needs, including collecting the required evidence for business cases, was thought to enable

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41 See evidence from case vignette interviews in Annex C, specifically evidence given by Innovator_IN12, Provider_IN13.
42 See evidence from case vignette interviews in Annex C, specifically evidence given by CCG_IN10, Innovator_IN14.
43 See evidence from case vignette interviews in Annex C, specifically evidence given by Provider_IN11.

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Box 15: Case vignette examples of successful and effective practical implementation support

**One-step nucleic acid amplification (OSNA)** analyses the sentinel lymph node intra-operatively to facilitate removal of the non-sentinel lymph nodes if metastasis is detected in breast cancer. This is an improvement on previous techniques that took days to partially analyse the sentinel node and would require a second operation to remove the non-sentinel nodes if metastasis had occurred. Uptake of the innovation was facilitated by the NHS National Technology Adoption Centre (NTAC), which created online support tools for hospitals implementing OSNA, such as the creation of a toolkit called the ‘How to Why to Guide’.41

**Kooth** is an online mental health and emotional wellbeing platform for children and adolescents experiencing mental health or emotional challenges, which can reach out to those who cannot access face-to-face services, or prefer to engage through online means. Efforts of the innovating team and its collaborators to provide training on how to use the service for health professionals as well as advertising of the service was seen to help adoption. This included collaborating with face-to-face service providers around advertising the service and communicating its benefits as well as providing training for health professionals offering Kooth.42

In-house training on how to use **SecurAcath**, a single-use device to secure and stabilise central venous catheters, was strongly supported by the innovator. This involvement helped to overcome uncertainties and gain buy-in on the part of clinical staff.43
closer dialogue between industry and the NHS and was reported as a specific gap by private sector stakeholders (see also Chapter 6). This includes developing NHS staff’s ability to clearly communicate NHS needs to innovators – which was also emphasised in one of the key recommendations of the Accelerated Access Review (2016) – as well as training businesses in how to work with NHS stakeholders. Training and capacity-building in this area should be designed by experts who can reflect both private sector and NHS needs and cultures in the training programme. The expertise available across the NHS Leadership Academy programmes and Health Education England, the NHS Innovation Accelerator, as well as entrepreneurial support schemes (e.g. Clinical Entrepreneurs Training Programme, Innovation Hubs, SBRI) could be helpful for designing such a course.

This should be coupled with mentorship and training on how to engage with the NHS, since industry representatives familiar with how the NHS works and how decisions are made may be more successful in their efforts to enter into business with the NHS. AHSNs already act as information brokers and provide support, training and mentorship to businesses, and it is felt that this should happen on an even larger scale in the future (see also Chapter 7). Moreover, AHSNs and other formal and informal networks and their initiatives (e.g. clinical leadership groups, strategic initiatives, thematic networks, meetings, professional associations, idea generation forums and problem-solving events) can help businesses gain the skills and capabilities to work with the NHS, as well as provide opportunities for cross-sector learning.

Several examples from our case vignettes demonstrate the importance of support for SMEs in their engagement with the NHS. For instance, IEG4, the company behind the development of CHC2DST, and NeoTract, the developers of UroLift®, benefited from AHSN support and guidance, and felt that this support helped them make quicker progress. Similarly, Sysmex, the developers of OSNA, and Interrad Medical, the developers of SecurAcath, received NHS support to develop their business cases, and Big Health, the company behind Sleepio, found their participation in the NHS Innovation Accelerator fellowship programme helpful for building relationships with NHS stakeholders.
5 Ensuring appropriate motivations and accountabilities
5.1. Summary

The current landscape: issues and developments

• Motivations and accountabilities shape people’s behaviours towards engaging with both the development of innovations and their uptake. Motivations span personal beliefs about the value of innovation for improving the quality, safety and productivity of care, leadership support and organisational values, and norms related to innovation, reputational, financial and career-related drivers. Multiple drivers (e.g. such as financial and the desire to do good) can co-exist.

• In the health system in England, the incentives for engaging with the uptake of innovation have historically been weaker than those that influence entrepreneurial activities. We have recently witnessed progress with the evolution in performance evaluation systems for initiatives such as AHSNs, which put emphasis on the roles that these initiatives play in facilitating uptake.

• The current system of accountabilities needs strengthening. Innovation should not be mandated and targets can lead to the unintended consequence of making innovation a tick-box exercise. However, stronger monitoring of accountabilities, for example ensuring that more compelling evidence of why proven innovations are not taken up in some contexts, is justified. This can help tackle unwarranted variation across regions and localities.

Key areas for action to improve the motivations and accountabilities landscape

• Executive leadership, middle management and clinical leaders in provider organisations need to assume more responsibility and accountability for raising awareness and disseminating information about how innovations can contribute to the quality, safety and productivity of care, and about how innovating fits with individual roles and organisational values and performance objectives. To achieve this:
  - Establish Innovation Champion roles with responsibility for monitoring delivery.
  - Promote individual accountability through clear role specifications and performance management initiatives.
  - Actively seek information on the cost and quality performance of innovations and engage with regional and national initiatives that provide such information (e.g. NICE, NHS Innovation Scorecard, NHS RightCare, GIRFT, AHSNs, Innovation Hubs, Trusts, peer networks, charities).
  - Share examples of impact from elsewhere within organisations to support culture change.
  - Embed innovation remits into organisational policies and quality of service assessments, providing clear standards and guidance on accountable and responsible risk management, and instigating board-level ownership of implementation activities.

• Strengthen organisational accountability by embedding innovating activities into national regulatory and improvement regimes (e.g. CQC, GIRFT, audits), performance indicators and outcome-related payments.

• Raise awareness about existing funding resources (e.g. organisational seed funds,
Trust competitions, AHSN or enterprise hub pump-prime funding, and national schemes) to support the development and adoption of innovations. Couple this with feasible buy-out of programmed activities to support health professional engagement with innovation, releasing time and headspace.

• Recognise and reward innovation by establishing ‘innovating with impact’-type awards for individuals and organisations which reward entrepreneurial activity and efforts to take up and embed innovations and innovative practice in provider organisations.

• Embed engagement with innovation into career development and promotion pathways in the health system and into the continual professional development point system.

• Channel part of organisational performance-related payments into rewarding innovative activity and support flexible risk and revenue-sharing agreements with the private sector.

• Clarify Trust IP policies to healthcare professionals.
5.2. The current motivations and accountabilities landscape: reflecting on issues and developments

Innovation is ultimately driven by the decisions that people make, but these decisions are taken within particular settings and are shaped by organisational and personal incentives and accountabilities. Indeed, individuals’ attitudes towards change and quality improvement fundamentally affect motivations to adopt and sustain innovations (Castle-Clarke, Edwards & Buckingham 2017; Savaya, Elsworth & Rogers 2009; Wisdom et al. 2014). We neither assume that people working in the innovation system are ‘knights’ (to use Le Grand’s term) who are public spirited altruists, nor that they are ‘knaves’ who are self-interested egoists (Le Grand 2003). A mature approach considers how the blend of motivations and accountabilities can best shape individual decision making in the public interest.

We know, for example, that incentives contribute to high levels of attainment of quality targets, an increase in incentivised activities, an increase in activities involving higher pay relative to level of effort, and a decrease in some activities not linked to incentives (McDonald et al. 2010; Swain et al. 2010; Wisdom et al. 2014). However, it is also evident that narrowly designed incentives and performance indicators can have dysfunctional consequences for health and social care systems. Poor measurement, misplaced incentives and sanctions, breaches of trust, and politicisation of performance systems are all potential consequences of poorly designed indicators (Mannion & Braithwaite 2012). It is important to find ways to balance the potential benefits of incentives with an understanding of their limits and possible unintended consequences.

Over the course of our study, we have found that for people working in health innovation, areas in need of particular attention in relation to motivations and accountabilities for innovating include: creating more permissive environments for engaging with innovation and leadership support for such activities; addressing risk aversion and communicating the risks of not innovating for patient safety and quality of care; targeting incentives and accountabilities for innovation uptake; and furthering support for entrepreneurial activity. For example, our survey found that organisational leadership that recognises and values innovation and visibly promotes innovation-related activities is a key incentive for engaging with innovative activities – be they supply or uptake related (selected by 64.8 per cent of respondents). However, we do not think this is simply a case of ‘leadership trumps incentives’ in driving innovation. There are other important contextual factors such as how decision makers are motivated (by professional, symbolic or material rewards) and how they are held to account. What consequences would follow for them as individuals and for their organisations if they failed to engage with innovation or if they innovated with unsuccessful results?

Finding the optimum balance of incentives and accountabilities mixed with culture, comprehension, collaboration and leadership within any particular setting is a matter of judgement informed by the context and the particular requirements of the intended innovation (Rose et al. 2006). More specifically, identifying the anticipated benefits for patients, accruing financial and reputational benefits for individuals and organisations, finding

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50 See evidence from the survey analysis in Annex A.
opportunities for professional advancement, and aligning the aims of the innovation with organisational norms and values can all be motivators for individuals and organisations to engage with innovation-related activities (Black & Lynch 2004; Plsek 2003).\(^{51}\) Other motivating factors identified in our study that could help change innovation-related behaviour include: releasing resources (time, funding) to incubate ideas and pursue innovation-related activities; sharing evidence about the benefits of innovations to encourage uptake; and identifying performance-related incentives associated with career development and promotion pathways.\(^{52}\) Many of these incentives and motivations seek to connect to individual interests and organisational objectives and aim to encourage and reward more positive engagement with innovation. This can lead to a clinician realising that engaging with innovation can help with their desire to improve patient care and make their job easier, or allow a manager to move closer to realising organisational efficiencies.\(^{53}\)

Supporting efforts to motivate innovation are formal organisational innovation roles and functions in provider organisations, including Innovation Leads, Innovation Scouts and Directors of Innovation and Improvement. Often working together in regional and national networks, these seek collectively to support innovation-friendly environments. However, although the creation of such roles and other related actions at organisational and individual level has raised the profile and awareness of innovation, they currently lack scale, connectedness and consistency across organisations, regions and nationally. In some cases, roles are not accompanied by detailed job specifications and have no accountability for delivery.\(^{54}\) Historically, there has also been more focus on incentives to engage with developing innovations, and less focus on incentives for the uptake of proven innovations, and this has been reflected in innovation roles, which tend to focus more on development rather than implementation.\(^{55}\)

Efforts to improve individual and organisational engagement with innovation may have limited traction where the efforts required and the potential benefits arising span multiple organisations and/or the costs accumulate in one organisation but the benefits arise elsewhere. Addressing these issues requires system-level interventions to enhance incentives and ensure accountability for innovation at a system level. This has given rise to a greater focus on networks and partnership working with agencies such as AHSNs given particular responsibility for cultivating these, and is reflected in the philosophy underlying Sustainability and Transformation Partnerships (STPs) and accountable care models (see also Chapter 7).

51 Evidence for this point is also supported by research from Phase 1 of this study, which was summarised in the interim report (Marjanovic et al. 2017b). Henceforth in this chapter, references to evidence that was summarised in that report will be provided in footnotes to reflect the fact it is part of the broad evidence base of primary research conducted for this study (as opposed to being a part of the wider literature on the topic of health innovation).

52 See evidence including: interview analysis in Annex B, specifically evidence given by Academics_INT7, Academics_INT8, Academics_INT10, Academics_INT11, Networks_INT1, Networks_INT4, Networks_INT6, Networks_INT7, Networks_INT8, Networks_INT10, Policymaker_INT3, Policymaker_INT5, Policymaker_INT6, Policymaker_INT9, Policymaker_INT11, ProviderCCG_INT13, ProviderCCG_INT16; workshop analysis in Annex D, specifically the networks workshop, policymakers workshop, private sector workshop; survey analysis in Annex A; evidence from Phase 1, presented in Marjanovic et al. (2017b).

53 See evidence from the workshop analysis in Annex D, specifically the providers and commissioners workshop.

54 See evidence from the workshop analysis in Annex D, specifically the networks workshop.

55 See evidence from Phase 1, presented in Marjanovic et al. (2017b).
Alongside positive incentives to support innovation, there was also general agreement amongst stakeholders that strengthened accountabilities are needed. While this is unlikely to be a panacea on its own, it should be included as a part of a balanced mix of carrot- and stick-based mechanisms, though stakeholders generally did not feel that engaging with innovation uptake should be mandated. Stakeholders did indicate, however, that a stronger accountability regime should be enforced where proven innovations have not been taken up and that compelling evidence for the reasons underlying non-take-up should be required.\textsuperscript{56}

When and how motivations and accountabilities drive innovation is complex and rooted in particular contexts. However, some more general conclusions about the wider landscape may be drawn. The extent to which implementing staff expect themselves to benefit from an innovation is associated with adoption and sustainability (Altaeotro, Tsark & Braun 2009; Karsh, Beasley & Hagenauer 2004; Savaya, Elsworth & Rogers 2009). Our stakeholders told us that innovation can be encouraged by communicating how innovations and changes are relevant to frontline staff’s work, in many cases by making their jobs more efficient and/or effective.\textsuperscript{57}

Innovation must be seen as an enabler, not a barrier.\textsuperscript{58} Many felt that focusing energy on those innovations where there is a compelling need to improve will make it easier for people to put the effort into adopting them.\textsuperscript{59} Survey respondents also reinforced this view: an enhanced focus on incentives for uptake specifically of proven, high value innovations was one of the most frequently selected ideas for areas where improving incentives in the system is needed (selected by 38.7 per cent of respondents).\textsuperscript{60} Given this broader landscape, we now turn to the analysis of how to implement a broad set of accountability and incentive mechanisms to support sustainable innovation.

5.3. Analysis to support the areas for action

Across the study, a number of ideas were suggested regarding how to embed appropriate motivations and accountabilities to support sustainable innovation throughout the NHS. Following a process of qualitatively clustering these ideas, three thematic areas of analysis emerged: strengthening the innovation culture and broadening the permission to innovate; establishing a portfolio of incentives; and embedding innovation in accountability regimes throughout the health system.

\textsuperscript{56} See evidence from the workshop analysis in Annex D, specifically the academics workshop, networks workshop, private sector workshop.

\textsuperscript{57} See evidence from the interview analysis in Annex B, specifically evidence given by Academics_INT3, Policymaker_INT8.

\textsuperscript{58} See evidence including: interview analysis in Annex B, specifically evidence given by Academics_INT7, Academics_INT8, Academics_INT10, Academics_INT11, Networks_INT1, Networks_INT4, Networks_INT6, Networks_INT7, Networks_INT8, Networks_INT10, Policymaker_INT3, Policymaker_INT5, Policymaker_INT6, Policymaker_INT9, Policymaker_INT11, ProviderCCG_INT13, ProviderCCG_INT16; workshop analysis in Annex D, specifically the academics workshop, networks workshop, private sector workshop.

\textsuperscript{59} See evidence including: interview analysis in Annex B, specifically evidence given by ProviderCCG_INT8, ProviderCCG_INT16; workshop analysis in Annex D, specifically the networks workshop.

\textsuperscript{60} See evidence from the survey analysis in Annex A.
5.3.1. Strengthening the innovation culture and broadening permission to innovate

Broadening and strengthening the organisational culture around innovation and permission to innovate can be achieved by:

- Emphasising the enabling role that innovation can play and how it fits with individual and organisational goals and values.
- Recognising and rewarding engagement with innovation.
- Addressing risk-averse cultures in the NHS by promoting responsible and accountable risk management that allows for a positive balance of risk and reward.

Innovation is often viewed as a luxury rather than as a day-to-day routine task (Castle-Clarke, Edwards & Buckingham 2017; Martin et al. 2012). Making innovation a part of routine practice requires attention to organisational values and ‘fit’. Services that are not embedded may be seen as supplementary and are more likely to be decommissioned. Conversely, projects that ‘mature’ into being part of a core programme are more likely to be sustained (Evashwick & Ory 2003).

For frontline clinicians and healthcare provider organisations, studies have shown that innovations that make jobs easier, for example by fitting into existing work flows and processes (see Box 16 for case vignette examples of this), or can address NHS goals of quality, productivity and quality improvement, are likely to have more traction (Martin et al. 2012; Castle-Clarke et al. 2017; and see examples in Box 16). However, we have also seen that innovations that provide solutions to immediate needs or are less complex in terms of implementation across the adoption pathway are more likely to be taken up (Cox et al. 2018). Given this, there is a need to demonstrate the enabling role that particular innovations might play in facilitating high-quality patient care, organisational success and personal development and to actively address and put in place incentives and motivations that can help overcome inertia and barriers inherent to innovation. This could be achieved by:

- Actively seeking information on the cost and quality performance of innovations and engaging with regional and national initiatives that provide such information (e.g. NICE, NHS Innovation Scorecard, NHS RightCare, GIRFT, AHSNs, Innovation Hubs, Trusts, peer networks and charities)
- Sharing examples of where innovation has had an impact within other organisations and/or organisational settings (see also Chapter 6).

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61 See evidence from the workshop analysis in Annex D, specifically the providers and commissioners workshop.
62 See evidence including: interview analysis in Annex B, specifically evidence given by Academics_INT2, Academics_INT6, Academics_INT9, Academics_INT10, Academics_INT11, Academics_INT12, CharityPPIE_INT2, CharityPPIE_INT3, CharityPPIE_INT5, CharityPPIE_INT12, CharityPPIE_INT14, Policymaker_INT1, Policymaker_INT2, Policymaker_INT8, Policymaker_INT10, ProviderCCG_INT8, workshop analysis in Annex D, specifically the academics workshop, charities and PPIE workshop, networks workshop, private sector workshop, providers and commissioners workshop; evidence from Phase 1, presented in Marjanovic et al. (2017b).
• Establishing individual roles that champion innovation (these individuals could be identified by AHSNs).63

• Aligning activities that promote innovation with the NHS’s goals of quality and productivity and its drive for continuous improvement (see case vignette examples in Box 16).64

• Raising awareness of how innovation can help meet individual and organisational goals65 and then building a culture of teamwork to address innovation challenges.66

• Providing supportive leadership that connects innovation to organisational goals and ensures that there is visible and stable leadership for innovation at different organisational levels.67

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63 See evidence including: interview analysis in Annex B, specifically evidence given by Academics_INT3, Academics_INT5, Academics_INT6, Academics_INT7, Academics_INT8, CharityPPIE_INT9, Networks_INT8, Networks_INT9, Networks_INT10, Policymaker_INT3, Policymaker_INT5, Policymaker_INT6, Private_INT6, Private_INT7, ProviderCCG_INT16, ProviderCCG_INT18, workshop analysis in Annex D, specifically the policymakers workshop. See also evidence from the wider literature, for example Aitaoto et al. (2009), Collins (2018), Dopson et al. (2002), Goodson et al. (2001), Jacobs (2002), O’Loughlin et al. (1998), Platou (2003), Savaya et al. (2009), Scheirer (1990), Swain et al. (2010), Wisdom et al. (2014) and Wright (2009).

64 See evidence including: workshop analysis in Annex D, specifically the academics workshop; survey analysis in Annex A.

65 See evidence from the interview analysis in Annex B, specifically evidence given by Networks_INT1, Policymaker_INT2, Policymaker_INT11.

66 See evidence including: interview analysis in Annex B, specifically evidence given by Academics_INT3, Academics_INT7, Networks_INT8, Academics_INT7, Academics_INT8, Academics_INT9, Academics_INT10, Academics_INT11, Networks_INT1, Networks_INT4, Networks_INT6, Networks_INT7, Networks_INT8, Networks_INT10, Policymaker_INT3, Policymaker_INT5, Policymaker_INT6, Policymaker_INT9, Policymaker INT11, ProviderCCG_INT3, ProviderCCG_INT16; workshop analysis in Annex D, specifically the networks workshop, policymakers workshop, private sector workshop, providers and commissioners workshop; evidence from Phase 1, presented in Marjanovic et al. (2017b).

67 See evidence including: workshop analysis in Annex D, specifically the policymakers workshop, providers and commissioners workshop; evidence from Phase 1, presented in Marjanovic et al. (2017b).
Box 16: Case vignette examples of how adoption can be positively influenced when an innovation aligns with existing processes and with wider NHS goals of quality, productivity and quality improvement

The adoption of new innovations can be incentivised when they are able to fit into existing workflows and processes. For example:

- **Almost 1,000 NHS Blood Donor Chairs**, innovative chairs that improve donor comfort and safety, have been produced and are in use across England. Alignment of the innovation to existing clinical pathways and existing competencies meant that there were no major technical or training barriers that could cause logistical or personnel problems.

- **ENDOCUFF VISION™** is a medical device used as a colonoscope attachment to improve mucosal visibility to detect abnormalities such as polyps, ultimately leading to the better prevention of bowel cancer. The device does not require a change in existing clinical pathways and was described as an easy-to-use product by both innovator interviewees.

Adoption can also be positively influenced when the innovation helps support the achievement of wider NHS goals of quality, productivity and continued quality improvement. For example:

- The NHS’s drive for improvements across the CHC process (NHS England 2017b) as well as broader changes to digitise the NHS, such as the paperless 2020 goal (NHS Digital n.d.) have made improving CHC assessments a high priority for CCGs. CHC2DST, software that allows CHC assessments to be conducted electronically, improving efficiency and accuracy over traditional paper-based assessments, was strongly supported by the broader NHS drive for CHC improvements. CHC2DST can support CCGs both to improve their CHC process and move towards electronic working.

- National policy developments put the spotlight on both mental health innovation for young people and digital solutions more widely (e.g. ‘Future in Mind’, i-THRIVE, local efforts of STPs, and the House of Lords Library Note ‘NHS: Ability to Meet Present and Future Demand’). This encouraged adoption of Kooth, an online mental health and emotional wellbeing platform for children and adolescents, as CCGs discovered that it could help them meet national policy and quality improvement goals.

- Troponin is a diagnostic marker used to detect heart disorders, in particular heart attacks. High-sensitivity troponin assays can detect smaller amounts of troponin in the blood than traditional assays, and therefore can be used to identify heart disorders closer to the onset of symptoms than previously possible. High-sensitivity troponin assays make a compelling business case for developing new diagnostic pathways as the assays can in principle be used to ‘rule out’ individuals who are not having heart attacks quicker than via traditional methods. This supports CCGs in their efforts to meet waiting time targets, for example in accident and emergency (A&E) departments, and thus increased adoption rates.

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68 For further details on each case vignette see Annex C.
69 See evidence from case vignette interviews in Annex C, specifically evidence given by CCG_INT2.
70 See evidence from case vignette interviews in Annex C, specifically evidence given by Anonymous_INT3.
In addition to demonstrating its enabling role, recognising and rewarding engagement with innovation will help to reinforce a shared sense of commitment to innovation among health and care professionals. Key examples of such recognition activities are presented in Box 17.

**Box 17: Examples of activities to recognise and reward engagement with innovation**

Engagement with innovation could be better recognised and rewarded by:

- Embedding engagement with innovation into career development and promotion pathways, including the continual professional development point system.

- Designing initiatives and prizes that recognise organisations and individuals that have excelled in innovation.

- Focusing on the uptake of innovations, as well as any associated decommissioning requirements, such as awards for the uptake of proven, high value-for-money innovations developed elsewhere and the design of improved information and evidence flows on innovation performance.

- Channelling a proportion of organisational performance-related payments to innovative activity.

- Establishing incentives for being entrepreneurial, such as providing clarity around financial benefits and innovation priorities in the NHS, on NHS IP policies and on benefit-sharing arrangements for innovators.

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74 See evidence including: interview analysis in Annex B, specifically evidence given by Academics_INT3, Academics_INT7, Networks_INT8; evidence from Phase 1, presented in Marjanovic et al. (2017b).

75 See evidence including: interview analysis in Annex B, specifically evidence given by Networks_INT3, Networks_INT4, Networks_INT5, Networks_INT8, Networks_INT9, Networks_INT10; workshop analysis in Annex D, specifically the academic workshop; evidence from Phase 1, presented in Marjanovic et al. (2017b).

76 This point in particular came across strongly in our survey (see Annex A).

77 See evidence including: interview analysis in Annex B, specifically evidence given by Academics_INT1, Academics_INT5, Academics_INT9; workshop analysis in Annex D, specifically the academic workshop, charities and PPIE workshop, networks workshop, policymakers workshop, private sector workshop, providers and commissioners workshop; survey analysis in Annex A.

78 This idea did not come up in a specific workshop, but rather surfaced as a research team reflection after engagement across the prioritisation workshops and informal discussions within these.

79 See evidence including: interview analysis in Annex B, specifically evidence given by Academics_INT1, Academics_INT5, Academics_INT9; workshop analysis in Annex D, specifically the academic workshop, charities and PPIE workshop, networks workshop, policymakers workshop, private sector workshop, providers and commissioners workshop; survey analysis in Annex A; evidence from Phase 1, presented in Marjanovic et al. (2017b).
A dedicated forum or an institution that staff can approach when they have an idea for innovation or improvement could also help promote an innovation culture, and initiatives such as AHSNS and various innovation and enterprise hubs in England seek to provide such a platform. To give an example from Scotland, a ‘platform’ of this type was introduced through Scottish Health Innovations Ltd (SHIL), a private company limited by guarantee with the Scottish Chief Scientist Office, NHS Tayside and the Golden Jubilee National Hospital. It encourages healthcare professionals to be more innovative and allows them to submit their ideas to improve patient care using an online form. If an idea is positively evaluated and viable to be commercialised, SHIL works with the submitter to further develop the idea (Scottish Health Innovations Ltd n.d.).

While recognising and rewarding innovative activity and raising awareness about the enabling role that innovation can play is key, it is also important to simultaneously address the aversion to risk that seems prevalent in the NHS, recognising that not taking carefully managed risks can be a risk to safety and a risk to improvement in and of itself. Addressing unnecessarily risk-averse cultures will require promoting positive, responsible and accountable risk management through the creation of standards, clear guidance and communication from leadership, and exchange of knowledge with other sectors about risk management mechanisms. Box 18 highlights how certain individuals we spoke to for our case vignettes took measured risks – including financial ones – in adopting innovations.

**Box 18: Case vignette examples of healthcare professionals taking measured risks in adopting innovations**

Establishing a culture of innovation will require dedicated attention to overcoming a deeply embedded aversion to risk within the NHS. Examples from our case vignettes show where measured risks have been taken in bringing new innovations into the system, and that they paid off.

- Short one-year contracts to commission **CHC2DST** encouraged commissioners to adopt it as there is less of a financial risk than needing to invest for three years. In addition, a flexible payment approach was introduced that enabled CCGs representing smaller populations to pay less for the software.

- A few specialist nurses became aware of **SecurAcath** through conferences and got to know the innovators and how the devices worked. This led to further interest from healthcare providers who decided to take the risk based on the recommendations of the specialist nurses and their existing familiarity with the devices.

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80 See evidence including: interview analysis in Annex B, specifically evidence given by Academics_INT2, Networks_INT5, ProviderCCG_INT22; workshop analysis in Annex D, specifically the academics workshop, charities and PPIE workshop, networks workshop, policymakers workshop, private sector workshop, providers and commissioners workshop; survey analysis in Annex A; evidence from Phase 1, presented in Marjanovic et al. (2017b).

81 See evidence from case vignette interviews in Annex C, specifically evidence given by CCG_INT9.

82 See evidence from case vignette interviews in Annex C, specifically evidence given by Innovator_INT18.

83 See evidence from case vignette interviews in Annex C, specifically evidence given by Innovator_INT16, Provider_INT11.
5.3.2. Establishing a portfolio of incentives for encouraging engagement with innovation thinking, and adoption and uptake of proven innovations

Establishing a portfolio of incentives for encouraging engagement with innovation, including the uptake of proven innovations, which cover a range of areas, can be achieved by:

- Raising awareness about financial and other resources available to support engagement with innovation throughout the pathway.
- Coupling funding strategies with feasible buy-out of programmed activities, which can secure time and headspace for healthcare professionals to engage with innovation.
- Supporting behaviours that are entrepreneurial and lead to successful uptake of innovation, as well as engagement with innovative thinking.

Funding is a necessary, but not sufficient, condition for incentivising innovation. As noted in the introduction to this chapter, a balanced set of incentives is more likely to be appropriate than one single incentive. However, overly complex arrangements are likely to be confusing and could undermine consistent engagement. A portfolio of incentives and enablers could support individuals in the NHS and the wider healthcare system to engage with innovation and the adoption and uptake of proven innovations, whilst allowing for adaptation to local circumstances.

As part of the financial mix in the portfolio, early-stage financing for the private sector to support development activities, as well as seed funding to help incubate ideas, were both mentioned by survey respondents as important elements. Some of these sources of funding already exist in the form of AHSN funds or Trust seed funding, as well as external funding programmes, such as national funding schemes for developing innovations such as the SBRI, NIHR Invention for Innovation (i4i) and others that provide dedicated funding for innovations (see Chapter 9 for further discussion of funding sources). Interviewees found the awards provided through the SBRI programme were effective at driving innovation, but noted that ensuring the stability and sustainability of dedicated schemes to fund the uptake of innovations is important in the long term.

Funding incentives should be coupled with a strategy that considers how to release time and headspace so that healthcare professionals can engage with innovation and ‘not just be firefighting’, a sentiment that is echoed across our stakeholders and in the wider literature. Related to this, 43 per cent of our survey respondents, when asked to select the top three of ten initiatives they thought could have the biggest impact on motivations and accountabilities, chose schemes to ‘free up’ health professionals’ time to engage with innovation-related activities. Evashwick and Ory (2003) found that institutional support, including motivation, leadership and time, is a key factor in an innovative project succeeding

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84 See evidence from the survey analysis in Annex A.
85 See evidence from the interview analysis in Annex B, specifically evidence given by Academics_INT9, Academics_INT11, Networks_INT1.
86 See evidence including: interview analysis in Annex B, specifically evidence given by Academics_INT3, Academics_INT8, Academics_INT10, Academics_INT11, CharityPPIE_INT1, CharityPPIE_INT9, Networks_INT8, Policymaker_INT3, Policymaker_INT5, Policymaker_INT6, Policymaker_INT9, ProviderCCG_INT12, ProviderCCG_INT17, ProviderCCG_INT19, workshop analysis in Annex D, specifically the academics workshop, charities and PPIE workshop, networks workshop, policymakers workshop, private sector workshop, providers and commissioners workshop.
5.3.3. Embedding innovation in accountability regimes, roles and responsibilities throughout the health system, at individual and organisational levels

Embedding innovation in job roles and responsibilities can be achieved by:

- Embedding an innovation remit in key enabler roles and functions in the health system, including but not limited to Innovation Leads, Innovation Scouts and Directors of Innovation and Improvement, and making sure they are accountable for delivery within the roles.

- Strengthening organisational accountability through national regulatory and improvement regimes, and through performance reviews and job descriptions at the individual level.

- Embedding accountability into standard regulatory regimes and practices, and relying on a suite of measures to ensure accountability mechanisms reflect system-level benefits, including integrating incentives for engaging with innovation into organisational policies, in quality of service assessments, and in instigating board-level ownership of implementation activities.

Incentives that support accountability regimes for engaging with and adopting new innovation could be established throughout the system. Nationally, NHS policy measures can be used as an incentive to support innovation, and innovation performance indicators can be embedded into regulatory regimes.87

At an organisational level, stakeholders discussed that responsibility and accountability for innovation could be achieved by:

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87 See evidence including: interview analysis in Annex B, specifically evidence given by CharityPPIE_INT7, CharityPPIE_INT11, Policymaker_INT1, Policymaker_INT11, Private_INT7, ProviderCCG_INT8, ProviderCCG_INT16; workshop analysis in Annex D, specifically the policymakers workshop, providers and commissioners workshop.
• Integrating incentives to engage with innovation into NHS and organisational policies.\(^8\)

• Embedding accountability through the design of standard regulatory regimes and practices, e.g. audits and inspections, and through more focus on robust ‘adopt or explain why not’ practices.\(^9\)

• Including innovation in quality of service assessments in hospitals.\(^10\)

• Instigating board-level ownership of the implementation of policy initiatives in NHS Trusts by introducing performance metrics to measure the board’s progress in terms of implementation, which could help incentivise Trusts’ ownership.\(^11\)

As the final bullet suggests, accountability can be achieved by introducing metrics, including finding ways of measuring the evidence on costs and impacts across the pathway in order to make the business case and establish rewards at appropriate points.\(^12\)

However, wider insights from the literature suggest caution when thinking through formal incentives such as targets. Although they can initiate compliance and encourage focus on a specific area, they may not always lead to the shift of staff culture needed to support these innovations (Albury et al. 2018). Targets are also often short-term, which reduces the incentives for CCGs to invest in long-term innovation projects (Collins 2018). Thus, commissioners should support the creation of useful, long-term incentives that prioritise the sustainability of innovations over their immediate impacts and outcomes (Albury et al. 2018).

At an individual level, there are several enabler roles and functions in the health system that should have innovation embedded in their remits, job descriptions and performance management indicators. Our study suggests that these include, but may not be limited to, Innovation Leads, Innovation Scouts and Directors of Innovation and Improvement. Specifying the place and associated responsibilities of innovation in these roles can simultaneously raise awareness of the links between innovation and achieving improvement and efficiency ambitions over time.\(^3\) In addition, reverse secondments between these positions and other frontline staff with policymakers and/or commissioners may help to raise awareness and enable mutual understanding of the challenges and opportunities facing different actors in the health system.

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8 See evidence including: interview analysis in Annex B, specifically evidence given by Networks_INT1, Policymaker_INT2, Policymaker_INT11; workshop analysis in Annex D, specifically the policymakers workshop, providers and commissioners workshop.

9 See evidence from the workshop analysis in Annex D, specifically the academics workshop, networks workshop, policymakers workshop, private sector workshop.

10 See evidence from the interview analysis in Annex B, specifically evidence given by Policymaker_INT2, Policymaker_INT11.

11 See evidence from the interview analysis in Annex B, specifically evidence given by Private_INT7, ProviderCCG_INT18.

12 See evidence from the workshop analysis in Annex D, specifically the policymakers workshop.

13 See evidence including: interview analysis in Annex B, specifically evidence given by Academics_INT2, workshop analysis in Annex D, specifically the networks workshop, providers and commissioners workshop; evidence from Phase 1, presented in Marjanovic et al. (2017b).
6 Improving the information and evidence environment
6.1. Summary

The current landscape: issues and developments

- Actors across the health system need different kinds of information and evidence to inform decision making. NHS decision makers need evidence on the impact of innovations, informed by baseline and outcomes data on healthcare performance; on the business case for investing in innovation development and/or adoption; on resources and guidelines on how to implement innovation and implementation support; on potential decommissioning needs; on training needs; and on financial schemes to support innovation activities.

- The private sector and clinical entrepreneurs need information related to health system demand – namely on priority innovation needs; push and pull funding schemes; points of contact for support on legal and IP issues and for adoption discussions (with clinicians, managers and NHS executives) and commercial negotiations; and institutions who can help broker networks.

- Patients and the public need to participate in identifying innovation needs and be signposted to information sources on innovations they could access and benefit from.

- The sources of information and the types of evidence that stakeholders consult are highly diverse and fragmented, and reflective of individual awareness of and beliefs in the types of information and sources they value and trust. Key sources include institutional websites (e.g. NICE guidelines and NHS England portals such as NHS Choices), AHSHNs, Knowledge Transfer Networks, Innovation Hubs, quality improvement networks, conferences, trade shows, journals, and direct communication with peer and personal networks. An improved information and evidence landscape requires better signposting of information to a range of actors.

Key areas for action to improve the information and evidence landscape

- Invest in consensus processes amongst regional and national actors across clinical leadership, NHS management and executives, policymakers, patients and public and third sector actors to identify priority innovation needs for the NHS so that innovators – with finite resources – can respond to more stable and clear demand.

- Create a national framework and infrastructure for overseeing and coordinating information and evidence flows within the system. Investment and a dedicated series of actions will be required to build this:
  - Appoint national data leads, building on the example of clinical leads and cross-cutting work stream leads in GIRFT and in recognition of the potential for combinations of innovations to improve clinical care pathways. Identify evidence and information flow champions at regional and organisational levels who reflect the values and behaviours of professional communities.
  - Collate and curate evidence from the diverse sources that individuals and stakeholders value and consult. Recognise that there will be a balance between having consolidated data and analytics on one platform versus a single place that signposts to a range of relevant sources. Create mechanisms for collective sense making of data that will be on the curated national data platform.
  - Support regional institutions to gather evidence to inform a national data platform and disseminate it to local actors through websites,
events, social media, training and direct communications. Build on the new information and evidence roles for AHSNs, Innovation Exchanges, efforts to map innovation pathways of the NHS and industry (e.g. through the Accelerated Access Review, the North East North Cumbria Innovation Pathway work, ITT and ITP processes), and horizon-scanning capacity.

- Support national initiatives and bodies across innovation and improvement spaces to collaborate, share and signpost information (e.g. NHS Innovation Scorecard, GIRFT, NHS RightCare, NHS England, NHS Improvement, NHS Digital, Innovation National Networks).

- The national framework and infrastructure should be supported by an integrated data platform that is a central repository of key analytics and a signposting platform to other information sources about innovation opportunities and the performance of specific innovations. It should:
  - Have a staged development, starting with innovation needs for which there is strong consensus and where the information infrastructure is already advanced, and be built on a web-based infrastructure and complemented with mechanisms for face-to-face engagement to help support the establishment of communities of practice to share learning on incorporating innovation into the health system.
  - Include information on opportunities to engage with: innovation activities (funding schemes and other new initiatives); innovation demand areas; available innovations and their performance; commissioning lines and contacts in the NHS; evaluation and regulatory approval requirements; implementation requirements and support; training requirements and decommissioning needs associated with specific (or combinations of) innovations; national policy initiatives; regional support bodies; and a national library of pilots (with inputs coordinated by regional actors such as AHSNs and Trusts).

- Healthcare commissioners and providers should lead a consultative effort to establish evidence standards, creating a unified and systematic approach to defining the type and quality of evidence needed for adoption decisions. Clear evidence standards should: recognise that there are different types of innovations; consider the mix of trial-based evidence and real-world evidence that is needed to support adoption; reflect the need for more diverse types of evidence to provide a compelling business case, influenced by innovation type, complexity of implementation and the adoption environment; and consider which innovations need full NICE approval prior to entry into the NHS, and which are amenable to accelerated access provisions.

- Create a framework for evaluating innovations once they are adopted, with clearly defined principles for good evaluation practice and sharing learning, recognising that innovations need time to mature. Evaluation should apply to both innovations and incumbent offerings so that the NHS can make informed decisions and innovators can accurately compare their innovations to what is already in use.

- Policymakers should develop guiding principles for private sector innovators on effective engagement with the NHS, and establish receptor roles in the NHS at clinical, managerial and executive levels, with responsibility for engaging with innovators from the private sector as well as clinical entrepreneurs and those with decision-making authority.
6.2. The current information and evidence landscape: reflecting on issues and developments

Information, evidence and resources about available innovative products, technologies and services cover a wide range of areas and can include data about the potential impacts of innovations; evidence supporting the business case for new innovations; resources and guidelines for how to implement innovations; and available financial resources and funding schemes to support innovating activities. All of these are basic requirements to inform decision making about which innovations might be adopted into the NHS and why. While there is no ‘one size fits all’ approach to a standardised set of evidence requirements, our research has identified a range of information priorities in the system that inform decision making and should comprise the information and evidence landscape. These include:

- Improved evidence on population and health system needs as they pertain to innovation.
- Platforms for signposting information about innovation opportunities and associated financial support schemes to different stakeholders, to help raise awareness and mobilise engagement.
- Baseline, evaluation and outcomes data (including real-world evidence) on healthcare performance which can inform decision making by commissioners, providers and relevant healthcare staff as it pertains to investments into innovation development and uptake.
- A more standardised approach to delivering the evidence required by the NHS.

The nature of evidence about an innovation is important because its perceived relevance and quality is related to the likelihood of adoption and sustainable implementation of the innovation (Grol & Wensing 2004; Blasinsky, Goldman & Unützer 2006; Ruch-Ross et al. 2008; Savaya, Elsworth & Rogers 2009; Swain et al. 2010; Wisdom et al. 2014; Albury et al. 2018; Collins 2018). However, different stakeholders put differential value on different types and sources of evidence (Scheirer 1990; Ulucanlar et al. 2013; Collins 2018). The preference for some types and sources of evidence over others often reflects a stakeholder’s role in their organisation, as well as their personal and professional identity. For example, clinicians tend to put greater weight on information and evidence obtained from peer-reviewed sources, systematic reviews and clinical guidelines (Kyratsis et al. 2014) and are more likely to disregard an innovation if they do not see evidence for a clinical issue and a care quality and safety gap that needs to be addressed (Karsh, Beasley & Hagenauer 2004; Wisdom et al. 2014). Managerial professionals put emphasis on evidence about cost implications in addition to considering the quality improvement benefits of innovation, particularly if this evidence was collected from

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94 See evidence including: interview analysis in Annex B, specifically evidence given by Academics_INT2, Academics_INT6, Academics_INT9, Academics_INT10, Academics_INT11, Academics_INT12, CharityPPIE_INT1, CharityPPIE_INT2, CharityPPIE_INT3, CharityPPIE_INT5, CharityPPIE_INT8, CharityPPIE_INT9, CharityPPIE_INT10, CharityPPIE_INT11, Policymaker_INT1, Policymaker_INT2, Policymaker_INT7, Policymaker_INT8, Policymaker_INT10, Policymaker_INT11, Private_INT4, Private_INT7, Private_INT8, ProviderCCG_INT8, ProviderCCG_INT18, ProviderCCG_INT19, ProviderCCG_INT16, workshop analysis in Annex D, specifically the charities and PPIE workshop, networks workshop, policymakers workshop, private sector workshop, providers and commissioners workshop. Evidence for this point is also supported by research from Phase 1 of this study which was summarised in the interim report (Marjanovic et al. 2017b). Henceforth in this chapter, references to evidence that was summarised in that report will be provided in footnotes to reflect the fact it is part of the broad evidence base of primary research conducted for this study (as opposed to being a part of the wider literature on the topic of health innovation).
a local area. Non-clinical managers are the least likely to use their professional network to access information on evidence compared to doctors, pharmacists, nurses and allied health professionals. Clinicians, pharmacists and frontline staff trust the experiential evidence and views of peers in their professional groups (Kyratsis et al. 2014).

Differences between providers and commissioners were also found in the sources they use to get information on innovation needs, opportunities and evidence of impact. For example, provider respondents use personal networks to gain information (selected by 86.5 per cent of provider respondents, compared to 50.0 per cent of commissioner respondents), as well as conferences and trade shows (73.0 per cent of provider respondents) and direct communication with health professionals (67.6 per cent of provider respondents). Commissioners found information gained via participating in various boards and committees (77.8 per cent of respondents), NHS England portals (66.7 per cent of respondents) and NICE guidelines (66.7 per cent of respondents) important.

Reflecting this diversity of approach to information and evidence types and sources, the current knowledge exchange and management landscape on innovation is characterised by a plurality of efforts aimed at providing information to different stakeholder groups, including:

- Regional innovation and health improvement networks that help facilitate the spread of innovation-related information and evidence, such as AHSNs, Innovation Hubs and quality improvement networks.
- Individuals with regional innovation roles who serve as a source of information and as boundary spanners and entry points into relevant networks, such as AHSNs and Innovation Hubs.
- Regional- and national-level face-to-face and virtual platforms for sharing ideas, information about innovation-related opportunities, implementation support and guidance and evidence of impact from innovation, within and between organisations. These platforms include meetings, committees, institutional boards, web-based platforms such as Trust, AHSN and Innovation Hub websites, funding scheme websites and national online resource portals like the Academy of Fabulous Stuff, national information resources such as NICE guidance, the NHS Innovation Scorecard, and information on innovation supported by schemes such as the ITT and the ITP.
- Legal mechanisms to reduce blockages to information and evidence-sharing, such as Non-Disclosure Agreements and royalty arrangements.

However, the sources of such information are fragmented and the content can lack appropriate communication and targeting.
– meaning there is a gap between the availability of information and its accessibility. For example, private sector representatives often find a lack of clarity as to the evidence on innovation performance that they need to produce to support uptake decisions in the health system.\(^\text{100}\) They are commonly required to extend their analysis beyond traditional cost/quality-adjusted life year (QALY) health economics assessments to consider also implementation needs and costs, decommissioning needs, implementation support and adoption training requirements. However, they do not always know who to approach for this information and how to progress their innovations along the pathway. Equally, NHS commissioners and provider organisations do not always know where to look for consolidated information on innovations that are available for them to consider, nor for innovations in the pipeline.\(^\text{101}\) All stakeholders are affected by the relative dearth of evidence on the impact of innovations in the real world. Though some information resources such as the NHS Innovation Scorecard provide information about the uptake of specific medicines, they do not address the impact of such uptake on the health system.\(^\text{102}\)

There is a clear need to create a unified and systematic approach to defining the quality and type of evidence needed for an innovation to be adopted by the NHS, and to share this with innovators and the wider health system,\(^\text{103}\) although some progress is being made. For example, the newly clarified roles and responsibilities for AHSNs emphasise the importance of their information brokerage roles at the regional level, as well as their roles in coordinating information flows about innovation needs, innovation-related opportunities, and available innovations with national-level networks. The North East and North Cumbria AHSN’s Innovation Pathway is an example of an effort to provide support to industry and NHS organisations, helping them to navigate innovation-related opportunities and connect with the right actors that can support the development and adoption of innovations (AHSN North East and North Cumbria n.d.). Similar efforts can be found in the Innovation Exchanges, which help to drive uptake of all innovations, and NHS Innovation National Networks, which support local and regional actors, AHSNs and national-level policymakers to be more connected and coordinated. At a national policy level, the government response to the Accelerated Access Review (Department of Health & Department for Business, Energy & Industrial Strategy 2017) highlights investments in developing horizon-scanning capacities and the information infrastructure that can help the NHS identify innovations that are in the pipeline, and subsequently help to inform the NHS’s decisions about priorities in terms of innovation support. For example, the UK PharmaScan resource identifies new medicines on the horizon, and NHS England is seeking to establish a similar information resource for medical technologies. The recently launched NIHR Innovation Observatory allows individuals and organisations to search for innovations that are up to ten years away from

\(^{100}\) See evidence from the interview analysis in Annex B, specifically evidence given by Private_INT4, Private_INT7, Private_INT8.

\(^{101}\) See evidence including: interview analysis in Annex B, specifically evidence given by ProviderCCG_INT9, ProviderCCG_INT11, ProviderCCG_INT19 (additionally, most healthcare providers and commissioners had not heard of many national innovation-related policies); workshop analysis in Annex D, specifically the networks workshop.

\(^{102}\) See metrics analysis in Chapter 11.

\(^{103}\) See evidence from the workshop analysis in Annex D, specifically the networks workshop, private sector workshop.
being publicly available (Department of Health & Department for Business, Energy & Industrial Strategy 2017).

The stakeholders we consulted were clear that more is needed to create a national framework and infrastructure for information and evidence and which has a focus on shared learning.104 Nearly half of our survey respondents identified that an explicit national strategy and guidance on how information and evidence flows in the health system is one of the initiatives that could have the most impact on the information and evidence environment.105 Such a learning-focused system could provide a shared data and evidence platform for disseminating information and facilitating the exchange of knowledge, and which could be used to share learning, identify successful innovations, provide evaluations of innovations to support embedded knowledge in the system, and prevent reinvention of the wheel for each innovation.106

6.3. Analysis to support the areas for action

Our evidence suggests that building an information and evidence landscape fit for the future will require two main areas of action. The first is about how to invest in an improved national framework and evidence infrastructure that provides mechanisms for overseeing information flows and knowledge exchange within the health system. The second is the establishment of clear evidence standards and a well-defined approach to the evaluation of innovations that are adopted.

6.3.1. Investing in an improved national framework and evidence infrastructure

Investing in an improved national framework and evidence infrastructure to provide oversight of flows of evidence and information and support knowledge exchange opportunities throughout the system at national, regional and local levels. Such a framework and infrastructure should include mechanisms for:

- Developing a consensus process to agree NHS needs and clearly articulate these to innovators so the latter can respond to clear and more stable demand. Actors across the system need to work more closely together to identify areas where innovations (or combinations of innovations) could make a real difference.

- Appointing national data leads and regional and organisational evidence and information flow champions, building on the example of clinical and cross-cutting work stream leads in GIRFT and in recognition of the potential for combinations of innovations to improve clinical care pathways.

104 See evidence including: interview analysis in Annex B, specifically evidence given by CharityPPIE_INT1, CharityPPIE_INT2, CharityPPIE_INT8, CharityPPIE_INT9, CharityPPIE_INT10, CharityPPIE_INT11, Policymaker_INT1, Policymaker_INT7, Policymaker_INT11, Private_INT4, Private_INT7, Private_INT8, ProviderCCG_INT8, ProviderCCG_INT15, ProviderCCG_INT16, workshop analysis in Annex D, specifically the providers and commissioners workshop. Stakeholders from the academics workshop, charities and PPIE workshop, networks workshop, policymakers workshop, private sector workshop, and providers and commissioners workshop all supported the point about the national framework supporting a shared learning environment, specifically.

105 See survey analysis in Annex A.

106 See evidence including: interview analysis in Annex B, specifically evidence given by Academics_INT2, Academics_INT3, Academics_INT6, Academics_INT7, Academics_INT8, Academics_INT9, Academics_INT10, Academics_INT11, Academics_INT12, CharityPPIE_INT2, CharityPPIE_INT3, CharityPPIE_INT5, CharityPPIE_INT6, CharityPPIE_INT8, CharityPPIE_INT10, CharityPPIE_INT11, CharityPPIE_INT13, Policymaker_INT2, Policymaker_INT8, Policymaker_INT13, Policymaker_INT6, Policymaker_INT10, Private_INT2, Private_INT3; workshop analysis in Annex D, specifically the academics workshop, charities and PPIE workshop, networks workshop, policymakers workshop, private sector workshop, providers and commissioners workshop; survey analysis in Annex A, where 49 per cent of the survey responders thought data infrastructure that considers the interoperability of data platforms is needed when asked to select three of seven initiatives that have the biggest potential impact on the information and evidence environment.
Implementing a national data infrastructure would require a detailed planning and implementation requirement setting phase, and testing of the overall approach through a pilot phase involving a subset of priority clinical pathway areas to draw out common and unique issues. Whereas we suggest below that a first step would be starting with innovation needs for which there is strong consensus and where the information infrastructure is already advanced, it would also be helpful to pilot a few contrasting areas where perhaps the infrastructure is particularly weak and where there is also urgent need as well as scope for impact from improvements.

Below we elaborate on some of the key criteria for making such an infrastructure workable, recognising that it will also need to be maintained, and evolved and adapted to deal with emergent needs and priorities under sound strategic, supply chain and operational management. Further detail would need to be worked out in the implementation planning phase.

Creating an integrated and learning-focused national framework and infrastructure for overseeing and coordinating information and evidence flows within the system is the overarching action needed to establish the information and evidence landscape required for a thriving and innovative health system. An improved national framework and evidence infrastructure should: provide a clear set of mechanisms for supporting and establishing flows of information and knowledge exchange opportunities; be sensitive to different innovation and care pathways and types of innovations (e.g. medicines, digital innovations, medical technologies, service innovations); and allow for sharing information about innovations and their performance, whilst balancing national oversight and assistance with coordination, local delivery and engagement in co-producing and disseminating the information and evidence required.

As a first priority, a national framework should provide a consensus process and dedicated mechanisms for agreeing NHS needs and then clearly articulating these to innovators so that actors across the system can work more closely together to identify areas where innovations (or combinations of innovations) could make a real difference, while also recognising available resources.
and budget constraints and prioritising within them to ensure feasibility and in consideration of the need to accommodate efforts with both shorter- and longer-term (but equally important) returns. Needs identification mechanisms could start by bringing NHS staff (clinical leaders and frontline staff, management and executives levels, commissioners) and policymakers together to identify areas that need improvement, ideally where the need is likely to remain stable, and could benefit from new innovations, as well as where there is scope for pre-commitments to certain types of innovations. These processes should not neglect rare conditions and innovations where the degree of need and degree of burden are not the same. The needs should then be communicated to innovators and a concerted effort made to embed practices of co-design and co-production of corresponding innovations between NHS staff, innovators and other health system actors. ‘Receptor’ roles within the NHS could then be created with specific responsibility for engaging with the private sector and clinical entrepreneurs within the NHS to ensure that they are aware of the needs and for providing clear information to them. Our case vignettes provide examples of where companies were able to match and/or create successful innovations when there was a clearly defined gap in the NHS that their innovation was able to fill (see Box 19). Consensus processes rooted in Delphi approaches, and making use of priority setting organisations such as the James Lind Alliance (JLA), could be explored, as well as new means to achieve consensus with a critical mass of contributors through crowdsourcing platforms and online Delphi methods (Parks, d’Angelo & Gunashekar 2018).

To support a national information and evidence infrastructure, it will be important to create an integrated data platform for sharing information about innovations and the performance of innovations, complemented by strong regional information-exchange environments. Specifically, the data platform should enable a range of services and functions and collate and curate information on key areas that have been identified as gaps, namely: opportunities to engage with innovation activities (funding schemes and other new initiatives); innovation demand areas; available innovations and their performance; commissioning lines and contacts in the NHS; evaluation and regulatory approval requirements; implementation requirements and support; training requirements and decommissioning needs associated with specific (or combinations of) innovations; national policy initiatives; regional support bodies; and a national library of pilots (with inputs coordinated by regional actors such as AHSNs and Trusts). Although there would

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107 See evidence from the workshop analysis in Annex D, specifically the networks workshop, policymakers workshop, private sector workshop, providers and commissioners workshop.

108 See evidence from the interview analysis in Annex B, specifically evidence given by CharityPPIE_INT2, CharityPPIE_INT6, CharityPPIE_INT7.

109 See evidence from the workshop analysis in Annex D, specifically the providers and commissioners workshop.

110 See evidence from the workshop analysis in Annex D, specifically the private sector workshop.

111 See evidence from the interview analysis in Annex B, specifically evidence given by CharityPPIE_INT2, CharityPPIE_INT12, CharityPPIE_INT14, ProviderCCG_INT16.

112 See evidence from the workshop analysis in Annex D, specifically the networks workshop, providers and commissioners workshop, policymakers workshop.

113 See evidence from the workshop analysis in Annex D, specifically the networks workshop.
need to be discussions on the most useful data to collect and resource implications, overall the platform should enable better processing, filtering, targeting and signposting of information and evidence to support innovation-related activities and opportunities.

The platform should be built on a web-based infrastructure, complemented by mechanisms for face-to-face engagement (e.g. events, roadshows and workshops). It should have a staged development, starting with innovation needs for which there is strong consensus and where the information infrastructure is already advanced. Such a platform needs to be based on principles of openness and transparency, ensuring that data is open access and freely available so that all stakeholders are able to obtain the most accurate and up-to-date information,114 whilst respecting governance and data privacy concerns.115 As different actors will respond to different communication styles and language, communication should be tailored accordingly116 and disseminated through multiple channels, for example through websites, social media, events, networks (e.g. AHSNs) and training events.117

Some study participants suggested that this platform could potentially be driven by AHSNs, CLAHRCs, quality improvement networks and/or Innovation Hubs and Test Beds at a regional level, and Innovation National Networks at a national level. Lessons could be learned from the GIRFT initiative in terms of approaches that work (e.g. using clinical leads and cross-cutting work stream leads, see Box 20), and in terms of information on innovations that have already been tested to outline what worked well and provide advice for Trusts thinking of implementing the same innovation.118

114 See evidence including: interview analysis in Annex B, specifically evidence given by Academics_INT6, Academics_INT9; workshop analysis in Annex D, specifically the charities and PPIE workshop.
115 See evidence from the interview analysis in Annex B, specifically evidence given by CharityPPIE_INT2.
116 See evidence from the workshop analysis in Annex D, specifically the academics workshop, charities and PPIE workshop, policymakers workshop.
118 See evidence including: interview analysis in Annex B, specifically evidence given by Academics_INT11; workshop analysis in Annex D, specifically the policymakers workshop.
As we have outlined above, a national framework and infrastructure should ultimately enable more effective signposting and dedicated processes for flows of information on innovation opportunities between health system actors, including frontline staff, innovators, commissioners and policymakers, charities and the third sector, patients and the public. Policymakers should recognise that such a platform will need to balance having consolidated data and analytics versus a single location that signposts to a range of relevant sources. Specifically, our study identified the following areas to address:

• Explicit positioning of regional initiatives (such as AHSNs and/or CLAHRCs and Innovation Hubs) as gatekeepers and information brokers between the health system and research and innovation communities, as well as contributors to the national evidence infrastructure.¹¹⁹

• Alignment and coordination of information flows between regionally implemented initiatives such as AHSNs, Innovation Exchanges and Vanguards and national innovation schemes (e.g. ITT, ITP) and healthcare improvement efforts (e.g. NHS RightCare, GIRFT). There is also transferrable learning to be gained from how information flows are coordinated and acted on in the improvement space – for example from initiatives such as NHS RightCare and GIRFT, who use data and evidence to inform interventions (see Box 20).

Box 19: Case vignette examples of how innovators were able to satisfy health system needs

These examples demonstrate how working with actors in the health system to create an effective demand pull can allow innovations to be developed in a manner more responsive to demand, and potentially increase likelihood of adoption:

• The NHS Blood and Transplant (NHSBT) service identified poor patient experience and process disruption (as a result of donors fainting) to be key problems associated with current blood donation practice, and thus aimed to introduce new blood donor chairs. NHSBT put out a tender for the design of a new type of chair, and found a company able to develop a prototype of a blood donor chair able to address the identified problems. The prototype was tested by health professionals and patients before deciding on the final design. The chairs have been rolled out throughout NHSBT services in England.¹¹⁹

• IEG4, the company behind CHC2DST, held a workshop open to all NHS commissioners and frontline staff to discuss areas where digital technologies could improve quality and efficiency. Workshop participants shared the need for improvement to the CHC assessment process, which was further investigated by IEG4 through consultations with patients and their families. This stakeholder engagement led to the development of the CHC2DST software, which was also undertaken in collaboration with NHS staff, commissioning managers, CHC project leads and performance managers.¹²⁰

¹²⁰ See case vignette interviews in Annex C, specifically evidence given by Innovator_INT18.
¹²¹ See evidence from the workshop analysis in Annex D, specifically the networks workshop, private sector workshop.
• Creation of a role for stakeholders who may on occasion feel underrepresented in the innovation policy space – such as some smaller research charities – to communicate evidence on innovation-related activities to policymakers.  
• Ensuring frontline staff are exposed to evidence about innovations so they can be empowered to more actively participate in decision making about the best options for cost-effective care. Frontline staff currently access evidence from very diverse sources and through diverse mechanisms.
• Establishing working practices that more readily identify and incorporate innovation, including information on implementation and commercial support to facilitate adoption.
• Facilitating the formation of communities of practice where experiences are shared, communicated and translated into improvements in the information and evidence environment for an innovating health system. Communities of practice could allow actors to inform each other about new innovations and the evidence for them, identify the right type of language to use when engaging across professions and sectors in innovation-related activities, and promote the use of evidence gathered during evaluation activities, for example as a source of information for policy development.
• Development of guiding principles for private sector innovators on effective engagement with the NHS about the kinds of evidence and information needed, and establish receptor roles in the NHS at clinical, managerial and executive levels for engaging with innovators from the private sector and clinical entrepreneurs.

Box 20: Examples of how to signpost and utilise information and evidence

NHS RightCare is an NHS England national programme that advises local health economies to help ensure that they can make the best use of resources and make evidence-based decisions about optimal care pathways in a joined-up way. By analysing publicly available systems data, it provides a set of resources to concentrate improvement efforts on where there is greatest opportunity to address variation and improve health. It also works with delivery partners to ensure implementation of change and transformation efforts – based on the evidence on performance provided through this national programme and their work with local economies.

122 See evidence from the interview analysis in Annex B, specifically evidence given by CharityPPIE_INT7, CharityPPIE_INT13.
123 See evidence including: survey analysis in Annex A; evidence from Phase 1, presented in Marjanovic et al. (2017b).
124 Communities of practice refers to groups of people who share a passion, interest or concern for something they do, in this case innovation in the health system, and then, by coming together in a community, learn how to do it better through regular interactions (Lave & Wenger 1991).
125 See evidence from the interview analysis in Annex B, specifically evidence given by Academics_INT1, Academics_INT2, Academics_INT4, Academics_INT7, Academics_INT9, Academics_INT10, CharityPPIE_INT7, CharityPPIE_INT8, Networks_INT7, Policymaker_INT1, Policymaker_INT7, Private_INT1, Private_INT4.
126 See evidence from the interview analysis in Annex B, specifically evidence given by Policymaker_INT10, Policymaker_INT11.
It focuses on three pillars: (1) ensuring intelligence exists and is disseminated, using data to provide information on variation and performance and identify areas of opportunity for quality improvement; (2) supporting innovative practices, working with local organisations, national programmes and patient groups to develop and test new concepts and influence policy; and (3) driving implementation, supporting local health economies to know where to look for opportunities and evidence, what to change and how to change.

NHS RightCare produces a series of products such as: data packs; long-term condition scenarios using fictional patients to examine a care pathway for a certain disease to compare sub-optimal but not atypical scenarios against an ideal pathway, together with relevant cost and impact data; atlases that interrogate routinely available data that relate investment, activity and outcome to the whole population in need, not just those contacting a service, allowing a search for unwarranted variation at population level; casebooks to share best practice of local commissioning; and short forms to help patients engage, together with clinicians, in decision making about care choices.

NHS RightCare also collaborates with other bodies and initiatives, for example: with professional bodies to coordinate guidance material; the NHS Innovation Scorecard to show variation in uptake at CCG level; the Prescribing Metric open access tool on CCG and GP prescribing data; and stakeholders to establish frameworks to guide delivery of quality care (e.g. nursing, midwifery and care staff framework). NHS RightCare has 20 delivery partners who are embedded in local health economies to support local implementation of the initiative; they provide, for example, data packs that allow health economies to compare themselves against similar economies.127

**Getting It Right First Time (GIRFT)** is a national programme set up under NHS Improvement’s Operational Productivity Directorate to help improve the quality and efficiency of care in the NHS. It aims to reduce unwarranted variation in service delivery between Trusts and to support the sharing of best practice, whilst saving the NHS between £240 and £420m over 2017/2018, and up to £1.4bn by 2020/2021 (NHS Providers 2018, 8).

It began as a pilot within orthopaedic surgery and was expanded to 41 medical specialities after its success. It is now a partnership between the NHS Royal National Orthopaedic Hospital Trust and the Operational Productivity Directorate (Getting It Right First Time n.d.-c). Each GIRFT programme area is led by a clinical leader(s) with expertise in a specific field. A GIRFT team reviews Trust performance using a combination of data (e.g. Hospital Episode Statistics, registry, professional association data) and responses to a questionnaire provided by reviewed Trusts. Based on this information, the GIRFT team identifies and assesses unwarranted variation, develops and shares good practice examples, and recommends quality of care improvements and ways to realise cost savings. For each Trust, recommendations across all specialities are collated into a single action plan. Data are uploaded to the Model Hospital portal, the main portal for accessing GIRFT information (Getting It Right First Time n.d.-b).

Over time, GIRFT intends to work closely with other NHS bodies and programmes, and will also work nationally with clinical, government and public bodies, such as the Medical Royal Colleges, to help Trusts act on recommendations (Getting It Right First Time n.d.-a; NHS Providers 2018, 12, 16–17).

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127 See evidence from the interview analysis in Annex B, specifically evidence given by Policymaker_INT10, Policymaker_INT11.
6.3.2. Establish clear evidence standards for good quality evidence

Providing improved and clear definitions of what evidence is required to support new innovations, both for new business cases and for evaluations, by:

- Developing clearer guidelines on what evidence criteria need to be met before the NHS adopts an innovation and articulating these to innovators.
- Identifying a more diverse range of evidence sources for innovators to collect in support of their innovations in order to create a more compelling business case, possibly with support from AHSNs.
- Creating an evaluation framework for innovations once they are adopted with clearly defined principles of good evaluation practice and opportunities for shared learning.
- Supporting sharing of data on the performance of current products, technologies, services and practices so companies can accurately compare their innovations to what is already in use in a given area of the health service. These data could, for example, be collated and curated as part of the national data platform, with consideration of commercial sensitivities.

Good-quality evidence to support the adoption and uptake of innovation needs to be rigorous, relevant and feasible to collect. Throughout the workshop and interviews, it became clear that many stakeholder groups believed that clearer, more defined guidelines that apply across Trusts\(^\text{128}\) are needed on what constitutes good-quality evidence, what kinds of evidence are needed, and who should be responsible for collecting and providing the evidence at multiple stages along the pathway. The basic principles for an evidence standard should ensure that there is alignment on what needs to be agreed nationally and what can be agreed locally, that there is only one set of evidence criteria for innovators to work to, and that evidence needs and requirements are segmented by innovation characteristics and the adoption environment (e.g. type of innovation, complexity of implementation, degree of disruption).\(^\text{129}\)

Healthcare providers and commissioners could lead the development of these standards, as they are often the decision makers when adopting an innovation. However, in order to support more effective innovator–adopter discussions and relationships, standards and associated guidelines should be decided in a consultative, participatory fashion, with stakeholders across the health system.\(^\text{130}\)

In addition to the quality of evidence, multiple stakeholders raised the need for a more diverse range of evidence and data sources to be collected in support of innovations, as this would lead to more compelling business cases and better reflect and meet the needs of decision makers. Our case vignettes show that when diverse sources of data were used, the case for adoption was more compelling (see Box 23). These sources should include accurate information on the realistic cost of implementation, decommissioning or associated disruption costs (guidance on decommissioning should be released by NHS

\(^\text{128}\) This point was raised in particular by private sector stakeholders, some of whom felt that evidence accepted by one Trust may not be accepted by another (see interview analysis in Annex B, specifically evidence given by Private\_INT4, Private\_INT7, Private\_INT8).

\(^\text{129}\) See evidence from the workshop analysis in Annex D, specifically the policymakers workshop.

\(^\text{130}\) See evidence including: interview analysis in Annex B, specifically evidence given by Charity\_PPIE\_INT8, Policymaker\_INT1, Policymaker\_INT2, Policymaker\_INT11; workshop analysis in Annex D, specifically the networks workshop, policymakers workshop, private sector workshop.
England based on evidence from NICE,131 quality data on the comparative gains of the new innovation over existing options; training and other implementation support needs; the type of innovation pathway involved; and interdependencies for success. For example, for some digital innovations there will be complexities involved in implementation and some degree of disruption as new data platforms are used and/or new software is rolled out. Much of this more nuanced data on cost, quality and impact implications is needed across the whole healthcare pathway (not just a primary or acute part of it) and is a necessary part of communicating the value of new innovations to policymakers, providers and commissioners. The quantitative analysis of population-level and CCG factors associated with the uptake of innovative medicines that was conducted as part of this study (by colleagues at the University of Manchester) supports the assertion that the evidence base upon which uptake decisions are made needs to be enriched. That analysis sought to understand whether variation in uptake of innovative medicines is determined by population characteristics of CCG attributes. At present, and as illustrated in Box 21 below, the evidence on the influence of population-level factors remains inconclusive.

Box 21: Variation in the uptake of innovative medicines and the influence of population factors and CCG attributes

A range of diverse sources of analysis and evidence is needed to inform business cases and adoption decisions. To give an example, analysis conducted as part of this study (further detailed in Annex F) looked at 54 individual medicines and 3 groups of medicines captured in the Innovation Scorecard (which captures variation in the uptake of medicines across different CCGs) in an attempt to understand whether variation in uptake of innovative medicines is determined by population characteristics or CCG attributes. The findings show that indicators of population need are only one factor influencing innovation uptake – and possibly quite a weak driver in many instances. The evidence reinforces the finding that there is a continuing challenge for decision makers to consistently incorporate quantitative evidence of population need alongside an understanding of what can be implemented and diffused at the local level. Although the overall picture is complex, the results suggest that at least for the 54 analysed individual medicines tracked by the Innovation Scorecard, CCG characteristics, rather than population characteristics, very often determine innovation uptake and spread. The only population characteristic that is significantly associated with innovative prescribing levels is the proportion of patients reporting a long-term health condition. Other factors significantly associated with prescribing levels are factors associated with the CCG itself, the number of employees, whether the CCG met its expenditure target, and whether the CCG received a rating of ‘Assured’. Some regional influences were also reported (e.g. an association between being in the North of England and the probability that a CCG will participate in innovative prescribing was identified).

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131 See evidence from the workshop analysis in Annex D, specifically the policymakers workshop.
However, there is diversity in the nature of links between different determinants of prescribing levels between different health conditions and over time— and somewhat different findings when groups of medicines, rather than individual medicines, are analysed. For example:

- For the Acute Coronary Syndrome group of medicines analysed in the Innovation Scorecard, income deprivation, the proportion of the population recording a long-standing health condition and CCG net expenditure were positively associated with levels of prescribing of innovative medicines. However, when examining the growth in prescribing over time, growth was slower in CCGs with a higher proportion of patients recording a long-standing health condition, bringing into question the impact of some population-level factors. At the same time, the age composition of registered patients was found to be significant in influencing prescribing, with faster growth in prescribing levels for CCGs with larger proportions of patients aged both under 18 and over 65.

- For the Diabetes group of medicines, only the age composition of registered patients and net expenditure were found to be consistently related to prescribing volumes.

- For novel oral anticoagulants (NOACs) used in atrial fibrillation to reduce the risk of stroke and systemic embolism, the proportion of a CCG’s population aged over 65 was found to be positively associated with prescribing volumes. Receiving a CCG rating of ‘Not assured – intervention required’ was found to be associated with lower prescribing volumes.

Overall, for all three grouped medicines, a significant and strong upward trend in prescribing volumes over time was found, indicating that innovative prescribing practices are generally increasing over time. Understanding these determinants of innovation spread at the CCG level could provide valuable insight to innovators wishing to implement and spread the innovations they develop at scale across the NHS. For example, whilst CCGs with higher net expenditures in the baseline period were significantly more likely to engage in innovative prescribing over the following two years, the levels of innovative prescribing were significantly lower amongst CCGs that met their expenditure targets. This illustrates the importance to commissioners of the costs of new innovations when deciding whether to provide these new treatments.

In addition, more sophisticated and innovative health economics analyses that clarify implementation costs and requirements, decommissioning needs and reflect impacts and outcomes for the entire system are needed.\(^2\) Importantly, many stakeholders pointed to the idea that evidence and data on innovations provided by NICE are necessary, but not sufficient, and there are variations in uptake of NICE guidance as shown by the NHS Innovation Scorecard evidence. All of this points to a renewed approach to the types, standards and quality of evidence.\(^3\)

A better standard of evidence should also incorporate a systematic and clearly defined approach to evaluation of innovations that are adopted, so that outcomes can be compared

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\(^1\) See metrics analysis in Chapter 11 and quantitative analysis of uptake of innovative medicines conducted by the University of Manchester as summarised in Box 22 and Annex F.

\(^2\) See evidence from the workshop analysis in Annex D, specifically the academics workshop, policymakers workshop.
and cost savings identified.\textsuperscript{134} A standardised evaluation framework could be implemented after an innovation has been introduced into the health system and this should fulfil the criteria presented in Box 22.\textsuperscript{135}

In establishing any evaluation framework, it will be important to ensure that innovations have enough time to mature and for their use to become established before they are evaluated.\textsuperscript{136} There also needs to be greater clarity in deciding which innovations require a full NICE evaluation and which can be safely adopted without this, in order to speed up access.\textsuperscript{137}

The development stages and introduction into the health system of nearly all our case vignette innovations (see Annex C) involved gathering a high-quality evidence base to drive adoption of the innovations; Box 23 highlights some case vignette examples of how evidence played a role at the introduction, uptake and spread stages.

**Box 22: Criteria for a standardised evaluation framework**

After an innovation has been introduced into the health system, a standardised framework fulfilling the following criteria could be implemented:

- Ensure that innovations are assessed against indicators of success and feedback systems on innovation performance and impact in the real world can be implemented.
- Promote learning and decisions about the uptake of innovations and decommissioning needs.
- Provide funding to undertake the actual evaluations.
- Provide mechanisms to share data from the evaluation and any associated learning and support implementation after the evaluation is complete.
- Data collected from evaluations of innovations should also be routinely shared to disseminate learning on what works, realistic timescales for implementation and the best type of data to collect for evaluations.

\textsuperscript{134} See evidence from the interview analysis in Annex B, specifically evidence given by CharityPPIE_INT8, policymaker INT1, policymaker INT7, Academics_INT2, Academic_INT4, Private_INT1, Private_INT4, Networks_INT7.

\textsuperscript{135} See evidence from the interview analysis in Annex B, specifically evidence given by CharityPPIE_INT7, CharityPPIE_INT11.

\textsuperscript{136} See evidence from the interview analysis in Annex B, specifically evidence given by CharityPPIE_INT10.

\textsuperscript{137} See evidence from the workshop analysis in Annex D, specifically the policymakers workshop.
Box 23: Case vignette examples of how high-quality evidence can drive adoption

**HeartFlow FFR\textsubscript{CT} Analysis** is a non-invasive coronary artery disease detection tool using regular computed tomography (CT) scans to develop a 3D model of coronary arteries and determine the impact of artery blockages on the blood flow. The technology should help assess the impact of blockages and prevent the need for invasive – and potentially unnecessary – tests. A strong focus on the collection and dissemination of compelling performance evidence (clinical and costs) enabled early discussions related to adoption of HeartFlow FFR\textsubscript{CT} Analysis with provider organisations and commissioners, and helped inform a positive NICE recommendation. Publishing performance evidence from trials in academic literature seems to have supported the credibility of the evidence being shared, and the clinical effectiveness and cost-effectiveness of the product helped the innovators behind HeartFlow FFR\textsubscript{CT} Analysis to make quick progress in regulatory clearance matters and supported their uptake negotiations with potential providers. The Trust and CCG interviewees highlighted several times how the product’s evidence base convinced them to use the technology. For instance, the CCG interviewee noted that ‘We have seen all the study data, so we knew about all the trials, we could see the images that were available for people who have adopted this. We knew it was in place in other hospitals across the country and nationally. There is enough evidence for having this that we didn’t need any more convincing’.\textsuperscript{138}

The ability to demonstrate the value of the innovation for the health system, workforce and patients helped support uptake and acceptance by clinicians of **remote cardiac monitoring devices**, which are systems in patients’ homes monitoring the technical performance of cardiac devices as well as patients’ health condition. While hospital members initially feared that remote monitoring devices may lead to more work, innovators were soon able to demonstrate the system’s value, including reduction of routine face-to-face follow-ups at hospitals (and associated time demands on staff, health system costs and impacts on patient quality of life).\textsuperscript{139}

The large evidence base for **drug-eluting stents**, which treat the effects of restenosis (arterial narrowing in the heart), meant clinicians were able to see the benefits to patient outcomes and cost savings. Combined with NICE approval, Trusts were more likely to adopt drug-eluting stents to meet the standards set out in the National Service Framework for CHD.\textsuperscript{140}

Since the first version of **MoodGYM**, a form of computerised cognitive behavioural therapy (cCBT) aimed at young people suffering mild to moderate anxiety or depression, was developed, there have been over 25 clinical trials conducted (Bennett 2016) to evaluate its effects on patients’ mental health and its cost-effectiveness compared to other cCBT and traditional treatments. In general, these have provided a diverse evidence base, showing that MoodGYM improves patient mental wellbeing, reducing symptoms of anxiety and depression in a cost-effective way (although more recent evidence disputes this) (Beacon 2.0 2016; Duarte et al. 2017). The large body of positive research evidence for MoodGYM was thought to be one of the contributing factors to NICE promoting the use of cCBT, leading to a higher level of adoption in England compared to other countries.\textsuperscript{141}

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\textsuperscript{138} See case vignette interviews in Annex C, specifically evidence given by CCG\_INT11, Provider\_INT3.

\textsuperscript{139} See case vignette interviews in Annex C, specifically evidence given by Anonymous\_INT7.

\textsuperscript{140} See case vignette interviews in Annex C, specifically evidence given by Innovator\_INT3.

\textsuperscript{141} See case vignette interviews in Annex C, specifically evidence given by Innovator\_INT6.
Nurturing effective relationships and networks regionally and nationally
7.1. Summary

The current landscape: issues and developments

- Over the past decade, there has been a proliferation of initiatives aiming to support, enable and coordinate collaboration for an innovating and improving health system (e.g. AHSNs, Vanguards, Test Beds, Innovation Hubs, Knowledge Transfer Networks, Catapults, CLAHRCs, STPs, quality improvement initiatives and various other regional networks and organisations). Many of these are nationally governed and implemented at regional levels. To varying degrees, they support both formal and informal, organisation-level and individual-level relationships between different actors – spanning healthcare professionals, academics, innovators, patients and the public and the third sector.

- These initiatives have a role in coordinating organisations within the system, but should also coordinate activities to ensure an appropriate alignment of activity at the regional level and nationally, and to maximise impact.

- Strengthening the relationships between existing initiatives is likely to help mitigate against ‘initiativitis’ – i.e. against unintentionally and unnecessarily introducing initiatives that could ‘reinvent the wheel’ rather than harnessing the existing capacity in the system.

Key areas for action to improve the relationships and networks landscape for innovation

- Improve the alignment of existing innovation-relevant initiatives, organisations and relationships by designing the innovating health system to orchestrate alignment. This should be achieved through policy intervention to improve collaboration and coordination: (1) across the innovation pathway; (2) between professions (e.g. clinical, managerial, executive); (3) between stakeholder groups (private sector, healthcare providers, academics, patients and the public, funders and commissioners, charities and PPIE organisations); and (4) within regions, between regions and with the ‘centre’/national bodies and policymakers.

- To operationalise the design of a better-aligned system, policymakers can:
  - Ensure that organisations and initiatives have greater clarity in their roles and remits (including boundaries) and in the scale and timing of funding commitments for their activities.
  - Evaluate initiatives against progress and delivery on clear remits and roles and link this to funding conditions.
  - Ensure that wider actors in the health system are made more aware of the skills, capabilities and services that are integral to the roles and remits of existing initiatives and organisations (so that they can more readily identify opportunities to collaborate and coordinate).

- To embed practices that support effective alignment ‘on the ground’, policymakers and organisational leadership can:
  - Pursue cross-organisational representation on committees (e.g. between AHSNs, Test Beds, Vanguards, Innovation Hubs, quality improvement networks and within STP structures; on national cross-governmental or cross-party initiatives; and on key national funding initiative selection panels).
  - Support collaborative projects and tasks to help create a shared vision of success (often facilitated by the close proximity of innovating and healthcare provider organisations in some hubs).
  - Consider prospects for shared posts for individuals, as well as secondments and placement schemes.
  - Appoint individuals with broker roles into initiative structures.
7.2. Relationships and networks for an innovating health system: reflecting on issues and developments in the landscape

A successful innovation landscape is partly seen to depend on relationships and personal and professional networks within and between regions, between regions and national bodies, and between individuals and organisations. Over the past decade, we have witnessed a proliferation of networks-based initiatives aiming to support, enable and coordinate collaboration for an innovating and improving health system. Examples in England include AHSNs, Vanguards, Test Beds, Innovation Hubs, Knowledge Transfer Networks, Catapults, the SBRI, Local Enterprise Partnerships (LEPs), CLAHRCs, STPs, the NHS Innovation Accelerator and associated networks it enables, the Practice Management Network, the Social Innovation Exchange, the Q initiative and various regional accelerators and incubators (see Marjanovic et al. 2017b, 52–56 for regional examples). Other countries in the UK have also increasingly tried to bring together different stakeholders; examples include Academic Health Science Centres in Scotland, which connect academic and NHS Scotland organisations; the Digital Health & Care Institute in Scotland, which aims to strengthen collaboration between academia, industry, charities and the public sector to develop solutions to health and care challenges; the South East Wales Academic Health Science Partnership, which connects researchers, industry stakeholders, healthcare professionals, patient groups and policymakers; and ACCELERATE, the Welsh Health Innovation and Technology Accelerator, which joins the Life Sciences Hub Wales, universities and industry to translate ideas into innovations as well as to speed up their introduction and adoption in the system (AHSP n.d.; Digital Health & Care Institute n.d.; South East Wales Academic Health Science Partnership n.d.; Welsh Government 2018). While these institutions are transformational initiatives established as part of national strategies and policies, they are often managed and implemented regionally. Various other collaborative initiatives support improvement and innovation in the health system as well (e.g. health research and development networks, patient safety collaboratives and quality improvement networks).

Linking into networks that cross disciplinary, clinical, professional and organisational boundaries can be influential in introducing and sustaining innovation (Bisset & Potvin 2007; Ferlie et al. 2005; Jones 2007; Martin, Currie & Finn 2009; Scheirer 1990), a finding that was also reflected strongly in the evaluation of the NHS Innovation Accelerator (Cox et al. 2018). As successful innovation often relies on early face-to-face interactions with influential stakeholders, accessing a pre-existing network of these individuals can allow for a wider reach and wider audience to drive early development and adoption (Albury et al. 2018).

Although the innovating health system in England offers a wide range of formal and informal networks and networking opportunities, it is unclear if the system and its actors have the capacity to fully take advantage of them. Given this, we have identified a range of issues associated with how relationships and networks in the current health innovation landscape are established, nurtured and sustained.

Firstly, having access to and using both formal and informal networks and networking opportunities, it is unclear if the system and its actors have the capacity to fully take advantage of them. Given this, we have identified a range of issues associated with how relationships and networks in the current health innovation landscape are established, nurtured and sustained. Firstly, having access to and using both formal and informal as well as diverse relationships and networks can enable successful innovating
Innovating for improved healthcare in the health system in England. Secondly, given the wide range of schemes already in the system, there is a need to avoid ‘initiativitis’ which can accompany the introduction of new schemes or excessive churn, and an associated need to make the most of existing initiatives. In other words, strengthening existing innovation-related institutions and networks is likely to reap greater benefits than unintentionally introducing initiatives that could ‘reinvent the wheel’.

In doing so, fragmentation in the system needs to be addressed. Although there was a general perception among stakeholders that there are a variety of existing networks actors across the system could make use of, there is a need to both build new relationships and strengthen current ones between the existing initiatives and organisations, and ensure that NHS organisations are better aligned. Several interviewees and workshop participants felt that NHS organisations relevant for an innovative health system are often detached from each other and that there is fragmentation in the system, all of which act as barriers to innovation. In a recent briefing published by the Nuffield Trust, Castle-Clarke, Edwards and Buckingham (2017) highlight the challenges posed by silo working in the NHS, emphasising that there is a need to better align organisations and enable cross-working.

Finally, it should be ensured that networks support and involve actors across the system, including at local levels, and foster interdisciplinary relationships. Several interviewees emphasised that innovation efforts involving different actors can be more successful across the innovation pathway as different actors’ needs and interests can be reflected and accountabilities shared. A combination of bottom-up, grassroots approaches driven by local organisations, and top-down policy support and mandates may provide the best mix – one which enables the local relationships that are critical for effective innovating and health and care systems more widely. However, in doing so, these approaches should not neglect the equally important need to foster inter-local and local–national interactions. Collaborations between different organisations in the health system, such as Trusts, CCGs, local government, charities, the research community, the private sector, innovation and improvement networks, and patients and the public, were seen as enablers of making change happen on a larger scale.

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143 See evidence including: interview analysis in Annex B, specifically evidence given by Academics_INT13, Networks_INT3, Networks_INT5, Networks_INT7, Networks_INT8, Networks_INT10, Private_INT2, Private_INT3, Private_INT4, Private_INT8; workshop analysis in Annex D, specifically the networks workshop, policymakers workshop, private sector workshop, providers and commissioners workshop; survey analysis in Annex A.

144 See evidence including: interview analysis in Annex B, specifically evidence given by Private_INT2, Private_INT3, Private_INT4, Private_INT8; survey analysis in Annex A.

145 See evidence including: interview analysis in Annex B, specifically evidence given by Academics_INT13, Networks_INT3, Networks_INT5, Networks_INT7, Networks_INT8, Networks_INT10, Private_INT4, Private_INT8; workshop analysis in Annex D, specifically the academics workshop, charities and PPIE workshop, private sector workshop, survey analysis in Annex A.

146 See evidence from the interview analysis in Annex B, specifically evidence given by Academics_INT3, Academics_INT7, Academics_INT12, Academics_INT13, CharityPPIE_INT2, CharityPPIE_INT3, CharityPPIE_INT10, CharityPPIE_INT13, Networks_INT1, Networks_INT5, Networks_INT6, Networks_INT7, Networks_INT9, Policymaker_INT3, Policymaker_INT10, Private_INT2, Private_INT3, Private_INT8, ProviderCCG_INT16, ProviderCCG_INT18.

147 See evidence from the workshop analysis in Annex D, specifically the networks workshop, private sector workshop.

This requires nurturing both individual-level relationships and institutional-level ones.\(^{149}\)

### 7.3. Analysis to support the actions

Our analysis identified two main areas for action about how to strengthen existing relationships and networks across the health innovation landscape, covering: how to improve the alignment of existing innovation-relevant initiatives, organisations and relationships by designing the health innovations system to orchestrate alignment; and how to operationalise the design of a better-aligned system and embed practices supporting effective alignment ‘on the ground’.

### 7.3.1. Designing the innovating health system to orchestrate alignment

Policy interventions are needed to improve collaboration, coordination and alignment of existing innovation-relevant initiatives, organisations and relationships across the innovation pathway, between professions (e.g. clinical, managerial, executive), between stakeholder groups (private sector, healthcare providers, academics, patients and the public, funders and commissioners, charities and PPIE organisations), and within regions, between regions and with the ‘centre’/national bodies and policymakers.

Contributors to the study highlighted the importance of nationally coordinated networks working at the regional level, such as AHSNs, Innovation Hubs, regional quality improvement networks and other organisations actively establishing relationships between different stakeholders.\(^{150}\) Case vignette interviewees illustrated how formal networks as well as collaborating with national organisations enable the uptake and spread of innovations. Interviewees consulted for the CHC2DST vignette specifically highlighted the importance of AHSNs for the uptake and spread of their innovations, while the adoption of Boston Scientific’s drug-eluting stents was strongly supported by the British Cardiac Intervention Society, and Sysmex, the company behind OSNA, benefited from support offered by the NHS National Technology Adoption Centre (NTAC) (see Box 24).\(^{151}\)

Contributors to this study also noted that there is lack of alignment of existing innovation-relevant initiatives, organisations and relationships. Policy interventions should be put in place to improve collaboration and coordination: (1) across the innovation pathway; (2) between professions (e.g. clinical, managerial, executive); (3) between stakeholder groups (private sector, healthcare providers, academics, patients and the public, funders and commissioners, charities and PPIE organisations); and (4) within regions, between regions and with the ‘centre’/national bodies and policymakers.\(^{152}\)

One way to illustrate this action point is to look at how AHSNs can allow for coordinated

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149 See evidence from the workshop analysis in Annex D, specifically the academics workshop, charities and PPIE workshop, networks workshop, private sector workshop.

150 See evidence from the interview analysis in Annex B, specifically evidence given by Innovator_INT3, Innovator_INT18, Networker_INT1, Policymaker_INT10, Private_INT2, Private_INT3, Private_INT4, Private_INT8, ProviderCCG_INT16, workshop analysis in Annex D, specifically the academics workshop, networks workshop, policymakers workshop, private sector workshop, providers and commissioners, survey analysis in Annex A.


collaboration and harnessing of the opportunities networks offer across the innovation pathway. AHSNs support businesses to do health economics analyses, which should help them: set up a business case and generate the necessary evidence base; communicate the wider benefits of innovations (i.e. not limited to cost benefits) to NHS organisations; and offer a wide range of networking opportunities such as lectures and workshops, which should help businesses and healthcare professionals at different stages of the pathway. However, the roles that AHSNs and other individual regional networks play, as well as the level of their support, are variable across the system. At the very least, alignment should happen between networks of the same kind, but there should also be better coordination and improved collaboration between different network types, such as AHSNs with STPs and accountable care systems, to be able to fully harness the opportunities they offer.

Key enablers of the development, introduction and uptake of innovations, and help foster the relationships needed for receptive innovation environments. Joining up executive teams and senior managers can help develop a united commitment and receptivity to change and innovation, as well as shared goals and leadership aims. Leadership needs to ensure that proposed changes and innovations to be introduced into health organisations have clear goals and visions that are clearly articulated to staff on the ground. Leadership must also provide the necessary support to their staff when it comes to introducing innovation.

Interviewees suggested a wide range of mechanisms for joint working and connecting people, including: making use of the close proximity of NHS organisations and research organisations/universities (e.g. the Cambridge Biomedical Campus), which can support collaborations between researchers and clinicians; physically bringing groups working on the same things in different areas together for meetings to learn from each other; and secondments, placement schemes and matchmaking organisations to act as facilitators of innovation implementation, matching up innovators with appropriate roles.

153 See evidence from the interview analysis in Annex B, specifically evidence given by Networks_INT1, Networks_INT2, Networks_INT6, Networks_INT8, Networks_INT9.
155 See evidence from the interview analysis in Annex B, specifically evidence given by Networks_INT8.
156 See evidence from the interview analysis in Annex B, specifically evidence given by Academics_INT8, Academics_INT12, Innovator_INT18, Networks_INT1.
157 See evidence including: interview analysis in Annex B, specifically evidence given by Academics_INT13, Networks_INT3, Networks_INT5, Networks_INT7, Networks_INT8, Networks_INT10, Private_INT4, Private_INT8; workshop analysis in Annex D, specifically the charities and PPIE workshop, policymakers workshop.
158 See evidence including: case vignette interviews in Annex C, specifically evidence given by Anonymous_INT6, Innovator_INT6, Innovator_INT17, Innovator_INT18, Innovator_INT19, CCG_INT9, interview analysis in Annex B, specifically evidence given by Policymaker_INT3, Private_INT8, ProviderCCG_INT7, ProviderCCG_INT18, workshop analysis in Annex D, specifically the networks workshop; survey analysis in Annex A (particularly respondents from commissioning as well as from innovation and improvement networks found it important to support joint-working mechanisms between organisations).
healthcare providers to help each other.\textsuperscript{160} However, this also requires stakeholders across the system to be more proactive in establishing contact with other stakeholder groups and organisations as well as making use of networking opportunities.

Evidence from the case vignettes shows how working across professions and organisations, and having such collaborations throughout the innovation pathway – i.e. from idea generation or development to introduction into the health system – can support successful innovating (see Box 24). Case vignettes also highlight the enabling nature of joint working across organisations of the same kind and within and across regions. For example, HeartFlow’s and Big Health’s innovations were successfully introduced on a large scale through the collaborative commissioning efforts of organisations in an STP region, respectively of CCGs across London.\textsuperscript{161} Similarly, an innovator interviewee explained how strong informal clinical networks between individual hospitals enabled the spread of remote cardiac monitoring devices.\textsuperscript{162}

\textbf{Box 24: Case vignette examples of the importance of networks for enabling innovation adoption and spread}

The Yorkshire and Humber AHSN provided support for IEG4, the innovators of the \textit{CHC2DST} assessment software, throughout the innovation pathway. For instance, they collected feedback on early versions of the product from frontline staff and commissioners to feed into the product adaptation process. An event they hosted for CCG representatives increased the awareness of CHC2DST and resulted in IEG4 entering in discussions with a diverse range of CCGs looking to adopt the product.\textsuperscript{163} Finally, the AHSN advised IEG4 on various aspects of development and implementation, such as the pricing model.\textsuperscript{164}

The engagement of the British Cardiac Intervention Society supported Boston Scientific, a developer of \textit{drug-eluting stents}, in increasing the adoption of their product due to the local variation in implementation. The Society approached hospitals to provide information on the benefits of the drug-eluting stents.\textsuperscript{165}

NTAC, a former organisation that supported innovators in achieving widespread adoption of a health technology and embedding it in the system (Llewellyn et al. 2014), supported Sysmex, the company behind \textit{OSNA}, to gather clinical and cost-effectiveness evidence and present it in a business case targeted at the NHS.\textsuperscript{166} It also created online resources, such as a toolkit, to support hospitals in implementing OSNA.\textsuperscript{167}

\textsuperscript{160} See evidence from the interview analysis in Annex B, specifically evidence given by Policymaker\_INT3, Private\_INT8, ProviderCCG\_INT7, ProviderCCG\_INT18.

\textsuperscript{161} See evidence from case vignette interviews in Annex C, specifically evidence given by CCG\_INT11

\textsuperscript{162} See evidence from case vignette interviews in Annex C, specifically evidence given by Anonymous\_INT7.

\textsuperscript{163} See evidence from the case vignette on CHC2DST in Annex C, specifically evidence given by Innovator\_INT18 and Networker\_INT1.

\textsuperscript{164} See evidence from the case vignette on CHC2DST in Annex C, specifically evidence given by Innovator\_INT12.

\textsuperscript{165} See evidence from case vignette interviews in Annex C, specifically evidence given by Innovator\_INT3.

\textsuperscript{166} See evidence from case vignette interviews in Annex C, specifically evidence given by Innovator\_INT12.

\textsuperscript{167} See evidence from case vignette interviews in Annex C, specifically evidence given by Provider\_INT13.
Innovating for improved healthcare

7.3.2. Operationalising the design of a better-aligned system and embedding practices supporting effective alignment ‘on the ground’

To operationalise the design of a better-aligned system, policymakers can:

• Ensure that organisations and initiatives have greater clarity in their roles and remits (including boundaries) and in the scale and timing of funding commitments for their activities.

• Evaluate initiatives against progress and delivery on clear remits and roles and link this to funding conditions.

• Ensure that wider actors in the health system are made more aware of the skills, capabilities and services that are integral to the roles and remits of existing initiatives and organisations (so that they can more readily identify opportunities to collaborate and coordinate).

To embed practices that support effective alignment ‘on the ground’, policymakers and organisational leadership can:

• Pursue cross-organisational representation on committees (e.g. between AHSNs, Test Beds, Vanguards, Innovation Hubs, quality improvement networks and within STP structures; on national cross-governmental or cross-party initiatives; and on key national funding initiative selection panels).

• Support collaborative projects and tasks to help create a shared vision of success (e.g. facilitated by close proximity of innovating and healthcare provider organisations in some hubs).

• Consider prospects for shared posts for individuals, as well as secondments and placement schemes.

• Appoint individuals with broker roles into initiative structures.

In order to improve the alignment of existing initiatives and networking efforts, a few actions have been identified that policymakers and organisational leadership can take. To engage effectively across the system, there is a need to raise awareness of the roles different organisations, initiatives and actors have and can have. Achieving this requires dialogue between regional bodies and national policymakers to promote and support greater clarity in the specification of roles and remits. This includes defining and ensuring transparency regarding the boundaries of roles and remits and the scale and timing of organisations’, initiatives’ and actors’ (funding) commitments for their activities, as well as ensuring that governance structures support collaboration and representation from related organisations and initiatives.168 It is also important for policymakers and funders to ensure that initiatives are evaluated against progress and delivery on clear remits and roles and link this to funding conditions.

In addition to clarifying the roles and remits of organisations, initiatives and actors, it is also necessary to clearly communicate available skills, capacities and services to the wider system (see also Chapter 4). This will allow actors to be aware of existing opportunities and will help them to make use of these as well as identify opportunities to collaborate and coordinate.169

In order to embed collaborative practices and to support effective alignment ‘on the ground’, policymakers and organisational leadership should ensure that there is cross-organisational representation across the system, both at local and national levels. This

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168 See evidence from the interview analysis in Annex B, specifically evidence given by Academics_INT2, Academics_INT4, Academics_INT5, Networks_INT6, Policymaker_INT4, Policymaker_INT7, ProviderCCG_INT6, ProviderCCG_INT16, ProviderCCG_INT18, ProviderCCG_INT19.

169 See evidence from the interview analysis in Annex B, specifically evidence given by Academics_INT3, Academics_INT7, Academics_INT8, Academics_INT11, CharityPPIE_INT6, CharityPPIE_INT2, CharityPPIE_INT3, CharityPPIE_INT8, CharityPPIE_INT10, CharityPPIE_INT11, CharityPPIE_INT13, Networks_INT5, Networks_INT9, Networks_INT10, Policymaker_INT3, Policymaker_INT6, Private_INT2, Private_INT3, ProviderCCG_INT16, ProviderCCG_INT18.
includes cross-organisational representation on committees; between AHSNs, Innovation Hubs, quality improvement networks and within STP structures; on national cross-governmental or cross-party initiatives; and on key national funding initiative selection panels (including having oversight on the representation to ensure balance and manage conflicts of interest). 170

Policymakers and leadership should also support collaborative projects and tasks at the local level, in order to help create a shared vision of success. 171 Moreover, they could actively contribute to establishing collaboration-supportive mechanisms, including creating shared posts for individuals, and offering secondments and placement schemes. 172 Identifying and mobilising individuals to act as brokers in initiative structures was also seen as a promising action to strengthen coordination and collaboration. 173

7.3.3. Strengthening the role of AHSNs

Responding to the need to better translate health research into practice and to better connect research and industry in order to improve patient and population health outcomes, AHSNs were first introduced in Innovation, Health and Wealth (Department of Health 2011) in 2011. In 2013, NHS England established 15 AHSNs across England, each covering several counties (except for two London AHSNs, Health Innovation Network South London and Imperial College Health Partners, which focus on parts of London) (The AHSN Network 2017a, 2017b).

While stakeholders across work streams referred to and discussed a variety of different networks and collaborative initiatives, there was an unsurprisingly high level of focus on AHSNs. This was due to the policy focus on AHSNs in recent times (including in relation to the Accelerated Access Review (2016) as well as NHS England and Office for Life Sciences efforts to map the innovation landscape (Brennan 2018)) and their growing innovation remit (alongside other initiatives).

AHSNs were initially funded for a five-year licence period from 2013 to 2018, receiving £50 million per year from NHS England (NHS England 2017d, 5). The second five-year licence period started in April 2018. NHS England funding was reduced to £44.2 million in 2018/2019 and £44.4 million in 2019/2020; this will be complemented by £39 million government funding, which was made available as part of the government’s response to the Accelerated Access Review (Department of Health & Department for Business, Energy & Industrial Strategy 2017, 9; NHS England 2017d, 5, 2018b, 3).

The additional government funding is intended to support a reinvigorated network of AHSNs, the roles of which – as articulated by policymakers, AHSNs and other stakeholders we consulted – will revolve around coordinating and brokering innovation activities across the pathway in regions, sharing opportunities and experiences between regions and coordinating with national innovation networks. More specifically, these roles include:

170 See evidence including: interview analysis in Annex B, specifically evidence given by CharityPPIE_INT2, CharityPPIE_INT3, CharityPPIE_INT13; workshop analysis in Annex D, specifically the networks workshop, private sector workshop.

171 See evidence from the interview analysis in Annex B, specifically evidence given by Policymaker_INT3, Private_INT8, ProviderCCG_INT7, ProviderCCG_INT18.

172 See evidence from the interview analysis in Annex B, specifically evidence given by Policymaker_INT3, Private_INT8, ProviderCCG_INT7, ProviderCCG_INT18.

173 See evidence from the workshop analysis in Annex D, specifically the academics workshop, providers and commissioners workshop.
• Being involved in regional needs identification and articulation: AHSNs (as well as STPs) have potential to innovate around local needs, and through Innovation Exchanges also to identify needs that span individual localities and regions.

• Signposting decision makers to innovators and innovations, and vice versa.

• Supporting and facilitating the scaling and spread of relevant innovations for patient benefit (both locally developed and through adoption of proven innovations from elsewhere).

• Acting as neutral and honest knowledge and innovation brokers between different stakeholders across the system – and in particular between industry and NHS organisations.

• Providing clarity on the services and value they offer to regional stakeholders.

• Supporting innovators to progress and test their innovations in the real world (e.g. through information, evidence, brokering contacts and directing innovators to additional sources of support) and direct them to where they can find additional support.

• Raising the awareness and profile of innovation and helping promote innovative cultures.

• Helping facilitate improved collaboration and coordination of activities between different AHSNs through new Innovation Exchanges, which will facilitate greater connectedness and collaboration between the 15 AHSNs and with national actors, and help to support innovators, clinicians, patients and innovation uptake.

• Working in close cooperation with NHS Innovation National Networks, which should join up AHSNs with clinical and policy leads at the national level, and also support the identification, uptake and spread of innovations (Department of Health & Department for Business, Energy & Industrial Strategy 2017, 9).

As highlighted in the government’s response to the Accelerated Access Review (Department of Health & Department for Business, Energy & Industrial Strategy 2017) and by stakeholders we consulted, AHSNs should play a stronger role in the identification and articulation of regional needs to innovators. This requires working closely with different professions and organisations – e.g. healthcare staff across the hierarchy, different healthcare organisations, researchers and innovators – and through regular communication with local NHS organisational representatives to ensure that region-specific needs are considered. Needs should be collected systematically – and perhaps brought together in a ‘national library’, which could help innovators identify potential areas of focus – and communicated

174 See evidence including: interview analysis in Annex B, specifically evidence given by Academics_INT1, Academics_INT7, Academics_INT8, Academics_INT9, Academics_INT12, CharityPPIE_INT10, Networker_INT1, Networks_INT1, Networks_INT2, Networks_INT5, Networks_INT6, Networks_INT7, Networks_INT8, Networks_INT9, Networks_INT10, Policymaker_INT3, Policymaker_INT7, Private_INT4, Private_INT5, Private_INT8; workshop analysis in Annex D, specifically the networks workshop, policymakers workshop, private sector workshop, providers and commissioners workshop.

175 See evidence including: interview analysis in Annex B, specifically evidence given by Networks_INT1, Networks_INT2, Policymaker_INT3, Policymaker_INT7; workshop analysis in Annex D, specifically the networks workshop.

176 See evidence from the interview analysis in Annex B, specifically evidence given by Networks_INT1, Networks_INT7, Networks_INT8, Networks_INT10.
between and across regional and national actors, supported by Innovation Exchanges.\textsuperscript{177}

Expanding on AHSNs’ role in identifying and articulating needs, stakeholders also suggested creating a specific role for AHSNs in the national horizon-scanning process proposed in the \textit{Accelerated Access Review} (2016). AHSNs were felt to be best placed to contribute to horizon scanning as they regularly communicate with industry, have a good understanding of available innovations, and have experience in monitoring what works in different settings.\textsuperscript{178}

In addition to communicating needs to innovators, stakeholders also felt that AHSNs should have a stronger role as knowledge and innovation brokers between different stakeholders, and in particular in signposting decision makers to innovations and innovators, and vice versa.\textsuperscript{179} Knowledge brokering, in particular, plays a strong role in innovation as it has been shown that knowledge brokering organisations are able to transfer insights and knowledge between multiple domains and enable an iterative process between learning and innovation (Hargadon 2002). Contributors to the study indicated that decision makers within CCGs and Trusts are often not visible enough to businesses. However, for this to be effective, AHSNs would need to have more authority in the system and would need to play a bigger role in bringing together a diverse set of actors.\textsuperscript{180} As an interviewee noted, actors such as NHS professionals, academics or innovators live ‘in different worlds (…) they don’t understand each other. AHSNs have bridged this a little, but there are still issues’.\textsuperscript{181}

At present, AHSNs already play a role in brokering knowledge and information to industry and, often, helping them develop business cases for the NHS.\textsuperscript{182} However, in doing so, AHSNs need to remain neutral and neither support nor provide preferential treatment to particular companies or stakeholder groups.\textsuperscript{183} As one interviewee commented, AHSNs’ ‘neutrality enables us to build these relationships between innovators in different sectors and the NHS, because people trust our judgment on something’.\textsuperscript{184} There was widespread agreement that this neutral role should continue, but that particular aspects of the knowledge brokering function of AHSNs could be strengthened.

Firstly, they could have a stronger role in raising awareness of funding schemes and brokering information as to what is and is not available to different stakeholders, i.e. provide greater clarity in AHSN value offers as emphasised in the government’s response to the \textit{Accelerated Access Review} (Department of Health &

\textsuperscript{177} See evidence from the workshop analysis in Annex D, specifically the networks workshop.
\textsuperscript{178} See evidence from the interview analysis in Annex B, specifically evidence given by Academics\textunderscore INT1, Academics\textunderscore INT7, Networks\textunderscore INT7, Networks\textunderscore INT8, Networks\textunderscore INT9, Private\textunderscore INT4.
\textsuperscript{179} See evidence including: workshop analysis in Annex D, specifically the charities and PPIE workshop, networks workshop, survey analysis in Annex A.
\textsuperscript{180} See evidence including: interview analysis in Annex B, specifically evidence given by Academics\textunderscore INT8, Academics\textunderscore INT9, Academics\textunderscore INT12, Networks\textunderscore INT1, Networks\textunderscore INT5, Networks\textunderscore INT6, Networks\textunderscore INT9, Private\textunderscore INT7, Private\textunderscore INT8, workshop analysis in Annex D, specifically the networks workshop, policymakers workshop, private sector workshop.
\textsuperscript{181} See evidence from the interview analysis in Annex B, specifically evidence given by Academics\textunderscore INT9.
\textsuperscript{182} See evidence including: interview analysis in Annex B and case vignettes in Annex C, specifically evidence given by Networker\textunderscore INT1, Networks\textunderscore INT2, Networks\textunderscore INT6, Networks\textunderscore INT8, Networks\textunderscore INT9.
\textsuperscript{183} See evidence including: interview analysis in Annex B, specifically evidence given by Networks\textunderscore INT5, Networks\textunderscore INT8, workshop analysis in Annex D, specifically the private sector workshop.
\textsuperscript{184} See evidence from the interview analysis in Annex B, specifically evidence given by Networks\textunderscore INT8.
Innovating for improved healthcare

Department for Business, Energy & Industrial Strategy 2017). Two AHSN interviewees highlighted the need to ensure that initiatives are particularly clearly communicated to NHS stakeholders, noting that many decision makers in NHS organisations are not aware of key support mechanisms such as the ITT.186

Secondly, AHSNs should pay equal attention to brokering knowledge to the private sector and to NHS organisations, in particular ensuring that available innovations and associated knowledge, including the cost and quality gains associated with the adoption of new innovations, are clearly articulated and demonstrated to frontline staff.187 This should go further than just communicating available innovations to frontline staff, and should also support NHS organisations in measuring or evaluating the success of innovations.188 To this end (and as discussed in Chapter 6), AHSNs could support the operation of a platform for sharing ideas, including highlighting successful innovations and evaluations of innovations that could help spread innovations and prevent reinventing the wheel.189

While knowledge brokering can help bridge the gap between NHS needs and the innovations that can address them, as well as raise awareness of available innovations and initiatives there is also a need to promote innovative cultures. Networks workshop participants felt that AHSNs could help raise awareness and the profile of innovation at the regional level,190 for example by creating incentives such as awards for role models in the system, identifying, mentoring and supporting Innovation Scouts or Champions within local organisations, and by actively aligning incentives for frontline staff, middle managers and senior executives in provider organisations.191

While interviewees and workshop participants thought that AHSNs have already brought great value to their regions, they also felt that there is a need for more coherence and coordination between them to create greater efficiencies in the system.192 This need was explicitly highlighted by AHSN representatives, although they also referred to the new Innovation Exchanges, which should support the spread of known innovations and practices across AHSNs and consequently across regions in the future.193

A key aspect related to the Innovation Exchanges and identified by private sector workshop participants was to have a clearer overview of AHSNs’ areas of specialisation and

185 See evidence from the workshop analysis in Annex D, specifically the academics workshop.
186 See evidence from the interview analysis in Annex B, specifically evidence given by Networks_INT5, Networks_INT10.
187 See evidence including: interview analysis in Annex B, specifically evidence given by Networks_INT5, Networks_INT8; workshop analysis in Annex D, specifically the policymakers workshop.
188 See evidence from the interview analysis in Annex B, specifically evidence given by Networks_INT5, Networks_INT8.
189 See evidence from the interview analysis in Annex B, specifically evidence given by Academics_INT6, Academics_INT9, Academics_INT11.
190 See evidence from the workshop analysis in Annex D, specifically the networks workshop.
191 See evidence including: interview analysis in Annex B, specifically evidence given by Networks_INT9; workshop analysis in Annex D, specifically the networks workshop, private sector workshop.
192 See evidence including: interview analysis in Annex B, specifically evidence given by Academics_INT9, Networks_INT1, Networks_INT5, Networks_INT6, Networks_INT9, Private_INT4, Private_INT8; workshop analysis in Annex D, specifically the providers and commissioners workshop.
193 See evidence including: interview analysis in Annex B, specifically evidence given by Networks_INT1, Networks_INT5, Networks_INT6, Networks_INT9; workshop analysis in Annex D, specifically the networks workshop.
focus. This was seen as particularly important, as partnerships between the private sector, health service providers and AHSNs should be based on more than geography (i.e. individual AHSNs’ key areas). To allow these partnerships to go beyond spatial boundaries, companies should be encouraged to partner with the AHSN with the most appropriate network and skills rather than simply their local AHSN. If AHSN specialisations are clarified, local AHSNs could be the signpost place and first point of contact to the appropriate AHSN. This messaging needs to be clear from both AHSNs and national policymakers.194

Networks and private sector representatives also noted that sustainability discussions and planning between AHSNs will need to happen while balancing a degree of inevitable competition (resource-constraint-related, mainly) between them that takes place within an overarching framework and spirit of collaboration.195

Achieving better coordination and addressing the areas for strengthened roles outlined above, however, will also require sustainable funding for AHSNs. Greater clarity and transparency on what the future national funding support for AHSNs will be like, and ‘what strings are attached’, should aid any discussions on the form and function of the AHSNs in future.196 Our prioritisation workshops identified a desire to think creatively about alternative ways of generating revenue, such as membership fees, grants or evaluation work, though caution should be exercised as regards payments from the private sector in order to maintain neutrality.197

194 See evidence from the workshop analysis in Annex D, specifically the private sector workshop.
195 See evidence from the workshop analysis in Annex D, specifically the networks workshop, private sector workshop.
196 See evidence including: interview analysis in Annex B, specifically evidence given by Academics_INT4, Private_INT4, Private_INT8, Networks_INT9; workshop analysis in Annex D, specifically the academics workshop, networks workshop.
197 See evidence from the workshop analysis in Annex D, specifically networks workshop, private sector workshop.
Facilitating meaningful patient and public involvement and engagement with innovation
8.1. Summary

Current landscape: issues and developments

- The innovating health system needs to create opportunities for PPIE across the entire innovation pathway, while at the same time mitigating the risks of tokenistic involvement that mandatory engagement can unintentionally lead to. National policy and regional practice needs to be based on evidence about what value PPIE can add and how it can best be mobilised.

- PPIE takes place through a broad range of activities. Examples include: identifying innovation needs (e.g. through priority-setting partnerships, as part of Trust, commissioner, AHSN and Test Bed lay committees and reference groups, and selection panels for funding awards); providing input into design and testing; establishing educational activities and materials for patients about new innovations; advocating for uptake; generating evidence for innovation and disseminating it; supporting implementation of innovations in hospital change programmes; participating in evaluations; and recruiting PPIE contributors from peer communities.

- The current landscape has evolved and is recognising the value of experiential evidence. There are beginning to be opportunities for PPIE across the innovation pathway. Despite developments, a systemic and coordinated strategy for PPIE with innovation does not yet exist in the health system in England. There is transferrable learning to be gained from the research and quality improvement space where developments in understanding how meaningful PPIE can be enabled are maturing (e.g. through the efforts of NIHR, INVOLVE, National Voices, Trust lay panels, charities and community organisations).

For engagement to have value, it has to be meaningful in relation to the innovation effort in terms of its quality, relevance, efficiency and impact. Patients and the public should have a good experience of engagement in terms of having clarity in relation to the goals of engagement, their roles and remits, feedback on their impact and on progress with the innovation effort and training to support effective contributions.

Key areas to inform the prioritisation of actions for improving the PPIE landscape relating to innovation

- Establish a national strategy and implementation plan for PPIE in innovation, based on the following seven principles: (1) ensuring that PPIE is meaningful and not a tick-box exercise; (2) embedding PPIE opportunities across the innovation pathway and communicating them to patients and the public in an accessible language and format; (3) pursuing diversity in the types of individuals that can contribute and recognising a need for an appropriate match between the type of PPIE representative and the nature of engagement needed; (4) building capacity for patients, carers, the public, innovators, providers, policymakers and researchers to engage with each other and to share experiences about the value of engagement and effective ways of engaging; (5) providing feedback on the value and impact of PPIE and on the progress and impact of the innovation initiatives; (6) acknowledging and rewarding contributors; and (7) evaluating PPIE processes and outcomes.

- Coordinate and sustainably fund and resource PPIE activities between local,
regional and national stakeholders and across improvement, innovation and research efforts. To achieve this:

- Map and identify existing PPIE structures within regions, nationally and across the research, innovation and delivery spaces they focus on. This will help coordinate the use of existing capacity in the system.

- Act on knowledge about what enables meaningful PPIE in innovation activities and their implementation.

- Signpost information that is important for patients and the public on innovations that are available, on the impacts of those innovations, and on PPIE opportunities for engaging with innovation in the national and regional information and evidence infrastructure.

- Ensure signposting and communication efforts make use of information sources that patients and the public consult (e.g. social media platforms, peer support groups and websites, charities, NHS websites such as NHS Choices, and health professionals). These information sources should feed into a national information platform and inform the PPIE activities of AHSNs, healthcare provider organisations and charities.
8.2. The current patient and public involvement and engagement landscape: reflecting on issues and developments

There is growing recognition that a sustainable and effective innovating health system needs to establish mechanisms that can support the involvement and engagement of patients and the public throughout the innovation pathway, from idea generation through to design, feedback and evaluation and advocacy-related activities (Cox et al. 2018). However, whereas systemic capacity to effectively engage patients and the public needs to be built with a whole-pathway approach in mind, meaningful involvement at the level of individual projects does not mean involvement in all aspects. Some individuals will have expertise or experience to contribute to design or to the testing of innovations, whereas others may be particularly suited to advocacy activities or to the dissemination of evidence. For example, the development of a medical device for a given health condition will need to target specific patient or public profiles, whereas other innovations, such as a digital self-care or health-promotion platform, will benefit from the input of diverse contributors. Similarly, not every innovation project will require PPIE at every stage of the pathway (Ball et al. 2019).

Across the regions considered in our research, health and care actors are working to engage patients and the public with health innovation through a diversity of channels. This includes dialogue between patients and those in the health system, awareness-raising about involvement needs and opportunities, and advocacy with the third sector. It is also possible to demonstrate innovations and their utility directly within communities, such as in supermarkets, at schools or during sports events, or through internet platforms and institutional patient and public participation or reference groups (Marjanovic et al. 2017b). Evidence also suggests that involving patients and the public can support the adoption and diffusion of innovations (Ball et al. 2019). If patients are exposed to the benefits of a particular innovation and can advocate for its adoption, this can influence health professionals’ attitudes so they are more likely to adopt it (Grol & Wensing 2004). Stakeholders across our sources of evidence described many examples of where PPIE had enriched the innovation process, including:

• Setting up patient reference groups and patient engagement roles within NHS Trusts, CCGs, AHSNs and Test Beds.
• Engaging the private sector to support the NHS in gathering patient views and experiences.

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198 This was also a recommendation in the UK Government’s response to the Accelerated Access Review (Department of Health & Department for Business, Energy & Industrial Strategy 2017). Evidence for this point is also supported by research from Phase 1 of this study which was summarised in the interim report (Marjanovic et al. 2017b). Henceforth in this chapter, references to evidence that was summarised in that report will be provided in footnotes to reflect the fact it is part of the broad evidence base of primary research conducted for this study (as opposed to being a part of the wider literature on the topic of health innovation).

199 There is a plurality of terms used to refer to the concept of patient and public involvement and engagement (PPIE), and various organisations, including NIHR and INVOLVE, who are established leaders in the subject, have tried to clarify the terms. INVOLVE uses involvement to describe contributions ‘where members of the public are actively involved in research projects and research organisations’; engagement to describe ‘where information and knowledge about research is provided and disseminated’; and participation to describe ‘where people take part in a research study’ (National Institute for Health Research 2015). In this report, we use both the words involvement and engagement, as both provide scope for contributions beyond one-way receipt of information.
• Creating patient-led innovations and patient-led prioritisation initiatives.
• Establishing educational activities for patients about new innovations.
• Participating in NHS-led initiatives and activities such as the NHS Innovation Accelerator, Research for the Future, the Working in Partnership Programme and the Cavendish Coalition were specifically mentioned by our survey respondents.200

As these examples show, while there has been growing attention towards PPIE in innovation activity over the past few years, it is still at a smaller scale in the research policy sphere, where NIHR and INVOLVE have championed efforts and developed guidance for good practice.201 Ball et al. (2019) have also shown that there is a stronger and more mature evidence base on what works and what doesn’t in the research space. For example, INVOLVE has created guidelines specifically for involving patients in research, highlighting that this represents a relationship between patients and the healthcare system rather than a consultation. INVOLVE also undertakes activities to support the embedding of PPIE principles throughout the research system, such as supporting the development of lay summaries for NIHR grant applications and providing a library of good practice examples of effective PPIE and the impact it can have.

In order to engage patients successfully, it is important to identify the various methods through which patients access health-related information and determine how these can be integrated with engagement activities.202 In the innovation space, the Accelerated Access Review (2016) has put the spotlight on the need for greater PPIE involvement with innovation across the pathway, particularly in the early evaluation of new innovations. It outlines the use of ‘I statements’, a set of principles which outline what good PPIE looks like in practice. Equally, the recent evaluation of the NHS Innovation Accelerator found that keeping the patient/user perspective at the forefront of efforts to refine innovations was a particular benefit of the programme (Cox et al. 2018).

However, our research shows that achieving effective patient and public involvement is challenging, and there were some concerns expressed across our sources of evidence over tokenistic attitudes on the part of innovators and limited, fragmented and highly variable PPIE practices in innovation.203 This highlights the need to ensure that involvement is meaningful for the innovation process, and is based around an understanding of what value patients and the public can add and how that value can best be mobilised (Cox et al. 2018). One finding from our study is that in order to encourage patient and public involvement with innovation activity, the innovation system and the NHS need to embrace multiple types of evidence, extending beyond just scientific and trials data and including evidence based on experience.204 However, there are concerns that there is limited receptiveness to such diverse types of evidence and experiential knowledge by the innovation and healthcare professional

200 See evidence including: survey analysis in Annex A, evidence from Phase 1, presented in Marjanovic et al. (2017b).
201 INVOLVE is a government-funded, national group supporting patient involvement in the NHS, public health and social care research space.
202 See evidence including: workshop analysis in Annex D, specifically the charities and PPIE workshop, networks workshop; evidence from Phase 1, presented in Marjanovic et al. (2017b).
203 See evidence from Phase 1, presented in Marjanovic et al. (2017b).
204 See evidence from the workshop analysis in Annex D, specifically the charities and PPIE workshop.
8.3. Analysis to support the areas for action

Our analysis identified a number of ideas about how to facilitate greater and more meaningful patient and public involvement and engagement with innovation. The overarching priority is the establishment of a national strategy with both national and regional implementation plans for PPIE with innovation. Such efforts need to clearly define a set of principles and values to underpin the strategy and develop and coordinate a series of activities that meaningfully engage local, regional and national stakeholders across improvement, innovation and research spaces.

8.3.1. The national strategy for patient and public involvement with innovation should be based on a clearly articulated set of principles and values

A set of clearly defined principles and values should be co-developed with patients and the public to underpin the PPIE with innovation strategy, including:

- Ensuring that PPIE is meaningful and not a tick-box exercise.
- Embedding PPIE opportunities across the innovation pathway and communicating them to patients and the public in an accessible language and format.
- Pursuing diversity in the types of individuals that can contribute and recognising a need for an appropriate match between the type of PPIE representative and the nature of engagement needed.

The strategy should be framed by a set of core principles and values that ensure patient and public involvement is meaningful and relevant. The establishment of such a set of principles was the most frequently mentioned concept related to a PPIE strategy for innovation by our stakeholders, particularly those in the charity and PPIE sector. They consistently emphasised that patient and public involvement is not just a tick-box exercise and should be seen as a way of getting new ideas and different perspectives, rather than as a burden.205 Alongside this, the strategy should ensure that diverse voices and patient and public profiles are reflected and represented in PPIE efforts. This means that the values should be co-produced and developed with the relevant communities of patients, the public, researchers, innovators, policymakers, providers and health professionals.206 They also need to be based on an understanding of the goals of PPIE in innovation initiatives, projects and programmes, what motivates patients and the public to engage, and what the scope of their engagement is. Once established, a complementary set of actions is needed to identify, coordinate and implement activities.

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205 See evidence from the interview analysis in Annex B, specifically evidence given by CharityPPIE_INT2, CharityPPIE_INT6, CharityPPIE_INT7, CharityPPIE_INT10, CharityPPIE_INT12, CharityPPIE_INT13, CharityPPIE_INT14, Private_INT2.

206 See evidence from the workshop analysis in Annex D, specifically the Charities and PPIE workshop.
to meaningfully, actively and effectively involve patients in the innovation process at local, regional and national levels. Box 25 outlines some examples of where our stakeholders felt that PPIE activities were already reflective of the principles and values outlined above.

Box 25: Examples of cases where PPIE activities were deemed to be meaningful and reflective of core principles and values

Examples of meaningful PPIE activities highlighted in our study were based on either stakeholder perceptions of unmet need, or positive prior experiences of PPIE activities such as:

- Setting NHS priorities and needs, as is seen in national Priority Setting Partnerships (see, e.g., James Lind Alliance 2018), especially during horizon scanning as patients often have first-hand experience of gaps in the NHS and can be more knowledgeable than clinicians on the newest drugs and technologies for their specific condition. However, not all interviewees agreed that patients should be involved in identifying needs for horizon scanning, or else they argued that if they are involved they need to have appropriate training first to ensure they can contribute effectively.

- Ensuring innovation fits the needs of patients, for example by engaging them in innovation design.

- Providing information on new innovations and the evidence behind them, as well as what constitutes ‘good’ evidence.

- Supporting implementation of innovations in hospital change programmes: this can allow a better understanding of what change and support is required when implementing an innovation.

- Being involved in the Accelerated Access Pathway selection panel (although it may be difficult to identify patients or members of the public who are condition neutral).

- Taking on patient engagement roles as part of Trust and CCG structures, AHSNs and Test Beds and other institutions, where patient representatives are encouraged to participate in innovation-related activity.

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207 See evidence including: interview analysis in Annex B, specifically evidence given by Academics_INT1, Academics_INT2, Academics_INT4, Academics_INT5, Academics_INT6, Academics_INT7, Academics_INT8, Academics_INT9, Academics_INT11, Academics_INT12, Academics_INT13, CharityPPIE_INT1, CharityPPIE_INT2, CharityPPIE_INT9, CharityPPIE_INT10, CharityPPIE_INT11, CharityPPIE_INT12, CharityPPIE_INT13, Networks_INT1, Networks_INT3, Networks_INT4, Networks_INT5, Networks_INT7, Networks_INT8, Networks_INT9, Policymaker_INT2, Policymaker_INT6, Policymaker_INT8, Private_INT1, Private_INT2, Private_INT5, Private_INT7, Private_INT8, ProviderCCG_INT6, ProviderCCG_INT9, ProviderCCG_INT12, ProviderCCG_INT13, ProviderCCG_INT14, ProviderCCG_INT18, ProviderCCG_INT19, ProviderCCG_INT20, ProviderCCG_INT21, ProviderCCG_INT22; workshop analysis in Annex D, specifically the charities and PPIE workshop.
8.3.2. Coordinating PPIE activities across the innovation pathway, between research, innovation and improvement efforts, and at local, regional and national levels

A set of PPIE activities should be coordinated that span the innovation pathway and meaningfully involve and engage patients and the public. Dedicated mechanisms are needed to coordinate these PPIE activities between local, regional and national stakeholders and across improvement, innovation and research efforts. These could include:

- Mapping and identifying existing PPIE structures within regions and on a national scale, as well as the different research, innovation and delivery spaces they focus on. This is a first step for ensuring better coordination within the system.
- Implementing specific activities that enable engagement across the pathway and stakeholder groups, such as: prioritisation exercises of themes and topics; design of innovation projects; evaluation activities; making the case for change and dissemination of evidence; and brokering PPIE networks as a conduit for engagement with the wider health and care community of patients, carers and the public. Activities should enable capacity-building and facilitate learning between communities and should be sustainably resourced.
- Ensuring existing structures in the system facilitate effective management and signposting of information about PPIE needs and opportunities, and help coordinate with national and regional bodies.
- Raising awareness about opportunities for involvement among a diverse range of individuals, making use of information sources and channels that patients and the public consult.

A consistent message across our study was that there need to be significant improvements in coordinating PPIE activities, information and infrastructure across the health system, at national, regional and local levels and across different types of organisations. There is currently no national leader for PPIE specifically within the innovation space, few regional approaches to PPIE, and many condition-specific organisations have only recently set up local PPIE groups. Although INVOLVE has driven PPIE forward with research in recent years, more is needed to bridge the gap between PPIE in research and PPIE in innovation. According to our stakeholders, improved coordination calls for:

- Mapping existing PPIE structures and activities within regions and on a national scale, and identifying to what extent existing structures and activities focus on PPIE for research, health service delivery, improvement and/or innovation spaces. This will be a first step towards making better and more coordinated use of existing capacity in the system.
- Identifying from the mapping exercise where opportunities for better coordination across research, service delivery and innovation spaces exist. Coordination efforts should involve identifying and acting upon PPIE needs, as well as managing existing capacity in the system. Access to information on existing training and guidance on PPIE from the research space could also be used to support capacity in the innovation space, such as that provided by INVOLVE.
- Ensuring existing structures in the system facilitate effective management

See evidence including: interview analysis in Annex B, specifically evidence given by CharityPPIE_INT10, CharityPPIE_INT11, Policymaker_INT2; workshop analysis in Annex D, specifically the academics workshop, charities and PPIE workshop, networks workshop, private sector workshop.
of information about PPIE needs and opportunities. This includes signposting to PPIE structures (individuals, panels, etc.) in the system and helps in terms of coordinating with national bodies and building capacity to raise awareness about opportunities for involvement to a diverse range of individuals.

These types of coordination activities could be carried out through AHSNs or quality improvement networks, at the national level through existing advisory bodies and platforms in the research space that could also be active in the innovation space (like INVOLVE, National Voices, and/or the National Cancer Research Institute), or by encouraging people in research PPIE communities to take on an innovation-specific focus. Many stakeholders suggested that an umbrella group could serve as a PPIE knowledge broker of sorts, facilitating effective management of information about PPIE needs and opportunities, signposting to PPIE infrastructures (individuals, panels, etc.) in the system, and helping coordinate activities that happen locally or regionally, both with each other and with national bodies. The latter point, in particular, could help support local efforts to be involved with and influence the national policy agenda.

Specific ideas about which involvement and engagement activities can and should be implemented were highlighted by our stakeholders as well as in the wider literature (Accelerated Access Review 2016) and through the case vignettes, in particular the need to ‘create mechanisms for patient-driven innovations’. Examples of success were abundant: for example the NHS Blood Donor Chair, MoodGYM and Sleepio demonstrate how patients can play a critical role in the design of innovation projects (see Box 26). Building on these examples, specific activities that could be implemented may include: prioritisation exercises of themes and topics; design of innovation projects; evaluation activities; making the case for change and dissemination of evidence; and brokering further PPIE networks as a conduit for engagement with the wider health and care community of patients, carers and the public.

Stakeholders also emphasised that any set of future PPIE activities should enable capacity-building amongst the patient and public, researcher, innovator, provider, policymaker and healthcare professional communities, as this will allow for engagement between these groups and contribute to the long-term sustainability of the activities. Capacity-building amongst the innovator community, in particular, is required so that they avoid jargon and know how to clearly specify involvement goals for patients and the public, while capacity-building amongst the patient and public community will empower them.

209 See evidence from the workshop analysis in Annex D, specifically the charities and PPIE workshop, networks workshop.
210 See evidence from the interview analysis in Annex B, specifically evidence given by CharityPPIE_INT2, CharityPPIE_INT11.
211 See evidence including: interview analysis in Annex B, specifically evidence given by Academics_INT7, CharityPPIE_INT12, CharityPPIE_INT13, Policymaker_INT8, Private_INT8; workshop analysis in Annex D, specifically the charities and PPIE workshop, networks workshop; evidence from Phase 1, presented in Marjanovic et al. (2017b).
212 This was the most frequently selected option in our survey of what is the single action that could have the biggest impact on PPIE (see survey analysis in Annex A).
213 See evidence from the interview analysis in Annex B, specifically evidence given by CharityPPIE_INT10, Policymaker_INT2.
to express their views with confidence.\textsuperscript{214} To
give one example, from Scotland, the Realistic
Medicine approach was introduced in 2016 in
the Chief Medical Officer for Scotland’s annual
report, \textit{Realistic Medicine} (NHS Scotland & The
Scottish Government 2016), with the goal of
improving patient involvement in health and
social care. More specifically, its key aim is
to have ‘the person’ at the centre whenever
decisions are made about that person’s care.
For instance, Realistic Medicine actively seeks
to empower patients to ask questions in their
consultations with healthcare professionals,
so that they receive the most appropriate care
(NHS Scotland & The Scottish Government 2017) (see also Box 30 in Section 9.3.2 for
more detail on Realistic Medicine in Scotland).
It also highlights the scope for providing better
care by reducing harm and burdens resulting
from over-investigation and over-treatment,
reducing public costs and preventing waste,
and in doing so helps to reduce unwarranted
variation in both clinical practice and
outcomes.
Implementing PPIE activities will require
diverse communication and recruitment
methods, and sustainable funding sources.
Recruitment of patients and the public
must be done carefully, ensuring clarity in
communication of aims and what type of
patient is needed.\textsuperscript{215} Care needs to be taken to
distinguish when a patient or member of the
public moves from being a lay representative to
a ‘patient expert’. The latter is likely to provide
different viewpoints\textsuperscript{216} and different kinds of
input, and may need to be involved at different
points in the innovation pathway.\textsuperscript{217}
In addition, a diverse range of communication
methods, modes and platforms can help in
recruiting and engaging a variety of patients.\textsuperscript{218}
The use of internet platforms, such as social
media and patient engagement platforms (e.g.
\textit{HealthUnlocked}\textsuperscript{219} or \textit{PatientsLikeMe}\textsuperscript{220}), can be
effective. Communication methods should not
be exclusively internet-based, though, as this
can exclude certain populations, particularly
elderly patients or those from lower socio-
economic backgrounds who may not have
internet access (Ball et al. 2019).\textsuperscript{221} We have
identified that umbrella PPIE organisations,
online engagement platforms and medical
charities are in the best position to reach out
to these populations.\textsuperscript{222} Direct outreach and
community engagement will be important
for these groups, for example through
roadshows, and coordinating bodies should
have responsibility for monitoring the types of

\begin{enumerate}
\item One interviewee noted that capacity building of this nature is particularly important for smaller PPIE groups, who need
additional support in creating the capacity to conduct effective PPIE (see Annex B, CharityPPIE_INT11).
\item See evidence from the workshop analysis in Annex D, specifically the charities and PPIE workshop, policymakers
workshop.
\item See evidence from the workshop analysis in Annex D, specifically the policymakers workshop.
\item In light of the \textit{Accelerated Access Review} (2016), it is worth noting that this was highlighted in our study in particular
when discussing patient and public involvement in horizon scanning (see Annex B, Networks_INT7, Networks_INT8,
Networks_INT10, ProviderCCG_INT14).
\item See evidence from the workshop analysis in Annex D, specifically the charities and PPIE workshop, networks workshop.
\item See HealthUnlocked (n.d.).
\item See PatientsLikeMe (n.d.).
\item See evidence including: interview analysis in Annex B, specifically evidence given by Policymaker_INT2; workshop
analysis in Annex D, specifically the charities and PPIE workshop; survey analysis in Annex A, evidence from Phase 1,
presented in Marjanovic et al. (2017b).
\item See evidence from Phase 1, presented in Marjanovic et al. (2017b).
\end{enumerate}
patients being engaged with to ensure diverse involvement.223

Across all modes of communication, messages should be effective and tailored to the needs, abilities and experiences of patient and public groups, and not presented using technical wording. For example, patients and the public need a good understanding of what innovation means. They should also be made aware of the opportunities and barriers to innovation in the health system, how innovation relates to quality improvement and how they can best engage with and contribute to the process.224

Finally, in implementing PPIE activities, the national strategy should provide dedicated, long-term resources that are well-managed and consistent over time.225 These should include financing, guidance documents and resource support to help charities and other organisations establish committed PPIE teams. In order to fully embed PPIE, Trusts could incorporate a requirement for PPIE within funded innovation activities.226 For example, the NHS Innovation Accelerator programme requires all applicants to demonstrate their plan to include patient and end user involvement in their product design and development. However, any requirements will need to avoid tokenistic practice by mandating involvement and focusing on how meaningful involvement can be ensured. Meaningful involvement does not mean involvement in everything, but it does mean considering whether and how value can be added in individual activities and stages (Ball et al. 2019). This element should be a central component of any future evaluation framework included in the regular evaluation of PPIE activities, including deepening our understanding of what is meant by meaningful engagement and adjusting PPIE activities as appropriate.

223 See evidence from the interview analysis in Annex B, specifically evidence given by CharityPPIE_INT6.
224 See evidence from Phase 1, presented in Marjanovic et al. (2017b).
225 See evidence from the interview analysis in Annex B, specifically evidence given by CharityPPIE_INT9.
226 See evidence from Phase 1, presented in Marjanovic et al. (2017b).
Box 26: Case vignette examples of successful patient and end user engagement in innovation development

The following examples demonstrate how patient and public involvement and engagement as end users can help to improve the design of new innovations, making them more likely to be adopted.

The **NHS Blood Donor Chair** is an innovative chair that improves donor comfort and safety, especially by reducing the number of donors fainting, and is easier to transport and clean. The NHS National Innovation Centre (NIC) engaged the public in the innovation development process by sending questionnaires to blood donors to collect their views on areas that needed improving with existing donor chairs. One of the key improvement areas identified was the need for the chair to take into account the difference between the recovery position and the blood donating position, resulting in the unique shape of the new blood donor.227

**MoodGYM** is a form of cCBT aimed at young people suffering mild to moderate anxiety or depression. End-user engagement in the product’s development ensured that the content was appropriate for the target patient group (young people with mild to moderate depression or anxiety). A focus group to demonstrate the MoodGYM pilot to potential users provided the innovation team with feedback on how to improve the user-friendliness of the software and ensure that there were no barriers to accessing it.228

**Sleepio** is a digital CBT programme aiming to help users improve their sleep and overcome insomnia. Patients were engaged in the design and testing of the programme, which enhanced its user-friendliness and helped to ensure that relevant and effective content is provided. Ongoing feedback from users further facilitated adaptations over time.229

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227 See evidence from case vignette interviews in Annex C, specifically evidence given by CCG_INT2.

228 See evidence from case vignette interviews in Annex C, specifically evidence given by Innovator_INT6.

229 See evidence from case vignette interviews in Annex C, specifically evidence given by Innovator_INT7.
Developing a funding and commissioning landscape to support innovation across the pathway
9.1. Summary

The current landscape: issues and developments

- A variety of funding schemes support innovation in the health system, but there is a need to improve their visibility and coordination as well as the sustainability and stability of funding flows.

- Mapping the funding landscape is important for enabling evidence-based, strategic dialogue about how to better coordinate funding sources and flows across different stages of the innovation pathway, from development through to uptake and scale-up. The Department of Health and Social Care and NHS England are conducting a mapping exercise and have identified a range of public sector research and innovation funders. The list of funding schemes is not yet in the public domain.

- Historically, a greater number and variety of schemes have focused on innovation development funding than on financial support to enable the adoption and diffusion of innovation in the health system. However, funding is needed across the pathway. There is now increased recognition of the need to support uptake, with initiatives such as the ITT, ITP, NHS Innovation Accelerator programme and outcome-based commissioning programmes.

Key areas for action to improve and support a whole-systems approach to a funding portfolio, rather than successful silos

- Allocate and coordinate public funding to achieve scale and complementarities in the funding landscape and to ensure that promising innovations can progress through the pathway. Do so through collaborative working between government departments, arms-length bodies and other funders (e.g. through joint funding programmes or shared posts for individuals). Take stock of existing funding schemes, their roles, remits, complementarities or overlap and where they sit in relation to NHS innovation needs and priorities. Efforts to better coordinate the allocation of innovation funding will need to recognise that different types of innovations, and different activities along the innovation pathway, may be associated with different costs.

- Raise awareness and provide clarity to stakeholders about available funding schemes and how such schemes are related and/or complementary. Support identification of downstream funding to develop, adopt or scale-up innovations through time. It is important for innovators to be able to navigate a funding system and to be motivated by the opportunities ahead.

- Revisit and refresh the push and pull funding mechanisms in the system to ensure that they support the development and uptake of innovations with diverse cost and quality benefit profiles over time. A policy focus on cost-neutral or cash-saving innovations alone will not incentivise or sustain the enthusiasm of the diverse stakeholders that need to support an innovating NHS.

- Enable an innovation portfolio strategy that balances short- and long-term considerations about upfront investments, short-term returns and longer-term cost and quality gains through a de-politicised
structure (cross-party and cross-departmental committee). Portfolio management techniques can support transparent and robust decision making on portfolio investments.

• Complement pull mechanisms that respond to the supply of existing innovations (e.g. ITT and ITP) with new pull mechanisms that are more responsive to demand (e.g. pre-commercial procurement commitments for innovations that respond to an articulated demand or meet quality and cost criteria; scalable and sustainable outcome-based commissioning; or adaptive commissioning models).

• Explore and evaluate the effectiveness and scalability of flexible and adaptive risk-sharing agreements between private sector innovators and the NHS (e.g. agreements that cover upfront costs of testing products for SMEs; flexible and adaptive pricing arrangements dependent on real-world performance or guaranteed market access and price-volume agreements; conditional reimbursement; and deferred payments).
9.2. The current funding and commissioning landscape: reflecting on issues and developments

The funding landscape for innovation is characterised by diverse sources including national funding pots and regional and organisational resources (see Box 27). Whereas some diversity is needed for a competitive innovation landscape, there is considerable fragmentation at present. As a result, the funding landscape is often unable to achieve the critical mass required to support innovations across the pathway. This is perhaps the natural result of an accretion of separate policy responses to perceived problems over many years, but has led to concerns about the sustainability of any one effort.

In particular, a greater number and variety of schemes have, historically, focused on innovation development funding (e.g. Innovate UK funding such as the SBRI, the NHS England Clinical Entrepreneurs Training Programme, the NIHR Invention for Innovation Programme, catalyst and catapult funding, private sector and philanthropic funding, grant funding, and seed funding from Trusts and AHSNs) than on financial and associated support to enable the adoption and diffusion of innovation in the health system (e.g. ITT, ITP, the NHS Innovation Accelerator and outcome-based commissioning models).\(^\text{231}\)

Box 27: Examples of national and regional funding schemes

A range of national funding programmes was identified by stakeholders: SBRI Healthcare; NHS England Innovation funding, including for the NHS Innovation Accelerator and Clinical Entrepreneur programmes; the NIHR Invention for Innovation (i4i) programme; Innovate UK funding through, for example, grants for health and life science enterprises; Accelerators, Catalysts and Catapults; European Union funding programmes, including framework programmes and European Regional Development Funds; private sector funding; philanthropic funding, for example through the Health Foundation and medical charities; and GrantFinder, a web-based search system for finding small pockets of funding, including for research and development, although predominantly for research grants.

Regionally and locally, stakeholders identified funding programmes including mini-competitions for seed funding in Trusts, CCGs and AHSNs, such as: ‘Dragon’s Den’-style competitions in the London, Greater Manchester and North West Coast and Eastern regions; small ring-fenced pots of innovation funding put aside by City and Hackney CCG; and an Eastern region Health Enterprise East-led collaboration that has recently launched a MedTech Accelerator, offering proof-of-concept funding to progress medical technology and software innovations that meet unmet clinical need in the NHS.

\(^{231}\) See evidence including: interview analysis in Annex B, specifically evidence given by Academics_INT1, Academics_INT6, Academics_INT8, Academics_INT10, Networks_INT2, Networks_INT5, Networks_INT8, Networks_INT10, Private_INT2, Private_INT4, Private_INT7, ProviderCCG_INT6, ProviderCCG_INT11, ProviderCCG_INT16, ProviderCCG_INT19, ProviderCCG_INT20, ProviderCCG_INT21, ProviderCCG_INT22; workshop analysis in Annex D, specifically the academics workshop, networks workshop, private sector workshop; survey analysis in Annex A (55.6 per cent of respondents found stable and sustainable national funding programmes to be key for an innovation-supportive health system); evidence from Phase 1, presented in Marjanovic et al. (2017b).
In balancing schemes across innovation development (supply) and adoption and diffusion (demand), there are two central challenges to overcome: (1) supporting a coordinated funding approach across the entire innovation pathway; and (2) ensuring funding scheme and funding pathway sustainability. While increased policy focus on the coordination of funding has been unfolding recently, we need to move beyond a situation where individual innovations make a difference in some areas, but not across the wider system. A key risk is that each funding mechanism addresses a specific need, but in so doing leaves the wider innovation system untouched (or, even worse, weakens that system by confusing decision makers and distracting from strategic goals). Overcoming this will require a funding approach that supports the changes in culture and attitudes to innovation that are needed for widespread engagement with an innovating health system, and for a sustainable landscape.

Taking each challenge in turn, any coordinated funding landscape must seek to align and balance ‘innovation push’ and ‘innovation pull’ financial instruments and associated policy initiatives. The concept of ‘innovation push’ versus ‘innovation pull’, and how they should best be managed, is a well-researched and acknowledged phenomenon (see, e.g., Edler & Georghiou 2007).

In the ‘innovation push’ landscape, stakeholders identified diverse schemes (outlined above) supporting the development of innovations, but they felt that the landscape was unable to achieve the critical mass and scale required to support innovations across the pathway. From an innovation pull perspective, stakeholders highlighted the potential for a range of mechanisms to make a difference in supporting innovation, including outcome-based payments and risk and reward-sharing agreements, as well as the streamlining of evaluation and commissioning requirements. The latter would help to consider financial pull that responds to demand as well as supply, and ensure that financial returns from innovations are fed back to support further innovation in the health system (and accountability for the financial management of innovation-related cash flows). And while some funding schemes are thought by stakeholders to be working well,
including NIHR-commissioned calls, the SBRI, the NHS Innovation Accelerator, Catapults, and the ITT and ITP; others were identified as needing to be realigned with innovation outcomes (see also Box 28 for examples of where funding schemes and policies have supported innovation activities). For instance, five survey respondents commented that the Commissioning for Quality and Innovation (CQUINs) payments framework tended to be used for performance management rather than innovation and improvement.236

Box 28: Case vignette examples of when funding schemes have successfully supported innovation development, adoption and diffusion across the pathway

CHC2DST was supported by the SBRI funding scheme. IEG4, the developer of CHC2DST, used their SBRI funding to conduct a health economic assessment which found that CHC2DST could provide huge savings across England. This significantly improved the business case IEG4 presented to CCGs, leading to increased adoption of the toolkit (Belsey 2017).237

UroLift® is a minimally invasive surgical technique for benign prostatic hyperplasia that involves introducing a device through the obstructed urethra to lift and hold the enlarged prostate tissue in order to clear the opening of the urethra. The ITT played a positive role in increasing uptake at system level as it triggered support from AHSNs, which helped development of relationships between the innovators, commissioners and healthcare providers to increase diffusion of UroLift® across the NHS.238

Other innovations discussed in our case vignettes were recently put on the ITP and ITT schemes. Therefore, the ultimate impact of the schemes on the uptake of these innovations in the health system remains to be seen, although they are enabling financial impetus. Examples include:

- ENDOCUFF VISION™, a medical device used as a colonoscope attachment to improve mucosal visibility for the detection of abnormalities such as polyps, ultimately leading to better prevention of bowel cancer, was recently selected on the ITP scheme. This is expected to enable wider uptake of ENDOCUFF VISION™ in the NHS as several significant financial barriers to adoption can now be overcome (NHS England 2018a).239
- SecurAcath, a single-use device to secure and stabilise central venous catheters, is one of the four innovations selected on the ITP scheme for 2018/2019 (NHS England 2018a).
- HeartFlow FFRct Analysis, a non-invasive coronary artery disease detection tool, was selected on the ITP scheme for 2018/2019 (NHS England 2018a). Innovator interviewees see the scheme as a ‘gate opener’ to the healthcare system in England.240

236 See evidence from the survey analysis in Annex A.
237 See evidence from case vignette interviews in Annex C, specifically evidence given by Innovator_INT18, Networker_INT1.
238 See evidence from case vignette interviews in Annex C, specifically evidence given by Innovator_INT11.
239 See evidence from case vignette interviews in Annex C, specifically evidence given by Innovator_INT15.
240 See evidence from case vignette interviews in Annex C, specifically evidence given by Innovator_INT17, Innovator_INT19.
It is difficult to provide data on whether the balance between investments in innovation push and those in innovation pull is appropriate or not, given that development of diverse innovations and adoption pathways has different cost and timeline profiles. However, in summary, the general view amongst our stakeholders, including in the private sector, is that the greater policy focus on supply rather than demand initiatives has supported a vibrant but increasingly dispirited entrepreneurial sector. This has, in turn, led to a situation where ensuring effective demand and a sustainable innovation pathway in the NHS has remained difficult.\textsuperscript{241}

Another challenge is to ensure the scale and sustainability of funding schemes across the entire pathway. This will require considering both the scale of existing schemes that support a specific part of a pathway, as well as the balance and sustainability of all schemes across the pathway. We know that one of the key barriers to uptake of innovation is that innovators do not know where they can apply for and access follow-up funding to help them with scale-up and implementation (Liddell, Adshead & Burgess 2008; Castle-Clarke, Edwards & Buckingham 2017; Collins 2018). To this end, the Department of Health and Social Care (Office for Life Sciences) and NHS England have recently worked on mapping the innovation landscape and have identified a range of schemes supporting health and care innovation across six organisations. While this effort will help innovators to identify funding, it does not address the scale and sustainability of the funding through a whole pathway lens. The sustainability of existing funding commitments is critical for supporting an innovating health system, with our survey and stakeholder responses emphasising this as one of the most important issues related to the funding landscape (see Box 29).\textsuperscript{242}

\textsuperscript{241} See evidence including: interview analysis in Annex B, specifically evidence given by Academics\_INT2, Academics\_INT4, Academics\_INT5, Academics\_INT6, Academics\_INT8, Academics\_INT9, Academics\_INT12, CharityPPIE\_INT11, Networks\_INT1, Networks\_INT2, Networks\_INT3, Networks\_INT8, Networks\_INT9, Networks\_INT10, Policymaker\_INT2, Policymaker\_INT4, Policymaker\_INT6, Private\_INT2, Private\_INT3, Private\_INT5, Private\_INT7, Private\_INT8, workshop analysis in Annex D, specifically the academics workshop, charities and PPIE workshop, networks workshop, private sector workshop.

\textsuperscript{242} See evidence including: interview analysis in Annex B, specifically evidence given by Academics\_INT4, Academics\_INT8, Academics\_INT10, CharityPPIE\_INT1, CharityPPIE\_INT3, Networks\_INT4, Policymaker\_INT4, Policymaker\_INT6, Private\_INT4, Private\_INT5, Private\_INT6, Private\_INT7, survey analysis in Annex A (the most frequently selected response – selected by 55.6 per cent of respondents – when asked what funding and commissioning factor could have the biggest impact on innovation was ‘Ensuring stable and sustainable national funding programmes for innovation (e.g. from the Department of Health and Social Care, National Institute for Health Research, NHS England, Innovate UK, foundations and charities, local and regional mini-competitions for seed funding in Trusts, CCGs and Academic Health Science Networks)’).
Innovating for improved healthcare

Stakeholders we consulted made it apparent that innovating will not become an integral aspect of NHS working until there is a balance between both short-term and long-term approaches to innovation and the cost savings and quality gains that will accrue. We see some evidence for this in the quantitative analysis of prescribing matters, which showed that CCGs with higher net expenditures are significantly more likely to engage in innovative prescribing over the following two years, while the levels of innovative prescribing were significantly lower amongst CCGs that met their expenditure targets. This illustrates the importance to commissioners of the cost of new innovations when deciding whether to provide them. The National Audit Office (NAO) has concluded that extra NHS funding allocated for transformation has in the past mostly been used to cope with current pressures and not to transform (National Audit Office 2018a); NHS organisations typically place a strong operational emphasis on meeting short-term financial pressures. The NAO also noted the lack of a stable platform ‘from which to transform services’

Box 29: Key issues related to the funding landscape

Stakeholders consulted for this study identified a number of key issues related to the funding landscape:

- Challenges associated with a focus only on cost-saving or cost-neutral innovations, as opposed to a portfolio of innovations with diverse cost and benefit profiles.
- A focus on short-term returns preventing uptake of technologies with longer-term payback – multi-year settlements with longer time frames need more consideration.
- Multiple points of sale preventing economies of scale on the purchasing side and making technologies more expensive for local NHS buyers.
- Extended and complex procurement processes making the NHS unattractive to vendors.
- Clinicians lacking guidance on making business cases for technologies to commissioners.
- Healthcare budgets being siloed in such a way that results in some areas of the health system not wishing to invest money that would result in another area of the system benefiting.
- Annual funding rounds making it challenging for the private sector, in particular, to engage and adapt to a dynamic market place.

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243 See evidence including: interview analysis in Annex B, specifically evidence given by Academics_INT4, Academics_INT8, Academics_INT10, CharityPPIE_INT3, CharityPPIE_INT8, CharityPPIE_INT9, CharityPPIE_INT11, Networks_INT1, Networks_INT4, Policymaker_INT4, Policymaker_INT6, Private_INT4, Private_INT5, Private_INT6, Private_INT7, ProviderCCG_INT20; workshop analysis in Annex D, specifically the academics workshop, charities and PPIE workshop, networks workshop, policymakers workshop, private sector workshop, providers and commissioners workshop; see also Castle-Clarke et al. (2017) and Liddell et al. (2008).

244 See evidence from the workshop analysis in Annex D, specifically the academics workshop, charities and PPIE workshop, networks workshop, private sector workshop.

245 See Annex F for the full details of the quantitative analysis conducted by the University of Manchester.
We would make a parallel argument, which is that a stable platform for innovation will include longer-term funding opportunities that have the capacity to rebalance efforts towards more transformational innovations that could establish a step change in the quality and efficiency of healthcare delivery.

**9.3. Analysis to support the areas for action**

We have identified three thematic areas about how to create a system where the funding and commissioning landscape better supports innovation across the pathway: improving efforts to coordinate funding and funders across the entire innovation pathway; making the most of available resources and exploring mechanisms to support the upfront costs of innovation; and utilising a portfolio strategy for investments to balance short-term and long-term needs with cost savings and quality gains.

**9.3.1. Coordinating funding and funders across the entire innovation pathway**

Allocating and coordinating public funding across the entire innovation pathway, including for uptake of innovations and their implementation, in such a way that it allows for scale and sustainability, as well as recognising complementarities within the system, can be achieved by:

- Supporting innovations to move through the innovation pathway, from development through to uptake and implementation, and not hit the ‘valley of death’.

Adapting the way in which innovation funding in the health system is governed and managed so that promising innovations can be supported across the whole healthcare innovation pathway – from design to uptake – was identified as an area for immediate action by stakeholders across our study. A call for more initiatives to achieve pathway integration was the third most highly selected theme related to funding and commissioning in our survey (36.3 per cent of respondents) and this was echoed throughout our interviews and stakeholder workshops. Some also felt there should be more joined-up commissioning approaches between different aspects of healthcare, such as between health and social care; greater adoption and integration of approaches, such as those being developed for STPs and for new models of care or for Vanguard initiatives; and more exploration of opportunities for charities to provide dedicated
innovation implementation funding under some circumstances.\textsuperscript{249} There is evidence from other studies to support the positive effects of such joined-up approaches: one finding of the NHS Innovation Accelerator evaluation was that collaboration between the ITT and the Innovation Accelerator in determining funding themes was seen as real enabler of innovation (Cox et al. 2018).

As a first step, a mapping exercise being conducted by the Office for Life Sciences and NHS England should identify and analyse current funding pathways and, simultaneously, identify the bottlenecks within services so that funding can be redirected to support innovation across the pathway. The exercise should be independent and rooted in rigorous approaches to distinguishing innovation funding and support mechanisms from research funding, and result in the development of accessible directories of sources of innovation funding.

Following this, government departments in particular could work more closely together to coordinate funding to achieve a critical mass. Isolated schemes are sometimes seen as ‘a drop in the ocean’.\textsuperscript{250} Coordination could be enabled through more joint programmes and shared posts between departments, as well as leveraging opportunities for closer working between departments and bodies focused on healthcare improvement and innovation, including NHS England, the Department of Health and Social Care, the Department for Business, Energy & Industrial Strategy, UK Research and Innovation, the Office for Life Sciences and NIHR.\textsuperscript{251} For example, Innovate UK and the Office for Life Sciences could provide funding for testing innovations, while the Department for Business, Energy & Industrial Strategy, UK Research and Innovation, the Office for Life Sciences and NHS England could supply funding for early stage innovation development or digital innovation.\textsuperscript{252} The \textit{Industrial Strategy} (HM Government 2017a) presents an opportunity to align healthcare, research and innovation relationships so that there is a receptive environment to innovation across the system, moving away from solely sets of initiatives that are designed to permeate the system. This would allow multiple policy communities to have input and ‘buy-in’ to the initiatives and create multiple avenues for the portfolio approach to be implemented.\textsuperscript{253}

Overall, a package of coordinated support measures across the innovation pathway could include, for example, tariff-based incentives for innovation (such as the ITT and ITP), flexible and adaptive licensing and pricing models, and outcome-based commissioning commitments (see more detailed discussion below).\textsuperscript{254} Some interviewees suggested that seed-funding or pilot funding from AHSNs, Vanguards or the charity sector work well as enablers of innovation at a regional level, and that this model could be scaled up across the country.\textsuperscript{255}

\textsuperscript{249} See evidence from the interview analysis in Annex B, specifically evidence given by CharityPPIE\_INT2.
\textsuperscript{250} See evidence from the workshop analysis in Annex D, specifically the networks workshop, private sector workshop.
\textsuperscript{251} See evidence from the workshop analysis in Annex D, specifically the charities and PPIE workshop, policymakers workshop, private sector workshop.
\textsuperscript{252} See evidence from the workshop analysis in Annex D, specifically the networks workshop, private sector workshop.
\textsuperscript{253} See evidence from the workshop analysis in Annex D, specifically the policymakers workshop.
\textsuperscript{254} See evidence from the workshop analysis in Annex D, specifically the academics workshop, networks workshop, private sector workshop.
\textsuperscript{255} See evidence from the interview analysis in Annex B, specifically evidence given by ProviderCCG\_INT6, ProviderCCG\_INT11, ProviderCCG\_INT20, ProviderCCG\_INT21, ProviderCCG\_INT22.
9.3.2. Introducing new mechanisms to support both innovation push and pull

There is a need for mechanisms able to support both innovation push and pull:

- Revisiting and refreshing the push and pull funding mechanisms in the system to ensure that there is a range of available resources for supporting both the development of new innovations (supply push) and the uptake, adoption and diffusion of innovations (demand pull).

- Exploring new mechanisms in both push and pull areas that complement each other and in which pull mechanisms can be more responsive to NHS needs (areas for innovation demand) as well as help create demand. Improved pull mechanisms would (1) help support the uptake of existing innovations in the supply chain (e.g. through tariff schemes, the Accelerated Access Pathway and outcome-based commissioning), but go beyond that to also (2) stimulate the development of innovations for which there is a clear and articulated need and support demand for their uptake (for example through pre-commercial commitments and adaptive commissioning arrangements).

- Exploring and evaluating the possibility for risk-sharing agreements, and rewarding sharing to support the upfront costs of introducing innovations into the NHS, which can help secure the ‘pull’ mechanism.

Revisiting and refreshing the innovation push and pull mechanisms that currently exist would help to identify which kind of mechanisms might be needed. There should be clear and articulated healthcare needs and demand for specific healthcare solutions that drive the development pipeline (i.e. what innovators work on) and knowledge of where innovations in the development pipeline have a greater likelihood of achieving a receptive NHS market (should they meet required criteria). Refreshed mechanisms for funding innovation supply and supporting demand would also need to reward whole-system working, rather than successful silos. Box 31 provides real-world examples of when innovation push and pull have worked together to support innovation.

Outcome-based commissioning that rewards improved organisational performance and evidenced impact on the healthcare system is a promising development and supported by our stakeholders, as are pre-commercial procurement agreements that would ensure a demand and ‘pull mechanism’ into an NHS market for innovations that meet pre-specified criteria. Our survey showed strong interest in ‘supporting outcome-based commissioning models to help create a viable route to market’. These models were also discussed extensively in the workshops.

Evidence from the literature and other evaluations supports the use of strategic commissioning and public procurement initiatives to help overcome bottlenecks and barriers to entry for innovators (Cox et al. 2018). However, there is very little evidence evaluating individual schemes in a particular health context. The scalability and uptake of some of the relatively new mechanisms being used in the health system to support innovation

256 See the case vignette on the NHS Blood Donor Chair in Annex C.
257 See evidence from the survey analysis in Annex A (selected by 46.7 per cent of respondents).
258 See evidence from the workshop analysis in Annex D, specifically the academics workshop, networks workshop, private sector workshop.
259 Commissioning is the whole process/cycle whereby needs are identified, priorities made and resources allocated. Procurement is the part of this process that concerns how to secure the necessary activities and resources — in-house, third sector, private sector — and how to manage these contracts. Both have important roles in the funding landscape for innovation.
uptake (e.g. commissioning through evaluation, outcome-based commissioning pilots, ITP, ITT) remain to be seen. Given the diversity of challenges to the adoption of innovations (e.g. financial, legal and regulatory, policy-related, cultural, information-related) that have been discussed throughout this report and elsewhere (e.g. Greenhalgh et al. 2017), the rollout of national funding schemes to support innovation uptake and spread would need to happen concurrently with wider systemic changes, including those related to budget cycles and planning, decommissioning and planning for the upfront costs associated with adoption.

Some funding mechanisms only apply to specific types of innovations and healthcare improvement efforts. For example, while an outcome-based commissioning approach can support payments based on how well an innovation responds to an NHS need 'in the real world’ and based on real-world evidence (and puts the onus of responsibility on the NHS to articulate its needs), this may not work in all spaces. Participants in the healthcare providers and commissioners workshop highlighted that any attempt to introduce outcome-based funding as part of the innovation pull landscape would require consideration of a wider set of incentives and mechanisms. For example, incentives such as outcome-based commissioning could discourage innovation in public health prevention, where outcomes can take too long to materialise for this to act as a viable pull (e.g. commissioning of public health programmes on smoking being linked to a target number of people stopping smoking).260

In addition, mechanisms that support adaptive and flexible commissioning and the accumulation of evidence on outcomes over time are needed, for example with opportunity for adaptation in volumes commissioned, time frames of a commissioning commitment and other factors based on gradually accumulating performance information.

Private sector stakeholders suggested that within innovation pull mechanisms, policymakers need to revisit the focus on creating a pull that responds to what is already in the supply chain versus a pull on creating a supply chain that responds to clearly articulated areas of NHS need and demand.261 For example, while the ITT and ITP are supply-driven, pre-commercial procurement contracts would be demand driven and an important incentive for the private sector. In addition, innovation pull schemes that are supply-led, such as the ITT and ITP policy initiatives, were seen to recognise real gaps in innovation, but private sector stakeholders warned that the selection of only a few winners and the ‘breakthrough designations’ on the Accelerated Access Pathway could also narrow the field by supporting only a very limited number of innovations into the system. Private sector workshop participants flagged a need for greater clarity on how the new commercial unit in NHS England (which was discussed as part of the Accelerated Access Review) will function in terms of supporting commercial negotiations related to access for SME products/technologies and in terms of realising efficiencies in how innovations are evaluated.

In Scotland, NHS Scotland’s Realistic Medicine approach introduced a stronger focus on the demand side in that it puts a person receiving health and social care at the centre whenever decisions are made about that person’s care. It does so by encouraging both people providing care and people receiving care to use a more personalised and shared decision-making approach. The Realistic Medicine model should

260 See evidence from the workshop analysis in Annex D, specifically the providers and commissioners workshop.
261 See evidence from the workshop analysis in Annex D, specifically the private sector workshop.
not only improve the care an individual receives, but also help to reduce unnecessary variation in both practice and outcomes, reduce harm and waste, manage risks better and encourage healthcare professionals to become more innovative in providing care and improving outcomes (NHS Scotland & The Scottish Government 2016) (see Box 30 for an overview of Realistic Medicine).

Box 30: NHS Scotland’s Realistic Medicine approach

In 2016, the Chief Medical Officer of Scotland, Dr Catherine Calderwood, introduced the vision of a Realistic Medicine approach in her first annual report, Realistic Medicine (NHS Scotland & The Scottish Government 2016). The two subsequent annual reports published in 2017 and 2018 updated this report and provided more details on actions to make the Realistic Medicine approach a reality (NHS Scotland & The Scottish Government 2017, 2018).

Realistic Medicine is focused on the person receiving health and social care, and thus encourages health and care workers to put that person at the centre of decisions. Health and care professionals should thus consider the needs of the individual and search for the best options for that person and their particular situation (NHS Scotland & The Scottish Government 2016). The term ‘medicine’ not only refers to medication or doctors’ work, but is understood as a multidisciplinary approach involving healthcare professionals, the social care workforce, patients and carers, all of whom could aid in prioritisation of actions in consideration of resources available (NHS Scotland & The Scottish Government 2017).

The key aims of the approach are to provide better care by reducing harm and burdens resulting from over-investigation and over-treatment, reduce public costs and prevent waste, help reduce unwarranted variation in both clinical practice and outcomes, combine patients’ and health and social care professionals’ expertise and share decisions, improve the patient-doctor relationship, better manage clinical risk, and encourage health and care professionals to become more innovative in providing care and improving outcomes. Reducing over-investigation and over-treatment can also help manage constrained budgets. While the initial vision about what Realistic Medicine should entail was provided by the Chief Medical Officer, different stakeholders – including health and social care professionals, patients and the wider public – were invited to discuss and further develop the vision and specify how it should be realised (NHS Scotland & The Scottish Government 2016, 2017).

Specific action points to make Realistic Medicine a reality include: integration of the approach into health strategies, policies and action plans in Scotland; creation of a Realistic Medicine team within the National Clinical Strategy work stream of the Scottish Government; incorporating the approach in medical education; making literature available to junior doctors and students, which should empower them to approach more senior healthcare professionals and ask questions; and displaying empowering posters in healthcare facilities encouraging patients to ask questions in their consultation with their doctor and/or nurse (including: if a test, treatment or procedure is really needed; what the benefits, downsides and possible side effects are; if there are simpler or safer alternatives; what would happen if the patient did nothing) (NHS Scotland & The Scottish Government 2017).
Innovating for improved healthcare

Policymakers noted that there needs to be improved coordination across evaluations of innovations, so that local evaluations do not take place unnecessarily when national or regional evaluations are already available (while recognising the role of some local evaluation activity to identify and address local context-specific elements). This coordination is starting to come through with the Accelerated Access Pathway. More can be done to build on it, in particular by looking for opportunities to translate evaluation findings across contexts, so that innovations proven in one context may not need an entirely ‘from scratch’ evaluation in another context, or could be considered for fast-track commissioning.\(^\text{262}\)

Finally, building on the current efforts of NHS England, the Office for Life Sciences, Department of Health and Social Care and others, it will be important to continue to explore and evaluate risk- and reward-sharing agreements between private sector innovators and the NHS to help support the upfront costs of introducing innovations into the NHS. These are agreements that cover the upfront costs of testing products for SMEs and are flexible and adaptive pricing arrangements dependent on real-world performance or guaranteed market access and price-volume agreements, conditional reimbursement, and/or deferred payments (Accelerated Access Review 2016). They will be crucial to securing the pull mechanism, alongside the existing innovation push, but it is yet to be seen how effective these mechanisms are.\(^\text{263}\)

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**Box 31: Examples of where innovation push and pull work together to support innovation**

NHSBT services are the sole users of blood donor chairs, so the guarantee of a market for uptake of the innovative **NHS Blood Donor Chair** was crucial. The presence of a centralised buyer that could offer a pre-commercial procurement process for innovators – with guaranteed purchases for the successful supplier – incentivised applications from industry in the development stage. This ensured financial viability and helped catalyse the development of the blood donor chair (innovation pull).

Direct purchasing by healthcare providers (hospitals) and clinical engagement in purchasing decisions facilitated the uptake of **ENDOCUFF VISION™**, a medical device used as a colonoscope attachment to improve mucosal visibility for the detection of abnormalities such as polyps.\(^\text{264}\)

The flexible approach to commissioning – i.e. short one-year contracts – encouraged commissioners to adopt **CHC2DST**, as there was less of a financial risk than needing to invest for three years.\(^\text{265}\) A flexible payment approach also enabled CCGs representing smaller populations to pay less for the software.\(^\text{266}\)

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\(^\text{262}\) See evidence from the workshop analysis Annex D, specifically the policymakers workshop.

\(^\text{263}\) See evidence from the workshop analysis Annex D, specifically the policymakers workshop, private sector workshop.

\(^\text{264}\) See evidence from case vignette interviews in Annex C, specifically evidence given by Innovator_INT15, Innovator_INT20.

\(^\text{265}\) See evidence from the interview analysis in Annex B, specifically evidence given by CCG_INT9.

\(^\text{266}\) See evidence from case vignette interviews in Annex C, specifically evidence given by Innovator_INT18.
9.3.3. Utilising a portfolio strategy for investments in order to balance short- and long-term considerations alongside benefit gains

An innovation portfolio strategy can be used to fund investments in innovation whilst balancing short-term needs to address today’s challenges with the long-term time frames associated with realising returns on innovation. Such a strategy should:

- Set the costs associated with upfront investments against the future benefits that are expected to result.
- Utilise portfolio management techniques that enable transparent and open decision making.
- Establish a compelling value offer that provides a better case for investment.
- De-politicise innovation by creating opportunities for cross-party and cross-department funding initiatives.

Investments in innovations that help with today’s ‘firefighting’ and respond to the constraints of cost-neutral portfolios and short-term return requirements, should be made in parallel with ambitions for a portfolio of transformative innovations and widespread innovative cultures in the health system (Collins 2018). Investment decisions that balance short- and long-term considerations and support innovations with different cost and benefit profiles can be better informed by using a portfolio strategy for investments. Whilst a policy focus on only cost-neutral or cost-saving innovations is understandable with a short-term perspective of a cash-constrained NHS, it does not work to engage and incentivise the diverse stakeholders that need to support innovating for the future – these stakeholders are driven by a mix of common and unique cost and quality considerations. Addressing this is particularly pressing for some current policy initiatives since eligibility criteria can suggest that innovations must be cost-neutral within one year. Some stakeholders also highlighted that while there is a need for policy not to have too disassociated approaches across different types of innovations, it is important to recognise their differing requirements: while there are areas of commonality, products such as pharmaceuticals require different regulations than service innovations, diagnostics, digital health or medtech products, because they are associated with different risks. Policies also need to consider that the development and introduction of pharmaceutical products can take longer due to time frames associated with clinical trials and associated regulations.

Development of dynamic innovation portfolios could provide benefits for quality of care as well as on the economic front, and allow for returns to investment to accrue across the system over longer time frames. These portfolios need to make funding available across the innovation

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267 See evidence from the workshop analysis in Annex D, specifically the networks workshop, private sector workshop.
268 Such a portfolio strategy would also relate to investments in the supply side and in terms of demand-pull – see also Section 9.3.2.
269 See evidence from the workshop analysis in Annex D, specifically the academics workshop, charities and PPIE workshop, networks workshop, private sector workshop. This finding was also highlighted by the evaluation of the NHS Innovation Accelerator (Cox et al. 2018).
270 See evidence including: interview analysis in Annex B, specifically evidence given by Networks_INT7, Policymaker_INT5, Policymaker_INT6, Policymaker_INT8, Private_INT1, Private_INT7; workshop analysis in Annex D, specifically the networks workshop, providers and commissioners workshop.
271 See evidence from the workshop analysis in Annex D, specifically the academics workshop, charities and PPIE workshop, networks workshop, private sector workshop.
Innovating for improved healthcare

pathway, including for implementation after research and development activities have ended. As part of a longer-term, portfolio-based funding strategy, the NHS will also need to establish a compelling environment for potential innovators. Longer-term investment and vision is enabled when the potential of innovation to respond to both healthcare improvement and economic competitiveness criteria are made explicit and where there is a cross-party commitment to establishing leadership in a given area (such as was the case with Genomics England). The NHS could bring in learning from similar initiatives that have adopted a long-term orientation and where a more holistic strategy for funding could outlive the term of a government and help to avoid the repetition of political cycles that accentuates pressures on the NHS to deliver returns within short budgeting cycles. Box 32 highlights an example from our case vignettes in which a long-term perspective, and subsequent sustainable funding, contributed to an innovation’s success.

There are various methods that can support thinking about portfolio approaches and prioritisation (Meskendahl 2010) and that could be used to implement such an approach. For example, participants in the policymaker workshop suggested that in order to ensure a balanced portfolio of interventions that meet the needs of a specific disease area, a value of implementation and QALY framework could be used to look at different themes and/or disease areas. This would allow them to identify the best combination of interventions for treatment of a particular disease in a given commissioning region. Participants in several of the workshops also emphasised that when making purchasing decisions, the ‘whole-life costs’ of innovation and ‘whole-system costs’ have to be considered. This implies that a move away from siloed organisational-level decision making needs to be supported through policy and regulation and embedded in evolving sustainable transformation partnerships and, ultimately, in accountable care organisation arrangements. This will require a shift away from short-term re-commissioning, as well as empowering commissioners to use their existing powers to look for value, not just low price. To support this, new economic methods for whole-system cost-benefit analyses also need to be brought into the policy community. Without them, perverse incentives will impede an effective market for innovations in the health system. Unless there is joined-up responsibility and accountability for innovation decisions, there will be too many conflicting interests to take steps that provide the most value at the population level.

272 See evidence including: interview analysis in Annex B, specifically evidence given by CharityPPIE_INT2, ProviderCCG_INT2, ProviderCCG_INT4, ProviderCCG_INT6, ProviderCCG_INT11, ProviderCCG_INT20, ProviderCCG_INT21; workshop analysis in Annex D, specifically the charities and PPIE workshop, networks workshop.

273 See evidence from the workshop analysis in Annex D, specifically the charities and PPIE workshop.

274 See evidence from the workshop analysis in Annex D, specifically the private sector workshop.

275 See evidence from the workshop analysis in Annex D, specifically the policymakers workshop.

276 See evidence from the interview analysis in Annex B, specifically evidence given by CharityPPIE_INT3, CharityPPIE_INT8, CharityPPIE_INT9, CharityPPIE_INT11, ProviderCCG_INT20.

277 See evidence from the workshop analysis in Annex D, specifically the academics workshop, networks workshop, private sector workshop.
Box 32: Example of where a longer-term funding strategy has worked well

MoodGYM, a cCBT therapy aimed at young people suffering mild to moderate anxiety or depression, has received long-term funding from the Australian government since 2007. This was considered to be a key enabler of both development of the innovation and adoption into the health system. The funding has meant that MoodGYM can continuously improve, for example through the expansion of an in-house development team who created the ability to conduct automated clinical trials on the platform.\textsuperscript{278}

\textsuperscript{278} See evidence from case vignette interviews in Annex C, specifically evidence given by Innovator\_INT6.
Better aligning policy design with a consideration of implementation requirements and success criteria
10.1 Summary

Current landscape: issues and developments

- The design of policies related to innovation in the health system is increasingly being informed by diverse sources of evidence and consultation that reflect the experiences of different stakeholders. However, policies do not always achieve their intended impacts nor attract sufficient buy-in on the ground. This is partially related to insufficient awareness of new innovation policy-related initiatives amongst the private sector, healthcare providers, the third sector and patients and the public. It is also related to insufficient upfront consideration of policy implementation requirements and success criteria by policymakers.

Key areas for action to align policy development and implementation more closely

- When designing new policy interventions, assess how they relate to the existing policy infrastructure to avoid unnecessary duplication, to identify opportunities for coordination and for harnessing complementarities, and to build on existing capacity by:
  - Ensuring that innovation, improvement and research policy bodies collaborate more closely in deciding on the needs for and design of new policy initiatives. Good examples would be the recent efforts of NHS England and the Office for Life Sciences to work with other actors to map the innovation funding landscape as a first step towards more coordinated funding; the Health Innovation Challenge Fund, a funding partnership between the Department of Health and Social Care and Wellcome Trust; and joint funding provided by the Engineering and Physical Sciences Research Council and the Medical Research Council for innovations.
  - Placing greater policy focus on identifying areas where joint funding of innovation efforts can mitigate against piecemeal and fragmented investments and support critical mass and scale (see also Chapter 9).
  - For policy initiatives to have traction on the ground, implementation requirements and success criteria need to be brought into the policy design process more explicitly by:
    - Specifying what financial resources and human resources will be required for implementation.
    - Identifying and communicating the relationships that will need to be secured for successful implementation (e.g. between individuals, professions, stakeholder groups and parts of the health system).
    - Being clear about the physical and information infrastructure that is required for successful implementation.
    - Specifying key metrics for evaluating success upfront.
    - Identifying sources of implementation support that stakeholders could access and contact.
  - Communicate and raise awareness about innovation policies and associated schemes by:
    - Considering the information needs, incentives and accountabilities of stakeholders across innovation, improvement and research communities who need to be engaged with the take-up of new policy schemes and ensure that their needs are reflected in the communication approach.
    - Providing sufficient notice for stakeholders to be able to engage. Make sure that selection criteria, timelines and selection processes for successfully applying to schemes are clear, explicit and transparent in communications.
10.2. Alignment of policy design with implementation requirements: reflecting on issues and developments

Often policies that seem sensible and rooted in evidence and consultation fail to roll out as successfully as they might. This is either because awareness about initiatives associated with policies is not widespread, or because the resource requirements, relationships, skills and infrastructure required for successful implementation and impact have not been integrated into policy design stages and their associated interventions. This can subsequently lead to the policies having limited traction. Thus, in order to support the effective ‘landing’ of policy developments on the ground, there is a need to consider new policy initiatives (and associated areas of intervention) and their implementation requirements, design specifications and success criteria in a more joined up and timely fashion.279

In particular, our stakeholders highlighted the need to give more upfront consideration to the financial, skills, infrastructure, informational and relational requirements needed for policy initiatives to have uptake. For example, stakeholders have identified gaps in knowledge about available funding schemes in the system and how to access these, understanding selection criteria for various schemes and who to contact for information about initiatives.280 In addition, they also reported inadequate upfront notice regarding timelines for schemes and a lack of implementation capacity, both in terms of financial and human resource skills, for innovations and innovation-related initiatives.281

Although the policy environment supporting an innovating health system has evolved in recent years, with more focus on initiatives that can support the entire pathway from idea generation through to uptake and diffusion, there is still a need for more upfront thought about implementation requirements for policy initiatives. For example, the Accelerated Access Pathway and the NHS Innovation Accelerator aim to speed up access across different types of innovations, but only apply to a small number of innovations. The ITP supports the NHS in adopting evidence-based innovations, but likewise focuses on a small number of innovations. There is a need to ensure that policies which seem structurally sound and well-designed can get traction and buy-in on the ground and this requires careful consideration of the feasibility and acceptability of meeting implementation requirements.

Many of these challenges to successful uptake of policies can be tackled through more coordinated upfront design of policy and alignment with existing infrastructure, along with proactive information dissemination and engagement of interested communities. This does not necessarily always mean building extra capacity and providing additional resources to support new policy initiatives, but instead more thoroughly considering the capacity that exists and how it can be mobilised.

279 See evidence from the workshop analysis in Annex D, specifically the academics workshop, charities and PPIE workshop, networks workshop, private sector workshop.


281 See evidence including: interview analysis in Annex B, specifically evidence given by CharityPPIE_INT12, CharityPPIE_INT13, workshop analysis in Annex D, specifically the academics workshop, charities and PPIE workshop, networks workshop, private sector workshop.
10.3. Analysis supporting the areas for action

This is a cross-cutting and overarching area of action, with several main areas regarding how to better align policy development and implementation. These include: designing new policy interventions to maximise the complementarities between new policy schemes and the existing infrastructure, particularly across the research, innovation and improvement spaces; communicating policies with full consideration of the information and resource needs and the incentive and accountability drivers of different stakeholder communities; and engaging in timely awareness-raising.

10.3.1. Designing new policy interventions in order to maximise complementarities

In order to align better policy development with implementation requirements, more integrated consideration should be given across the health innovation policy infrastructure. This could be accomplished by:

• Designing new policy initiatives with due consideration of complementary policies and schemes, as they relate to the entire healthcare innovation pathway. This is essential for harnessing complementarities.

• Supporting implementation by bringing improvement, innovation and research communities together around a shared understanding of policy aims and potential benefits.

• Establishing communities of practice that cross multiple sectors and disciplines and involve stakeholders in policy development and implementation.

The link between a proposed policy and the wider healthcare innovation pathway needs to be explicit when designing policies. Effective policies should link an intervention to the wider innovation pathway and service improvement process and goals, to promote buy-in and awareness of the initiative for specific stakeholders. Better alignment between different policy initiatives can improve the value of engagement as it can maximise synergies and make the most of shared and complementary implementation capacities in the system.

One way to improve alignment is to design new policies with a clear focus on implementation requirements across different health systems and communities. In order to support successful implementation of innovation initiatives in the health system – and especially engagement of the healthcare provider community – national policy and local practices need to be based on closer working between those active in the improvement, innovation, research and implementation spaces and to address the matter of scale and longevity across the pathway. Specifically, there is a need to go beyond pilots focused on one part of an innovation pathway, and to dedicate resources to a whole pathway approach – including through downstream implementation funding. STPs have potential to bring innovation, improvement and implementation communities closer together in terms of their design, and their ability to do so will in part depend on how this is reflected in their governance structures and accountability regimes. Implementing the STPs effectively in this regard will also require particular

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282 See evidence from the workshop analysis in Annex D, specifically the academics workshop, networks workshop, policymakers workshop.

283 See evidence from the workshop analysis in Annex D, specifically the academics workshop, networks workshop, policymakers workshop.

284 See evidence from the workshop analysis in Annex D, specifically the networks workshop, providers and commissioners workshop.
attention to how budget management will reflect complementary needs and opportunities between those involved in innovation and improvement initiatives.

One way to do this is to encourage improvement and innovation communities to work more closely together to support successful design and implementation of innovation policy initiatives. Though innovation can often appear to entail more radical change, the two aspects are interrelated. Stakeholders commented that in the NHS there appears to be only a partial understanding of what innovation is or should be, and it is too often focused on technologies rather than on wider types of innovation, such as digital or service innovation. Some stakeholders felt that there does not seem to be the same type of receptive attitude within the NHS to innovation as there is to improvement, and clinical cultures are not as sensitised to education on innovation issues.

To this end, the regulatory environment, which already takes quality improvement into account, could be a vehicle for encouraging innovation, for example by integrating innovation into the inspection regime or into performance related pay. However, this would require careful consideration and reflection on effective mechanisms of achieving receptive attitudes, without the unintended consequences that can accompany mandates (e.g. such as activity becoming a tick-box exercise). Overcoming the dangers that mandated innovation could entail could involve forming communities of practice (see also Chapter 6) that cross multiple sectors and disciplines, as well as actively creating spaces to involve stakeholders in policy development and implementation. Co-design of policies could help to ensure that stakeholders have a vested interest in implementation, in addition to helping ensure that the policies themselves are sensitised to the different environments they will be operating in.

10.3.2. Communicating policies with full consideration of information and resource needs

Better communication between policymakers and other stakeholders is needed to specify clearly the implementation requirements of a new policy and its related initiatives. When communicating and engaging stakeholders about new policy initiatives, the following elements should be considered:

- Incentives and accountabilities of different stakeholders and ways for communicating the reasons/aims/goals of a policy initiative/intervention in light of these drivers.
- Timely and effective communication and engagement strategies, with sufficient upfront notice about forthcoming opportunities that stakeholders may wish to engage with and selection criteria for initiatives.
- Provision of transparent information about how to access support for implementation.

Policymakers need to consider the motivations and incentives for all stakeholders who will be involved and affected by a new policy in order to articulate it in a way that incentivises those stakeholders and recognises the different drivers which affect them. This will also allow reflection of which policy initiatives

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285 See evidence from the workshop analysis in Annex D, specifically the charities and PPIE workshop, networks workshop, policymakers workshop.

286 See evidence from the workshop analysis in Annex D, specifically the academics workshop, charities and PPIE workshop, networks workshop, policymakers workshop, private sector workshop, providers and commissioners workshop.
relate to which health system stakeholders. It could help the design and rollout of new policy schemes to be based around an understanding of how policy initiatives respond to incentives for specific stakeholder groups, and help communicate the benefits in a compelling manner and thereby support stakeholder acceptance and buy-in for implementation.

Policymakers also need to understand how different incentives relate to and interlink with each other. For example, some workshop participants felt that in current policies, private sector incentives were considered to a greater extent than NHS and healthcare provider incentives. An alignment of incentives in the rationale and communication of a policy scheme is critical to successful uptake.

Once incentives are established, communication and engagement activities must be tailored accordingly and delivered in a timely fashion.287 This could be achieved through consistent communication through a range of channels, such as NHS Trusts and Medical Royal Colleges, and by providing opportunities to share information.288 In addition, frontline staff involved in implementing an innovation or policy can be the ones to write the information that is shared with other staff members.289

Alongside communication about the policy itself, policymakers should discuss and specify the implementation requirements that will be needed to introduce a policy. This was also a finding of the evaluation of the NHS Innovation Accelerator and is seen as a key feature of relevance for scaling innovations (Cox et al. 2018). These requirements need to include aspects such as: resource requirements, the nature and scale of stakeholder engagement needed for implementation, time frames of implementation, decommissioning needs associated with implementing innovations, risks to implementation, and areas of uncertainty and how they can be managed.

It is important for these criteria to be laid out prior to the rollout of any policy and associated interventions to ensure they gain traction within the health system.290 Understanding and outlining policy implementation requirements can also support policy and intervention development and adaptation prior to rollout. For example, by understanding which actions will have the biggest effect, stakeholders and policymakers can determine how to distribute resources, and have a clear picture of the implementation details needed to successfully introduce a new policy initiative.291

Once the implementation requirements have been identified, policies also need to be accompanied by transparency about how to access support during implementation. This includes the selection criteria for participating in a scheme, the eligibility criteria and timelines associated with implementation decisions and processes. All of this should be communicated


288 See evidence from the interview analysis in Annex B, specifically evidence given by Policymaker_INT10, ProviderCCG_INT16.

289 See evidence from the interview analysis in Annex B, specifically evidence given by Policymaker_INT3, Policymaker_INT11.

290 See evidence from the workshop analysis in Annex D, specifically the academics workshop, charities and PPIE workshop, networks workshop, private sector workshop.

291 See evidence from the workshop analysis in Annex D, specifically the private sector workshop.
in a timely manner. For example, whereas private sector workshop participants in principle welcomed the £6 million package of support from the Office for Life Sciences for SMEs to test their products in the real world and generate evidence of effectiveness, they could not make decisions nor express views on the value of the scheme without knowing over how many SMEs and over how many products the resources will be spread. There was also a lack of clarity as to the process of engaging with the scheme. Though such clarifications may come with time, the lack of detail at the outset can prevent stakeholders from engaging in forward planning and taking actions today that will lay the groundwork for successful implementation in the future.

See evidence from the workshop analysis in Annex D, specifically the networks workshop, private sector workshop.
Measuring innovation uptake and impact: how can we know whether we are succeeding?
11.1. Summary

Measuring innovation in healthcare: the context

• Measuring the innovation process and its outputs and impacts is important for understanding the effects of innovation on the health service, the economy, healthcare organisations and patients.
• Learning from sound measurement is also important for guiding efforts to improve how innovation is done in the health system.
• The development of metrics to evaluate innovation performance has been studied from a variety of perspectives, such as science, technology and innovation studies, business and innovation management studies, public administration, and health economics.
• Commonly used indicators (e.g. research and development expenditures, patents, publications, GDP and new product sales) fail to capture the complexity and diversity of innovation processes, and do not account for the diversity of factors that influence innovation pathways and their outcomes.
• In addition, and in the context of healthcare, the commonly used indicators tend to be more relevant for innovations underpinned by research and development-intensive processes than for service model innovations. They also do not adequately capture the diversity of impacts of health innovation activities, such as impacts on the health of patients, population wellbeing, quality of care and the cost-effectiveness of care.

Towards more appropriate, systemic approaches to measuring health innovation

• Four types of indicators should be considered to allow for better measurement of innovation in the healthcare system. Measuring innovation processes and outcomes along these dimensions could support a more holistic understanding and appreciation of how innovation spreads through the health system, and where particular bottlenecks might lie. The four categories of indicators consider the entire innovation pathway and include:
  - Indicators of the progression of an innovation across different stages of the health innovation pathway.
  - Indicators of the adoption and diffusion of innovations through the health and care system.
  - Indicators that track the impact on patients, the population, the health system and the wider economy.
  - Indicators of capacity for innovating in the healthcare innovation system.
• We provide some examples of aspirational indicators for each category. Decisions on priority indicators are likely to be context-specific and potentially different for different types of innovations (e.g. medicines, devices, service models and digital innovations). Any effort to prioritise indicators on which to collect information on in the health system would also need to consider other criteria such as the feasibility of collecting high-quality data for that indicator and how a specific indicator complements others within the set of indicators used.
11.2. The wider landscape and context

As we have seen in this study, innovation in the health system has the potential to help respond to the future challenges of growing demand for healthcare services alongside limited resources, to contribute to productivity gains and to improve the efficiency and effectiveness of the NHS in England. Even without the current pressures on the NHS, the requirement to deliver good value for money implies that innovations should be exploited wherever they present more effective and efficient ways to meet needs.

Although the NHS has a history of pioneering health innovations, it has traditionally been better at their development than at their adoption and diffusion (Department of Health 2011; HM Treasury 2011). Understanding the process of adoption and diffusion, then, as has been the focus of the study results presented thus far, is one piece of this puzzle. However, measuring that process and its outputs and impacts is also critically important for understanding the effect of innovation on the health service, healthcare organisations, patients and the economy. This has become an important subject in recent years and specific examples are outlined below. However, no common framework for measuring uptake (let alone impact) has yet been agreed. While the outcomes and impacts of new pharmaceuticals or devices have been discussed in the wider literature, the consideration of metrics for digital and service innovations is significantly less well developed, partly because the pathways from development through to uptake that these types of innovations take are less well understood.

This chapter brings these elements together and discusses the feasibility of developing better metrics to measure the outcomes and impacts of innovation along the health innovation pathway, and to do so from a systems perspective. Although the focus is specifically on metrics, the process by which our thinking has developed is sensitised by the conceptual framework of the wider study, the results presented in preceding chapters, and a consideration of the different aspects of health innovation pathway – from idea generation through to the development, adoption and diffusion of new ideas, technologies, products and services that can improve the quality and effectiveness of care in the health system.

11.2.1. The health innovation pathway: how different types of innovations progress

Given the wider systems perspective of this study, zooming in on the health innovation pathway itself calls attention to a diversity of features that need to be considered when studying the way progress, outputs and impacts can be measured for different types of innovations.

Firstly, different types of research activity are important as inputs into innovation efforts. This includes basic and directed research (e.g. with directed research encompassing applied or interventional studies); research from individual or multiple disciplines (e.g. genetics, molecular biology, immunology, ethics, sociology, health services, regulatory, implementation science, quality of care, etc., or multi- or inter-disciplinary); research and...
Figure 5: Health innovation pathways – overview

Source: RAND Europe analysis
development geared towards specific types of products or technologies (e.g. drugs and vaccines, device and diagnostic, service innovations or digital); wider social science research (e.g. policy research, implementation science, ethics, regulatory research or quality of care); research that is disease-specific or spans multiple diseases; and research geared at particular population groups (e.g. vulnerable groups).

Secondly, the core stages of the innovation pathway differ for different types of innovations. For example, a proof of concept, prototype development and pilot or feasibility trials stage applies to the early development of medical devices, while for drugs, the early development stage involves target identification, lead selection, lead optimisation and pre-clinical testing. Similarly, for service innovations and digital platforms, the market launch pathway has different routes to commercialisation.

However, there are overarching shared phases of research and early development; later stage development; commercialisation/further translation and launch; ‘real-world’ monitoring and evaluation (including the use of innovations in real-world settings and associated evaluation such as phase IV clinical trials); and a cross-cutting evaluation phase governing transition points within the pathways of different types of innovation. Figure 5 provides detail on the elements and sub-stages of the pathway that need to be considered when evaluating different types of innovation and considering appropriate metrics. The visualisation is a simplification for illustrative purposes, and we recognise that the processes involved are much less linear and much more dynamic in reality.\(^{294}\)

11.2.2. Measuring health innovation – a reflection on current, dominant practice

The development of metrics to evaluate innovation performance has been studied from a variety of perspectives: science, technology and innovation studies (Edison, bin Ali & Torkar 2013), business and innovation management studies (Evangelista & Vezzani 2010), public administration (Potnis 2010), and health economics (Jalles 2010). Different perspectives also point to different levels at which innovation outputs and impacts can be measured. Innovation performance at the macro level can be measured by its contribution to the national or regional innovating health system. Performance at the micro level can be measured by understanding the impact of individual health technologies, or by understanding performance at different stages of the innovation cycle as a new product, service or process moves from research and development to commercialisation and diffusion (Chaudoir, Dugan & Barr 2013). While macro-level indicators are useful when considering how to assess the overall impact of innovations on improving health outcomes or health system effectiveness, micro-level indicators can reflect differences in performance and impacts across individual innovations, innovation types (such as pharmaceuticals, diagnostics, digital health or service innovation), and innovators (private sector, social enterprises, healthcare organisations or clinical entrepreneurs) (Smith, Voß & Grin 2010).

However, each approach has its limitations. The primary objective of macro-level measures

\(^{294}\) See also a similar depiction of a health innovation pathway for global health and universal health coverage in Cochrane et al. (2017). Both projects were undertaken at the same time with significant overlap in project team members leading to a productive cross-fertilisation of ideas.
of innovation is to capture the contribution of innovation to economic growth and productivity. Historically, such measures have relied heavily on input metrics such as research and development expenditure and output metrics such as patents (Archibugi & Planta 1996; Griffith, Harrison & Van Reenen 2006). As widely noted in the innovation literature (Archibugi & Planta 1996; Gault 2013), there are problems with measuring innovation simply through binary input indicators (e.g. research and development expenditures) and output indicators (e.g. patents, publications, GDP and new product sales), though these measures tend to be those used by most national statistics offices. Innovation studies suggests that a broader set of metrics are needed which recognise the processes that influence innovative performance, including the rate and directionality of innovation (Stirling 2009) and metrics that recognise the flow and diffusion of innovation through measuring network nature, demand and other conditions that influence innovation outputs and impacts.

In addition, patents and citation-based measures are increasingly considered inadequate to capture the diversity and complexity of innovation processes (OECD 2010). This is particularly so for innovations where research and development processes are less linear and more interactive, for example in the case of ‘user innovation’ or open innovation (Gault & von Hippel 2009), or ‘hidden innovation’ (Nesta 2007). Macro-level metrics of innovation performance may also fail to capture elements of sector-specific performance. Finally, while macro-level indicators exist for innovation as a whole on a national or regional level, there are few that specifically measure the performance of a national/regional healthcare sector/system (Turner et al. 2011). In the case of health innovation, these types of indicators would involve understanding not only how health innovation contributes to creating new employment opportunities or sales, but also how it improves health system performance in terms of, for example, health status and effectiveness, efficiency, accessibility and safety of care.

Micro-level measures of innovation capture the contribution of individual products, services or processes. The outputs and impacts of individual innovations are conventionally measured by looking at their application, expressed in terms of employment and business performance (e.g. new-to-market product sales, new-to-firm product sales or exports), and their IP rights, to measure the achieved results in terms of successful know-how (e.g. patents, trademarks or designs) (OECD 2010). However, as with measuring innovation performance at the macro level, the problems with using traditional innovation indicators, such as patents or sales, are also present at the micro level.

In the context of health, these indicators also fail to capture innovation performance in two important ways. Firstly, they tend to be more relevant for innovations underpinned by research and development-intensive processes than for service model innovations. For example, patents are more likely to be filed for pharmaceutical or vaccine innovations than for incremental innovation in healthcare delivered through digital health, or innovation in healthcare services and business models. As noted by Gault and Von Hippel (2009), traditional indicators also fail to capture the contribution of service users in the innovation process and generally inadequately capture less research and development intensive innovation processes, such as open innovation, user-led innovation, or citizen innovation. Secondly, they do not adequately capture the diversity of impacts of health innovation activities, such as impacts on the health of patients (which can be measured by,
for example, health outcomes, quality of life, patient experience and patient safety), population wellbeing, quality of care and cost-effectiveness of care.

There are ongoing efforts to better understand and describe the innovation development pathway in the NHS in a more comprehensive way and for specific types of innovations, for example through the Accelerated Access Review (Accelerated Access Review 2016) and work conducted by Deloitte on innovation indicators (Deloitte 2016). Similarly, evaluations of programmes such as the NHS Innovation Accelerator should help inform progress in the indicator space for medtech, digital and service innovations (NHS England n.d.-e).

However, although there have been some attempts to measure national innovation performance and regional variation as it relates to specific products or technologies, these are limited in scope and scale. An example is the NHS Innovation Scorecard, which aims to ‘reduce variation and strengthen compliance of the uptake of NICE Technology Appraisals’ (NHS England n.d.-b). Using output measures, the NHS Innovation Scorecard enables the benchmarking of performance of different regions and their comparison to national levels in relation to the uptake of specific innovations. Similarly, PwC (2011) developed a Medical Technology Innovation Scorecard to measure variation in innovation performance across countries, regions and healthcare organisations. However, in our view none of these efforts takes a holistic systems view of innovation that is both amenable to metrics that consider different types of innovations and accounts for the wide-ranging impacts and outputs at patient, organisational and system levels.

11.3. Towards more appropriate, systemic approaches to measuring health innovation

As outlined above, measuring the impacts and outputs of health innovation is critically important for understanding the effect of innovation on the health service, the economy, healthcare organisations and patients. In this section, we provide an overview of the possible ways to measure health innovation and suggest a range of associated health innovation indicators and metrics that could be used to measure the progression of innovation through different pathways, uptake and impact.

We propose four types of indicators to consider when measuring innovation performance:

- The first three types directly capture progress and impact from an innovation(s) and are discussed in this chapter.
- The fourth type focuses on indicators of system capacity to support innovating (rather than being a direct indicator of the progress and impact of an innovation) and is therefore discussed in Annex F.

More specifically, the four types of indicators are:

1. **Indicators of the progression of an innovation across different stages of the health innovation pathway.** These indicators track progress all the way across the health innovation pathway, from research through to commercialisation, capturing milestones and output indicators relating to the successful completion of key stages.

2. **Indicators of the adoption and diffusion of innovations through the health and care system.** These indicators track the extent to which innovations are actively used in the health and care system, allowing for the capture of both breadth (diffusion)
and depth (adoption) of uptake within the wider system. These indicators focus on adoption, uptake and diffusion in the healthcare system.

3. **Indicators that track the impact on patients, the population, the health system and the wider economy.** These indicators differ from the previous set in that they go beyond the development of the innovations themselves and track their broader effects, outcomes and impacts on patients, the public, the health and care system, the economy and wider society.

4. **Indicators of capacity for innovating in the healthcare innovation system.**
These indicators capture the existing capacity in the system to engage with innovation. This capacity can be both a pre-requisite for innovation activity (i.e. it will support successful uptake) as well as an indirect consequence of it (i.e. with capacity-building resulting from the act of developing and adopting innovations). For more detail, please see Annex F.

In addition to the typology set out above, we must also think about the nature of the indicators themselves. As with all indicators, in order to be practical and useful there are a range of application criteria, including the need to be specific, measurable, achievable, realistic and time-bound (‘SMART’) (Doran 1981).295

Moreover, the indicators should assess health innovation relevance, efficiency, effectiveness, impact and sustainability (Ling & Villalba van Dijk 2009). Stakeholders evaluating health innovation performance need to balance concerns for the relevance of specific indicators with data availability and feasibility. The establishment of appropriate indicators may need to happen in parallel with capacity-building in the health system, in particular relating to data and evidence infrastructure, as indicators are only as useful as the quality of the data that supports them.

Taking all of the above into account, in the sections that follow we suggest a range of indicators that are of relevance to assessing health innovation performance. Some of these indicators will be more aspirational than others given the current state of data infrastructure in the health system. For example, the NHS Innovation Scorecard provides information on levels of drug uptake and regional variation, but only exists for some types of drugs and there are challenges to scalability in the system associated with the investments needed to collect the Scorecard data. For each main group of indicators below, we comment briefly on the relative importance of the set of indicators and their relevance in relation to measuring the overall performance of the health and innovation system, before presenting tables of the indicators themselves. Any efforts to prioritise indicators will need to engage with further discussion about time frames and the data infrastructure that needs to be built, to ensure that their implementation is achievable.

### 11.3.1. Indicators of progression across the health innovation pathway

The first type of indicators we propose are those that capture the progress of research and development activities across different stages of the health innovation pathway.

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295 SMART is used as an acronym to demonstrate that indicators should be: **Specific**, i.e. provide useful information on innovation performance and capability for innovation within organisations; **Measurable**, i.e. able to be quantified or at least suggest an indicator of progress; **Achievable**, i.e. able to be measured by agencies and healthcare organisations; **Realistic**, i.e. able to collect the data with the available resources; and **Time-bound**, i.e. in terms of the time spent in data collection and reflect the timing of data collection.
(as illustrated in Figure 5). These types of indicators are important to track because they allow us to assess the relative progress of innovations from early stage development to clinical trial and regulatory approval. They also allow us to take account of the nature of research and development relevant to the development of innovations. This could be a useful comparative or analytical element when looking across the indicators to try to understand how some innovations come to be adopted while others are not.

For example, as depicted visually in Figure 5, the underpinning research could include: research at different stages of explicit clinical relevance (e.g. basic or directed, with directed research encompassing applied or interventional studies); research from individual or multiple disciplines (e.g. genetics, molecular biology, immunology, ethics, sociology, health services, etc., or multi- or inter-disciplinary); if directed, research and development geared at specific types of products or technologies (e.g. drug, device, diagnostic, vaccine-related, microbicide-related research, other); wider systems and services-related research (e.g. ethics, regulation, social issues); or research that is disease-specific, spanning multiple diseases, or non-disease specific. In addition, the indicators allow us to capture the fact that the innovation and research and development translation effort can be at different stages of maturity once it comes to the attention of the NHS for uptake: research and early development, spanning stages that include target selection, lead identification and optimisation, and preclinical testing in the case of drugs, vaccines and microbicides, and proof of concept, prototype and pilot or feasibility studies for medical devices and diagnostics; later stage development, spanning clinical testing (e.g. Phase I, II and III for products and pivotal trials for devices); commercialisation (spanning regulatory approval, manufacturing, marketing and distribution); and adoption, diffusion and ‘real-world’ monitoring and evaluation (including use of innovations in real-world settings and associated evaluation such as phase IV trials).

Within each core stage, there will be different sub-stages depending on the type of research, development and innovation in question. For example, a proof of concept, prototype development and pilot or feasibility trials stage will apply to medical device early development, while for drugs this stage would involve target identification, lead selection, lead optimisation and pre-clinical testing. Similarly, milestones for drug- and vaccine-related research and development could include: completion of research and early development (e.g. as potentially indicated by accepted publications or leveraged funding and partners for more downstream development and innovation work); successful completion of various clinical trial phases; completion of cost-effectiveness/health economics analyses; approval of the product by regulatory agencies and granted patents; approval of manufacturing specifications; marketing authorisation; incorporation into healthcare guidelines by regulatory agencies; and establishment of procurement and purchasing agreements. For device-related research and development, milestones will be similar overall, with some unique research, early development and commercialisation aspects: completion of proof of concept (e.g. as indicated by accepted publication and attraction of partners for more downstream development); prototype completion (e.g. as indicated by prototype-level patents for mechanism and design and attraction of funding for later-stage innovation phases); successful completion of pilot or feasibility studies and pivotal trials; and CE marking approvals.

Table 3 to Table 6 present an overview of different indicators and metrics of health
innovation progression through the health innovation pathways for: (1) pharmaceuticals and vaccines; (2) medical devices and diagnostics; (3) digital health; and (4) service innovation. For each type of innovation, we present indicators for each of the three main phases of the health innovation pathway: (i) research and early-stage development; (ii) late-stage development; and (iii) commercialisation.

The information in Table 3 to Table 6 represents a synthesis of metrics from the available literature, and is informed by our prior experience with evaluating health innovation programmes (see for example Cochrane et al. 2017; Lichten et al. 2017; Marjanovic et al. 2015; Marjanovic et al. 2017a, 2017b) and insights from existing literature (specifically the Deloitte Monitor (Deloitte 2016); U.S. Department of Health and Human Services (n.d.) and NHS Innovations South East (2014). While the health innovation development pathway as presented in these tables might seem like a linear process at first sight, it is important to emphasise that the suggested output indicators do not assume that innovation development is linear and that all stages will be relevant for all new products, services or processes. Health innovation pathways are often non-linear and distributed, particularly when digital health and service innovations are concerned, and there are multiple feedback loops between different stages in the pathway.

Table 3: Health innovation pathway performance indicators for pharmaceuticals and vaccines

<table>
<thead>
<tr>
<th>Pharmaceuticals/ vaccines</th>
<th>Associated indicators</th>
<th>Examples of metrics (qualitative and quantitative)</th>
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</thead>
<tbody>
<tr>
<td><strong>Research and early-stage development</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Target selection</td>
<td>Targets for drug development selected</td>
<td>Results from experimental data, including an accumulated body of basic and applied research evidence identifying the principles underlying the concept (e.g. measured by journal articles and bibliometric analyses)</td>
</tr>
<tr>
<td>Lead identification and optimisation</td>
<td>Lead drug candidate molecules identified and optimised</td>
<td>Results from early laboratory testing; number of successful in vitro studies and in vivo studies conducted; decision to enter clinical development; number of patent applications (successful and unsuccessful)</td>
</tr>
<tr>
<td><strong>Late-stage development</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phase 1 clinical trials</td>
<td>Testing of treatment in a small group of people to demonstrate success in terms of safety, determine dosage ranges and identify side effects</td>
<td>First successful results from testing; lead identification confirmed; barriers for achieving target performance goals identified</td>
</tr>
<tr>
<td>Pharmaceuticals/ vaccines</td>
<td>Associated indicators</td>
<td>Examples of metrics (qualitative and quantitative)</td>
</tr>
<tr>
<td>---------------------------</td>
<td>------------------------</td>
<td>--------------------------------------------------</td>
</tr>
<tr>
<td>Phase 2 clinical trials</td>
<td>Further testing demonstrating success</td>
<td>Results of further testing with a wider group of people; scientific advice (regulatory and health technology assessment (HTA))</td>
</tr>
<tr>
<td>Phase 3 clinical trials</td>
<td>Results of large-scale testing with potential patients</td>
<td>Dossier compiled and published for submission; start of market access application</td>
</tr>
<tr>
<td></td>
<td>Preparation for regulatory approval process</td>
<td>Cost-effectiveness analysis completed</td>
</tr>
</tbody>
</table>

**Commercialisation**

<table>
<thead>
<tr>
<th>Regulatory approval</th>
<th>Regulatory approval achieved by regulatory authorities</th>
<th>Application submitted to the MHRA Early Access to Medicines Scheme (EAMS); approval from the MHRA EAMS (or an international equivalent)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marketing</td>
<td>Marketing authorisations achieved</td>
<td>Application submitted to the Committee for Medicinal Products for Human Use (CHMP) (or an international equivalent); approval from the CHMP (or an international equivalent); number and type of marketing authorisations achieved</td>
</tr>
<tr>
<td>Reimbursement and procurement, commissioning and purchasing</td>
<td>Reimbursement approvals achieved</td>
<td>Application submitted for a NICE Health Technology Assessment (HTA) (or international equivalent); recommendation received from NICE HTA (or international equivalent); application to specialised commissioning considered and submitted (if required); specialised Commissioning Oversight Group approval, if required (or international equivalent) Levels-up commissioning CCG features correlated with commissioning decisions (e.g. net expenditure, assurance rating)</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>Manufacturing authorisations achieved</td>
<td>Number and type of manufacturing authorisations achieved</td>
</tr>
<tr>
<td>Distribution</td>
<td>Purchasing agreements and contracts achieved</td>
<td>Number and type of purchasing contracts agreed; distribution of purchasing contracts; scale of purchasing contracts</td>
</tr>
</tbody>
</table>
### Table 4: Health innovation pathway performance indicators for medical devices and in vitro diagnostics

<table>
<thead>
<tr>
<th>Devices/diagnostics</th>
<th>Associated indicators</th>
<th>Examples of metrics (qualitative and quantitative)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Research and early-stage development</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proof of concept</td>
<td>Basic technological principles demonstrated</td>
<td>Experimental data performed on a lab scale to validate analytical predictions</td>
</tr>
<tr>
<td>Prototype development</td>
<td>Basic prototype developed</td>
<td>Basic technological components integrated and prototype developed</td>
</tr>
<tr>
<td>Pilot/feasibility testing</td>
<td>Clinical and non-clinical testing design considered</td>
<td>Product testing requirements considered (dependent on the class of medical device)</td>
</tr>
<tr>
<td></td>
<td>Product testing (clinical or non-clinical) completed</td>
<td>Results from basic technological components tested in a simulated environment</td>
</tr>
<tr>
<td><strong>Late-stage development</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Full prototype development</td>
<td>Full pre-production prototype developed (i.e. a prototype that would ‘work-like’ and ‘look-like’ the expected final solution, but which could not be sold)</td>
<td>Full functionality of the product demonstrated; integration and interoperability with existing infrastructure ensured</td>
</tr>
<tr>
<td>Pivotal trials</td>
<td>Results of the prototype testing in operational environment demonstrate success</td>
<td>Health economic analysis/clinical utility study completed; clinical safety/effectiveness studies completed, including first-in-man and pivotal studies</td>
</tr>
<tr>
<td></td>
<td>Results of testing in its final configuration collected</td>
<td></td>
</tr>
<tr>
<td><strong>Commercialisation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regulatory approval</td>
<td>Regulatory approvals achieved</td>
<td>Relevant European Commission Directive requirements determined (e.g. Medical Devices Directive (MDD)/In Vitro Diagnostic (IVD) Medical Devices Directive/Active Implantable Medical Devices Directive (AIMDD)) (or an international equivalent); conformity assessment (e.g. MDD, AIMDD, IVD Directive) completed, if required (or an international equivalent); CE marking and other regulatory requirements, including any associated safety trials (or an international equivalent); NICE Appraisal achieved (or an international equivalent)</td>
</tr>
</tbody>
</table>

---
<table>
<thead>
<tr>
<th>Devices/diagnostics</th>
<th>Associated indicators</th>
<th>Examples of metrics (qualitative and quantitative)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacturing</td>
<td>Manufacturing authorisations achieved</td>
<td>Number and type of manufacturing authorisations achieved</td>
</tr>
<tr>
<td>Marketing</td>
<td>Marketing authorisations achieved</td>
<td>Reimbursement assessment requirements considered; value proposition fully demonstrable with evidence; number and type of marketing authorisations achieved</td>
</tr>
<tr>
<td>Commissioning, Procurement and purchasing</td>
<td>Procurement approvals and purchasing agreements, commissioning agreements</td>
<td>Number and type of purchasing contracts agreed; distribution of purchasing contracts; scale of purchasing contracts Levels-up commissioning CCG features correlated with commissioning decisions (e.g. net expenditure, assurance rating)</td>
</tr>
</tbody>
</table>

Table 5: Health innovation pathway performance indicators for digital health

<table>
<thead>
<tr>
<th>Digital health</th>
<th>Associated indicators</th>
<th>Examples of metrics (qualitative and quantitative)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Research and early-stage development</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Proof of concept</td>
<td>Technical proof-of-concept achieved</td>
<td>User and system requirements considered; early functions/user interface developed; mocked-up prototype screens permitting user interaction feedback</td>
</tr>
<tr>
<td>Basic prototype</td>
<td>Basic prototype developed</td>
<td>Basic functionality of the product demonstrable; results from bench-type prototyping to test the technology; specialist testing and/or demonstration to provide basic proof of technical feasibility; lead time from proof-of-market to basic prototype development; amount and type of downstream investment obtained</td>
</tr>
<tr>
<td><strong>Late-stage development</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Full prototype</td>
<td>Pre-production prototype developed</td>
<td>Full functionality of the product demonstrable; integration and interoperability with existing infrastructure ensured</td>
</tr>
<tr>
<td>Digital health</td>
<td>Associated indicators</td>
<td>Examples of metrics (qualitative and quantitative)</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>--------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Trials and testing</td>
<td>Clinical validation/stakeholder review</td>
<td>Relevant technology standards considered; clinical safety assessment completed; systems review completed; security review completed; quality check completed; health economic analysis completed</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Commercialisation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regulatory approval</td>
<td>Regulatory process completed</td>
<td>Device class (Class I/IIa/IIb/III) determined; conformity assessment and essential requirements ('ER') undertaken; CE marking application; CE marking received</td>
</tr>
<tr>
<td>Early adoption and procurement</td>
<td>Routes to reimbursement clearly identified</td>
<td>Type and number of agreements with early adopters; type and number of strategic relationships and alliances</td>
</tr>
<tr>
<td>Large-scale clinical trials/evidence generation</td>
<td>Reports on real-world application performance</td>
<td>Collated evidence of performance of digital technology in real-world settings</td>
</tr>
<tr>
<td>Marketing</td>
<td>Routes to market identified</td>
<td>Number and type of routes to market specified; user training needs identified and support packages established and/or provided</td>
</tr>
<tr>
<td>Distribution</td>
<td>Distribution channels identified</td>
<td>Available distribution channels pursued; external deployment routes identified and pursued</td>
</tr>
<tr>
<td>Purchasing and Commissioning</td>
<td>Purchasing agreements</td>
<td>Number and type of purchasing contracts agreed; distribution of purchasing contracts; scale of purchasing contracts Levels-up commissioning CCG features correlated with commissioning decisions (e.g. net expenditure, assurance rating)</td>
</tr>
</tbody>
</table>
### Table 6: Health innovation pathway performance indicators for service innovation

<table>
<thead>
<tr>
<th>Service innovation</th>
<th>Associated indicators</th>
<th>Examples of metrics (qualitative and quantitative)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Research and early development</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Concept design</td>
<td>Concept formulated</td>
<td>Degree of early engagement and/or co-design with service users/commissioners; evidence of needs for service innovation and in support of the proposed concept</td>
</tr>
<tr>
<td>Basic prototype</td>
<td>Basic prototype designed and fidelity demonstrated</td>
<td>Functionality of basic service prototype to ensure it can be tested in operational environment</td>
</tr>
<tr>
<td>Pilot and testing</td>
<td>Basic prototype tested in simulated environment</td>
<td>Results of service model testing in simulated environment; target performance determined; barriers for achieving target performance identified</td>
</tr>
<tr>
<td><strong>Late-stage development</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Service prototype development</td>
<td>Full service prototype tested in operational environment</td>
<td>Results of prototype testing available</td>
</tr>
<tr>
<td>Further testing and trials</td>
<td>Service innovation proven to work in its final form and under expected conditions</td>
<td>Results of service model testing in simulated environment; target performance (technical and economic) determined; barriers for achieving target performance identified</td>
</tr>
<tr>
<td><strong>Commercialisation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Commissioning</td>
<td>Commissioning agreements</td>
<td>Levels-up commissioning CCG features correlated with commissioning decisions (e.g. net expenditure, assurance rating)</td>
</tr>
<tr>
<td>Adoption</td>
<td>Service innovation proven to work in its final form and under mission conditions or on market</td>
<td>Real application performance results</td>
</tr>
</tbody>
</table>
11.3.2. Indicators of adoption, diffusion and impact by patients, the public, the population, the health and care system and the wider economy

The ultimate value of an innovation will depend on its successful uptake across the entire health and care system. As pointed out at the very beginning of this paper, the NHS in England is traditionally seen as being better at the development of innovations than at their adoption, scale-up and diffusion (Department of Health 2011; HM Treasury 2011), and therefore a number of policy efforts are being targeted at adoption of innovations. These include programmes targeting specific innovations, such as the NHS Innovation Accelerator, a programme that supports selected individuals with an innovation to help them get it adopted, and initiatives aimed specifically at measuring uptake, such as the NHS Innovation Scorecard, which tracks the uptake of a number of drugs and medical devices at a regional level.

Table 7 below addresses measures of uptake of innovation, as this reflects the extent to which, once developed, innovations are adopted and diffused throughout the healthcare system. It shows potential indicators of uptake by patients, the population and the health and care system, along with possible measures for these indicators. However, not all the suggested indicators will have the same feasibility and acceptability. The categories of indicators to measure uptake are: amount of uptake (adoption); spread of uptake (diffusion); encouragement to scale-up (to measure support and funding for uptake); and pace/rate of scale-up (to measure the time it takes to achieve impact).

Table 7: Potential indicators of uptake (adoption and diffusion) by patients, the wider population and the health and care system

<table>
<thead>
<tr>
<th>Indicators</th>
<th>Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Drugs and vaccines</td>
</tr>
<tr>
<td></td>
<td>Devices and diagnostics</td>
</tr>
<tr>
<td></td>
<td>Service innovations</td>
</tr>
<tr>
<td></td>
<td>Digital innovations</td>
</tr>
<tr>
<td>Amount of uptake (adoption)</td>
<td>Number of units sold</td>
</tr>
<tr>
<td></td>
<td>Number of users (e.g. providers prescribing and administering)</td>
</tr>
<tr>
<td></td>
<td>Number of units sold</td>
</tr>
<tr>
<td></td>
<td>Number of users (e.g. providers providing and administering)</td>
</tr>
<tr>
<td></td>
<td>Number of settings using the innovation (e.g. units within providers, providers)</td>
</tr>
<tr>
<td></td>
<td>Number of individuals and/or teams trained to use the innovation</td>
</tr>
<tr>
<td></td>
<td>Number of times the innovation is sold (if appropriate)</td>
</tr>
<tr>
<td></td>
<td>Number of users (if appropriate)</td>
</tr>
<tr>
<td></td>
<td>Number of downloads for apps</td>
</tr>
<tr>
<td></td>
<td>Number of repeat visits to websites</td>
</tr>
<tr>
<td>Indicators</td>
<td>Measures</td>
</tr>
<tr>
<td>------------</td>
<td>----------</td>
</tr>
<tr>
<td><strong>Spread of uptake (diffusion)</strong></td>
<td><strong>Drugs and vaccines</strong>&lt;br&gt;Number of units/entities using the innovation (regions, healthcare settings, therapeutic areas)&lt;br&gt;Relative uptake levels (by region, healthcare setting, therapeutic area)&lt;br&gt;Nature (diversity in type) of users</td>
</tr>
<tr>
<td><strong>Encouragement to scale-up</strong></td>
<td><strong>Amount of funding raised to support scale-up (e.g. purchase funds)</strong>&lt;br&gt;Policy guidelines and mandates (e.g. NICE HTA)&lt;br&gt;User feedback</td>
</tr>
<tr>
<td><strong>Pace/rate of scale-up</strong></td>
<td><strong>Changes in usage levels and patterns over time, including increase (or potentially decrease) in number of users, number/variety of uses, geography, healthcare setting and therapeutic area.</strong></td>
</tr>
</tbody>
</table>

The measures for amount and spread of uptake and the pace/rate of scale-up all rely on the collection of usage or sales data. Usage figures are available for a specific set of drugs and devices on the Innovation Scorecard, which tracks uptake across the country and at the level of CCGs. The usage figures are compiled using a variety of sources, many of which are not publicly available; they include: prescribing data, the hospital pharmacy audit index, hospital pharmacy purchase data, hospital episode statistics and various sales data from pharmaceutical companies (NHS Digital 2017). Where available, these data sources could also
be used to compile uptake data for other drugs and devices, although the process for doing so could be labour and time intensive. For devices and drugs used in settings other than hospitals or primary care settings, it would be important to also find usage data from those settings. Some national programmes (e.g. the NHS Innovation Accelerator) also collect uptake data on the innovations in their portfolio, but this is at a small scale. It tends to be self-reported data from innovators who are promoting their products.

For service innovations, there is no currently available single source of data on uptake; instead data would have to be obtained from the individuals involved in using or promoting the service innovation. However, some national programmes that include service innovations do aim to collect data on uptake (e.g. the NHS Innovation Accelerator programme) for innovations in their portfolio, and this information could be mined for relevant indicator data.

For digital innovations, there is also no currently available integrated national source of data on uptake. However, data on downloads from apps, which itself is only a proxy for usage, could in principle be obtained from the company owning the app, or potentially from associated websites. For web platforms, traffic indicators (e.g. number of visits, number of unique IP addresses visiting) could also be obtained in principle and could serve as a proxy for usage, but there could be data governance concerns. Sales data could also be obtained from the company owning/Managing the innovation, if it is a paid-for digital product.

To calculate spread of uptake (diffusion) and the rate of scale-up (adoption), the uptake data needs to be collected over time and also broken down by region, healthcare setting (e.g. primary, specialist, community care, self-care/home use or other) and therapeutic area. While the Innovation Scorecard provides a breakdown of diffusion data over time and region for a limited set of drugs and devices, currently there is no other source bringing this information together, so the data would have to be obtained separately for each innovation. The majority of data for encouragement of scale-up would also need to be collected from the company/proponent of the innovation.

11.3.3. Indicators of impact on patients/the population, the healthcare system and the economy

Once an innovation has been adopted by the system, the key measures of its value arise from its impact on patients and the wider population, through improved quality of life and wellbeing, and on the healthcare system itself, through improved quality or safety of care, and improved cost-effectiveness, as well as through measures of economic impact on government budgets and the total economy. Table 8 shows five categories of impact across patients, the public, the healthcare system and the wider economy:

- Impact on NHS quality and safety of care
- Impact on NHS cost-effectiveness of care
- Impact on patient/wider population quality of life, wellbeing and health seeking behaviours
- Impact on self-management/reduced needs for hospital or social care
- Impact on the wider economy.

The majority of these measures tend to apply to all innovation types, but this is not always the case. Table 9 shows illustrative examples of links between a particular measure and innovation type for each of the five categories of impact. However, as noted in the final discussion, careful thought will need to be given to issues of contribution/attribution and time lags if these indicators are to be implemented.
### Table 8: Indicators of impact on patients, the population and the health and care system and potential measures

<table>
<thead>
<tr>
<th>Indicator: type of impact</th>
<th>Measures</th>
</tr>
</thead>
</table>
| 1. Impact on NHS quality and safety of care | 1.1. Reduced admission/re-admission (number, frequency over time, frequency per patient profile)  
1.2. Reduced length of stay in hospital per admission  
1.3. Reduced errors (number, frequency over time, frequency per patient profile)  
1.4. Reduced incidence of complications (number, frequency over time, frequency per patient profile)  
1.5. Reduced rate of progression of disease  
1.6. Avoided mortality (changed trends over time pre-/post-innovation existence) |
| 2. Impact on NHS cost-effectiveness of care | 2.1. Reduced cost per treatment/unit of administration or use  
2.2. Enhanced outcome per treatment/unit of administration or use |
3.2. Carer or family quality of life measures  
3.3. Fewer sickness absences from work and/or schools  
3.4. Patient satisfaction scores |
| 4. Impact on self-management/reduced needs for hospital or social care/other | 4.1. Reduced attendance at A&E/GP/outpatient appointments (as appropriate) due to self-management (where the innovation enables self-management) |
| 5. Impact on the wider economy | 5.1 Cost changes (increases or reductions) to other government budgets as a result of the implementation of an innovation  
5.2. Jobs created  
5.3. Investment gained  
5.4. Revenues to business  
5.5. Fewer sickness absences from work and/or schools |
### Table 9: Measures of innovation impact on patients, the population and the health and care system – illustrative examples by innovation type

<table>
<thead>
<tr>
<th>Overall impact type</th>
<th>Sub-measure</th>
<th>Examples showing relevance of measure to each innovation type</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Impact on NHS quality and safety of care</td>
<td>1.1. Reduced admission/re-admission (number, frequency over time, frequency per patient profile)</td>
<td>Due to more effective drugs that require less monitoring</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Due to self-care and/or remote care enabled by devices</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Due to improved care through service improvement</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Due to self-care and/or remote care that is web-enabled</td>
</tr>
<tr>
<td></td>
<td>1.2. Reduced length of stay in hospital per admission</td>
<td>Due to more effective drugs that require less monitoring</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Due to devices in surgery improving outcomes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Due to service improvement</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Enabled by improved digital hospital management system</td>
</tr>
<tr>
<td></td>
<td>1.3. Reduced errors (number, frequency over time, frequency per patient profile)</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Due to devices in surgery improving outcomes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Enabled by improved hospital management system</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Enabled by improved digital hospital management system</td>
</tr>
<tr>
<td></td>
<td>1.4. Reduced incidence of complications (number, frequency, frequency per patient profile)</td>
<td>Due to drugs with fewer interactions</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Due to devices in surgery improving outcomes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Enabled by improved hospital management system</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Due to health literacy and health education portals and apps, better hospital management systems</td>
</tr>
<tr>
<td></td>
<td>1.5. Reduced rate of progression of disease</td>
<td>Due to more effective drugs that reduce the rate of disease progression</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Due to devices allowing for more effective monitoring</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Due to improved care through service improvement</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Due to health and wellbeing platforms and virtual communities with a focus on prevention</td>
</tr>
<tr>
<td></td>
<td>1.6. Avoided mortality (trends over time pre-/post-drug/vaccine existence)</td>
<td>Due to more effective drugs that reduce the rate of disease progression</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Due to devices in surgery improving outcomes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Enabled by improved hospital management system</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Due to homeware technologies with digital monitoring and communication of vital signs</td>
</tr>
<tr>
<td>Overall impact type</td>
<td>Sub-measure</td>
<td>Drugs and vaccines</td>
</tr>
<tr>
<td>---------------------</td>
<td>------------------------------------------------------------------------------</td>
<td>------------------------------------------------------</td>
</tr>
<tr>
<td>2. Impact on NHS cost-effectiveness of care</td>
<td>2.1. Reduced cost per treatment/ unit of administration or use (assuming same effectiveness compared to alternative)</td>
<td>Due to reduced unit cost of drugs or vaccines or due to positive impacts of drugs or vaccines on NHS quality of care, e.g. reduced need for admission/ re-admission, reduced length of stay in hospital per admission, reduced health professional time per patient, increased productivity</td>
</tr>
<tr>
<td></td>
<td>2.2. Enhanced outcome per treatment/ unit of administration or use (assuming same unit cost)</td>
<td>Due to better patient targeting, reduced side-effects or other reasons</td>
</tr>
<tr>
<td>3. Impact on patient/wider population quality of life, wellbeing and health-seeking behaviours</td>
<td>3.1. Patient quality of life measures and feedback</td>
<td>Improved patient quality of life due to more effective drugs</td>
</tr>
<tr>
<td>Overall impact type</td>
<td>Sub-measure</td>
<td>Examples showing relevance of measure to each innovation type</td>
</tr>
<tr>
<td>---------------------</td>
<td>-------------</td>
<td>-------------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Drugs and vaccines</td>
</tr>
<tr>
<td>3.2. Carer or family quality of life measures</td>
<td>Improved carer quality of life due to drugs that require less monitoring</td>
<td>Improved carer quality of life due to devices enabling home monitoring rather than hospital monitoring</td>
</tr>
<tr>
<td>3.3. Fewer sickness absences from work and/or school</td>
<td>Due to more effective drugs</td>
<td>Improved patient satisfaction scores due to, for example, drugs requiring less follow up</td>
</tr>
<tr>
<td>3.4. Patient satisfaction scores</td>
<td>Improved patient satisfaction scores due to, for example, drugs requiring less follow up</td>
<td>Improved patient satisfaction scores due to, for example, faster diagnosis</td>
</tr>
<tr>
<td>4. Impact on self-management/ reduced needs for hospital or social care/ other</td>
<td>4.1. Reduced attendance at A&amp;E, GP or outpatient appointments due to self-management (where the innovation enables self-management)</td>
<td>Due to more effective drugs that require less monitoring</td>
</tr>
<tr>
<td>5. Measure of economic impact</td>
<td>5.1. Cost changes (increases or reductions) to other government budgets as a result of the implementation of an innovation</td>
<td>Due to a drug rollout for a condition increasing side-effects that need to be dealt with in social care or community settings</td>
</tr>
<tr>
<td>Overall impact type</td>
<td>Sub-measure</td>
<td>Examples showing relevance of measure to each innovation type</td>
</tr>
<tr>
<td>---------------------</td>
<td>-------------</td>
<td>----------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td>Drugs and vaccines</td>
<td>Devices and diagnostics</td>
</tr>
<tr>
<td>5.2. Jobs created</td>
<td>By virtue of related research, development, commercialisation activity related to drug or vaccine development and administration</td>
<td>By virtue of related research, development, commercialisation activity related to device or diagnostic development and administration</td>
</tr>
<tr>
<td>5.3. Investment gained</td>
<td>Increased number of clinical trials, increased product development in the UK as related to drug or vaccine development</td>
<td>Increased product development in the UK as related to device or diagnostic development</td>
</tr>
<tr>
<td>5.4. Revenues to business</td>
<td>Due to sales</td>
<td>Due to sales (if appropriate)</td>
</tr>
<tr>
<td>5.5. Fewer sickness absences from work and/or school</td>
<td>By virtue of improved health outcomes from innovation use (therefore higher productivity)</td>
<td></td>
</tr>
</tbody>
</table>

In presenting these indicators, we assume that all innovations that have been adopted into the health and care system are either benefit increasing or benefit neutral for patients; therefore when looking at indicators of impact on patients/the population or the health and care system we only describe positive indicators. Benefit increasing or benefit neutral innovations can all be either cost increasing, cost neutral or cost reducing. Cost reducing would be most desirable, but even if an innovation was cost reducing overall it may not be cost reducing in every part of the system it affects. For example, a drug may be more expensive, so the drug budget may increase, but it may reduce need for monitoring so that outpatient costs are lower. There is also the possibility that hospitals may 'make' less money as reduced patients may also mean reduced tariff payments; this may mean that
Innovating for improved healthcare

A hospital doesn’t save money because while it reduces costs it also reduces its income. However, when describing indicators of economic impact we include both positive and negative impacts.

Many of these indicators could be measured using data available from the Health and Social Care Information Centre (HSCIC). For example, all measures for impacts on NHS quality and safety of care, and in part the impact on self-management/reduced needs for hospital or social care/other could be calculated using hospital episode statistics. However, attribution of changes in these measures to particular innovations may be challenging, as in the majority of hospital appointments or admissions there will be a wide variety of actions undertaken. Because of this, evidence for indicators may need to be collected directly from users and be linked to changes in admissions/re-admissions or other indicators pre and post the administration and rollout of an innovation. This process is likely to be very time consuming.

HSCIC also has patient-reported outcome measures (PROMs), but only for four treatments in England: hip replacement, knee replacement and varicose vein and groin hernia surgery. PROM data are not collected routinely for other conditions, and quality of life data is also not routinely collected other than in clinical trials. Therefore to calculate measures of impact on patient/wider population quality of life, wellbeing and health-seeking behaviours, data would likely have to be collected specifically related to the innovation in question. Another means of potentially gauging impacts is through patient feedback platforms and surveys, but again, issues of contribution and attribution would need to be considered.

To calculate measures for impact on the NHS, care data on cost-effectiveness and outcomes are needed, along with a way of assessing contribution and attribution. Outcomes can be measured in terms of survival, quality of life, QALY and (depending on context) measures of patient experience. Costs would include direct and indirect costs and would have to be assessed using provider cost data.

Another possible source of data for impacts on patients is the NHS Outcomes Framework, which is a framework for outcome and impact indicators covering five domains: preventing people from dying prematurely; enhancing quality of life for people with long-term conditions; helping people to recover from episodes of ill health or following injury; ensuring that people have a positive experience of care; and treating and caring for people in a safe environment and protecting them from avoidable harm. For this framework, data are collected data at local authority, CCG population and/or provider level, for a range of impacts including health-related quality of life for a range of individuals, re-admissions within 30 days, etc. However, these data are collected at a population or patient level, and are not linked to particular innovations, it would be difficult to link changes in indicators to particular innovations.

Data for wider economic impacts are not readily available at either a macro level for health innovation as a whole within the UK, or for individual innovations. Data would have to be collected at individual innovation levels; for example, companies involved in the innovation

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296 For more information, see http://www.hscic.gov.uk/hes
297 For more information, see http://www.hscic.gov.uk/proms
298 For more information, see NHS Commissioning Board (2012).
could report jobs created, revenue and investment gained.

11.4. Overarching considerations

In this chapter we have presented three main types of impact that align with a health systems perspective on innovation adoption and diffusion, and a fourth type of impact is described in Annex F. The four areas of impact are:

1. Indicators of the progression of an innovation across different stages of health innovation pathways.

2. Indicators of the adoption and diffusion of innovations through the health and care system.

3. Indicators that track the impact on patients, the population, the health system and the wider economy.

4. Indicators of capacity for innovating in the system (see Annex F).

The four areas, if implemented, would allow us to have a more holistic understanding and appreciation of how innovation spreads through the health system, and where particular bottlenecks might lie. This is because the indicators begin by tracking innovation progress through the health innovation pathway, and then move to identifying specific areas of the health and care system through which innovations are adopted and then diffused before going on to have actual impacts on patients, the population, the health system and the wider economy. Finally, providing the foundation for these efforts are a set of indicators to track how the system builds capacity at different levels to engage with innovation activities. Of course, this set of indicators is aspirational, and as indicated in the sections above, the data are not necessarily readily available in many cases.

However, in developing any system for measuring impact, it is important to be cognisant of the challenges that can arise. These include the challenges of attribution and contribution; data collection and harmonisation; accounting for time lags; allowing for the non-linearity of impact and the wider systems view of innovation; and capturing adequate measures of capacity for innovation in the system (Morgan Jones & Grant 2013; Morgan Jones, Manville & Chataway 2017).

In the case of measuring the impact of innovation, one of the main challenges will be that of determining the proportional contribution of any given innovation initiative or activity to the actual uptake of the innovation and its associated impacts. Any system that assesses impact aims to ensure that we have an understanding of the ‘contribution’ and ‘attribution’ relative to the outputs, outcomes or impacts that result from the input and activity. Contribution refers to the relative efforts made by a team(s) and the relationship to the outputs, outcomes and impacts, while attribution refers to the proportional extent to which the outcomes or impacts have resulted from those efforts. The way contribution and attribution are, or should be, highlighted will be differentially important depending on the purpose of the impact assessment. But what is most important is that there is an appreciation of the fact that it will not be simple to disentangle the various pathways through which innovations become embedded in the health system and then to attribute wider impacts (e.g. benefits to patients) solely to those innovations. There may be other, wider system efforts that also support those impacts and to which the innovation has contributed, but could not be said to be completely responsible for. While in many cases detailed, proportional assessments of contribution will
not be necessary, it is important to note the distinction and be aware of the limitations. The challenge of data collection and harmonisation is touched on in the impact indicator sections above, where feasibility and acceptability of data is discussed in relation to some impact areas. The challenge goes much wider than this, though, as with such a diversity of innovation impacts ensuring that organisations are collecting the same types of data that mean the same things will not be a straightforward task. While some areas of impact lend themselves to readily available metrics, such as counts of patents or numbers of patients reached, even these figures can be open to interpretation. There are challenges, then, in developing sets of impact indicators which could ‘close down’ wider analyses that are necessary to appreciate the full context within which innovation uptake happens and is sustained.

We know that the time it takes for medical research to translate from ‘bench to bedside’ has been estimated to be, on average, 17 years (Hanney et al. 2015; Morris, Wooding & Grant 2011), although this will inevitably depend on the types of innovations in question and the context that supports their adoption. Getting innovations taken up into the health system can be challenging, as this wider study has shown. However, even if an innovation is adopted into the health system, to be sustainable and for impacts to accrue at scale, it will take time and evidence from its use in multiple settings and across a critical mass of user populations to robustly understand its impact.

Finally, as we have mentioned throughout this paper, innovation happens within a wider systems perspective. Innovations, and the impacts they may lead to, will not happen in a linear fashion and there will not be simple one-to-one relationships between the innovations and their impacts. This is particularly the case once we begin looking at impacts in the indicator categories that track adoption and diffusion (category 2), wider impacts on patients, the economy and society (category 3), and measures of capacity-building (category 4). The longer and more complex the time horizon and pathway to impact, the harder it will be to assess the route to impact and make causal links between the innovations introduced and the impacts they have led to.

However, none of these challenges should deter us from embracing a more holistic and system-based set of innovation metrics that account for the whole healthcare innovation system and associated pathways. Developing metrics that are attuned to these and sensitive to the different types of innovations and impact pathways that may arise will help the entire system and set of actors better understand where innovations are, and are not, making a difference at various levels. This more nuanced understanding can, in turn, lead to policy development that targets particular areas in which we want to see more impacts, more sustained uptake of innovation and more uniformity across regions.
12 In reflection: issues to consider when taking forward actions to support an innovating health system

12.1. Framing our proposed areas for action: whole-systems thinking is essential for transformational leadership across the innovating health system

Reflecting on this study, several things stand out. Firstly, innovation is at heart a social process involving relationships, leadership, creativity, motivation, incentives and rewards. We have seen in and beyond the NHS in England much enthusiasm for building relationships for an improving health system, and considerable creativity within these relationships. However, often the relationships lack the reach across different parts of the health and care pathway and across organisations needed to maintain a thriving innovation system.

Secondly, the social dimension to innovation, and the accompanying required social skills in areas such as leadership, networking, negotiation and so on, are all underpinned by a set of required technical competencies. These not only concern the science and technology expertise that underpins invention and innovation development, but also involve skills in technology appraisal, economic assessment, whole-system thinking, and understanding how business models play out in their social context. We find that the innovating health system is better supported by its skills in product and technology development, service model design, technology appraisal and economic assessments of cost-effectiveness than by its ability to embed whole-system thinking in appraising the need for and long-term impacts of innovation across the health and social care system; across primary, acute and tertiary care and across prevention, treatment and cure concerns.

Thirdly, innovation takes place primarily within organisational settings. Organisations are good at coordinating behaviour, setting standards, policing regulations, managing budgets and establishing accountabilities. However, these strengths can result in an innovation system that is constrained by organisational requirements – one that is siloed, poorly equipped to manage risk effectively (including the risks of not innovating), inward looking, and focused on in-year, short-term financial outcomes. In particular, organisations may be slow to learn from what has been tried previously or what is being tried elsewhere. Furthermore, the NHS comprises many heterogeneous organisations, which can also make it hard for innovators to navigate and understand the system.

These challenges are being recognised in the evolving policy landscape, with: (i) the move to more integrated systems (e.g. STPs planned to become Integrated Care Systems,
Vanguards, Applied Research Collaborations, devolution) and networked institutions with a remit to help coordinate the system (e.g. AHSNs, Innovation Exchanges, the Accelerated Access Collaborative); (ii) clearer articulation of priorities for innovation and improvement (e.g. in the Next Steps on the NHS Five Year Forward View, Accelerated Access Review, Carter Review and other policy positions); and (iii) efforts to identify central points of contact for commercial negotiations (e.g. an improved commercial unit in the NHS). While these measures all attempt to address the impediments of organisational silos and a fragmented system, it is important to reflect on the difference between over-fragmentation and a system that is targeted and fit for purpose, and this is a challenge that both national policy and local initiatives will need to resolve.

Local, regional and national relationships are stabilising and maturing and this potentially encourages the sort of longer-term relationships that can provide a stable platform for innovation and transformation. This supports both needed degrees of specialisation and localism, and the coordination at national levels that is needed to ensure the clarity in roles and responsibilities between different actors in the system, avoiding unnecessary duplication and supporting needed specialisation. Amongst the areas for action we have identified through our research, most are likely to have both a local and a national element and coordination institutions will have a key role to play in navigating local- and national-level activities.

Technical skills have also continued to develop and there is much more awareness of the need for organisations to be re-incentivised and for regulation and inspection to support, rather than stifle, innovation and improvement and reduce unwarranted variation in care (e.g. through programmes such as NHS RightCare and GIRFT).

Although there is much more work to be done to design and implement a system where innovating is embedded into NHS ways of working at scale and sustainably, progress is being made here too. As our research has shown, and as is supported by the literature we have reviewed and discussed throughout this report and in the accompanying Annex E, policy initiatives have helped establish and grow programmes that tackle a range of issues across the seven drivers we have identified. In the aftermath of the Health and Social Care Act (HSCA) (Parliament of the United Kingdom 2012) and the opening of NHS commissioning and procurement to more competition and more decentralised decision making, it is plausible that different places might experiment and adopt different solutions and innovations to shared problems. Most of the available evidence suggests that in practice the HSCA was used by commissioners to find a balance between competition and collaboration, but how this was done may have varied, making innovation pathways less clear. It will be important to consider how criteria for commissioning and procurement can be communicated and coordinated to ensure transparent decision making, and how evaluative evidence can be shared across the system to support such practices.

There are efforts to improve skills and build capacity both for developing innovative solutions and for facilitating and driving their uptake (e.g. Clinical Entrepreneurs Training Programme, NHS Innovation Accelerator).

The funding landscape is evolving, with a focus on health-related innovation in targeted schemes such as SBRI and i4i, and as part

299 See, for example, Allen et al. (2017).
of wider industrial policy and strategy (e.g. in areas such as digital innovation, precision medicine, artificial intelligence and robotics applications in health, and others). New commissioning and financial pull arrangements have been introduced (e.g. ITP, ITT, outcome-based commissioning, flexible risk-sharing agreements) and will be all the more important given our findings relating to CCG prescribing patterns, which highlighted the importance to commissioners of the cost of new innovations when deciding whether to adopt them or not.

Policy developments are looking at how to bring safe and effective innovations to patients and the service quicker (e.g. Accelerated Access Pathway, Digital Exemplars) and institutional arrangements explicitly focusing on health innovation as part of their remit are embedding into regional and national health system landscapes and strengthening the relationships and networks needed to create receptive and connected spaces (e.g. AHSNs, Test Beds, Innovation Hubs).

The information and evidence landscape is also gradually evolving (e.g. NHS Innovation Scorecard, GIRFT, NHS RightCare, NIHR Observatory), but there is a need for much more work in bringing practical and actionable evidence and information on innovation opportunities to diverse stakeholders (including patients and the public) and engaging them in the generation of evidence, as well as in the use of that evidence to make decisions about cost-effectiveness and improvements to quality of care. This need for further capacity-building applies all the more to information on innovations outside the medicines space (e.g. for medtech, digital and service innovation).

Among provider organisations, we are seeing roles and accountabilities with an explicit innovation remit (e.g. as part of Directors of Improvement, Innovation Scouts and others) (Marjanovic et al. 2017b), and in some cases a deliberate focus on motivations and incentives (recognition through awards, leadership support and career development opportunities) for engaging with innovation. There is also growing recognition and appreciation of the role of patient and public involvement and engagement, and efforts to make this meaningful and sustainable are generating momentum.

These developments are promising signs of gradual evolution and change, but they still lack scale, sustainability and connectedness. There remains a gap between what is required from an innovating health system and what is currently being delivered. To build on the current developments and establish a sustainable innovating health system of receptive and connected individuals, organisations, regions and stakeholders, there is a need to implement a series of recommendations related to the key drivers of innovation. The aim is for technology and innovation to enable accelerated service redesign to deliver a step change in the effectiveness, quality and efficiency of healthcare services (NHS England n.d.-f). New health technologies, digitisation, personalisation and new models of care provide some of the necessary ingredients for such transformations in healthcare but, given the scale of the ambition to transform healthcare, harnessing them will require the attention of innovators, patients and the public, healthcare professionals, managers and executives, working together with policymakers and regulators to create receptive spaces for innovation.

In proposing policy and behavioural responses to bridge the gap between potential and actual innovation, we are well aware of the importance of path-dependency. The existing architecture of innovation is necessarily the starting point for any improvements in the innovation landscape, and that architecture does not function in isolation from the wider
healthcare, socioeconomic, science and technology, and political context. There is an understandable sense of urgency and importance given to innovation as a vehicle for achieving quality and productivity gains in the health system, and this is reflected in a diversity of policy developments and reports including: *Innovation, Health and Wealth* (Department of Health 2011), and subsequently and with more emphasis in the *Accelerated Access Review* (2016), the *Five Year Forward View* (NHS England 2014) and the *Next Steps on the NHS Five Year Forward View* (NHS England 2017a), the *Carter Review* (Lord Carter of Coles 2016), and in the *Life Sciences Industrial Strategy* (Bell 2017).

By focusing on the knowledge and experience of those within this architecture, this study has brought a detailed understanding of the existing system constraints and opportunities, rather than starting from an abstract model of the perfect innovation system. From this we understand that for people seeking to support and foster innovation within the healthcare system, there is enthusiasm for both improvement and innovation, but that this is constrained by a number of issues that policymakers might address and that have been discussed throughout this report. For example, we were often told by stakeholders that the information needed to foster and catalyse innovation was not easily available and of variable quality and relevance. People went to many and varied places to find information not only to understand what innovations were coming down the pipeline, but also what the priorities and future needs of healthcare were and where demand for innovation lies. Innovators in our interviews, workshops and in our case vignettes often highlighted the challenges of trying to sell their ideas to one Trust after another, and this is certainly an inefficient way to provide signals to innovators.

Equally, commissioners and those delivering services were sometimes bemused by innovations being repeatedly proposed which they felt could never work within existing budgetary or organisational constraints. While the financial challenges facing health and social care may in some instances act as a spur to innovation, more often than not they have done so in a way in which short-term financial targets have been prioritised over long-term transformation (National Audit Office 2018a), thus supporting only innovations that can offer short-term cost-related benefits. This finding was reinforced by many of our participants, who recognised the need to consider innovative and radical alternatives, but lacked the resources to achieve this. Addressing this includes rethinking how accountability and financial responsibility sits within local organisational life in healthcare organisations and how policymakers can support a longer-term vision.

As well as informational and financial constraints, stakeholders often lacked the capabilities to engage with innovation and transformation. In many cases, this was mainly about time and headspace. But it was also about the technical skills needed to propose and implement innovations, or about the leadership support needed when proposing an innovation that was highly promising but had associated risks. These risks were at times related to individual or organisational concerns associated with personal promotion opportunities or the next organisational inspection and budgeting cycle.

In addition, it is clear that there are both common and unique constraints and opportunities related to actions that need to be taken to support different types of innovations (e.g. pharmaceutical, digital health, medtech, diagnostics). Interestingly, across the diversity of individuals we spoke to, shared needs and common concerns and opportunities were
raised more prominently than issues unique to specific types of innovations. That said, we recognise that unique determinants of success within different parts of the innovation system do exist. For example, digital technology platforms come with unique information security and interoperability determinants of uptake and spread, and the regulatory landscape for apps and digital innovations is arguably less mature than that related to pharmaceutical innovation (although it is evolving). Risk management and regulation around digital innovations as well as in relation to the rollout of medical devices is also seen by some to be a less mature policy area than that of pharmaceutical innovation. Harnessing the benefits of advancements in genomics, including genetic testing, will require investing in new skills and infrastructure. And the successful rollout of new technology-enabled models of care or ways of delivering services and making decisions (e.g. remote consultations, new models of accessing primary care, artificial intelligence and machine-learning enabled decision making) and the general acceptability of such interventions will in part be determined by evidence from evaluations of the wider, system-level effects that these interventions have. This means that evaluations will need to consider impacts not only in a specific setting or part of a care pathway, but on the wider health and care system and on transition points between primary, acute and community care.

Interestingly, what did not emerge particularly explicitly, but which could be inferred implicitly from our study, is the importance of power and sectional interests. The predominant metaphors and images used by our participants were of a system that needed fixing, not of power imbalances and vested interest. Yet we saw that innovations that succeeded were mainly those that reinforced, or at least did not challenge, existing professional and organisational interests. Disruptive technologies (for example providing new online routes to access primary care outside of ‘traditional’ General Practice) were often criticised not only on technical grounds (their impact on continuity of care and inequalities, for example) but also, it seemed, because they were a threat to the established way of doing things. This suggests a continued need not only for system-level leadership that drives transformational change, but also political leadership to establish a clear and longer-term vision for how the established way of delivering healthcare could or will change.

Our proposed recommendations reflect these interdependent concerns and offer concrete areas for action that can be implemented at organisational, regional and national levels. It will take the entire system working together to implement them successfully. This study therefore offers an opportunity to step back and consider what collectively we have learnt, as it relates to the diverse drivers influencing an effective innovation system and across all actors within it, and how this fits with the experiences of those involved in innovation and in care delivery in the English healthcare system.

Throughout the research in this study and its diverse work streams, it is system-level factors, and specifically drivers related to skills, capabilities, leadership, motivations, accountabilities, funding environments, relationships and networks, and the information environment, that seemed to weigh more heavily on the propensity for engaging with innovation and with the uptake of innovations, over population-level factors. The quantitative analysis conducted for this study, as summarised in Chapter 6 and reported in full in Annex F, found that the relative effect of population-level factors (e.g. prevalence of health conditions, age of population) and CCG
features on the uptake of innovation varied across different medicines. We find that decision makers involved in innovation are influenced by a variety of factors and these vary from place to place according not only to the availability of information but also the incentive and capacity to use it. Uptake will also vary by the availability of the skills and capabilities needed to embed innovations within existing pathways and models of care (or to change such models). Furthermore, we have seen that what are initially thought to be promising innovations may not always prove to be as beneficial as first hoped. This situation can arise for many reasons, such as technical proficiency may not be matched by organisational capacity; the innovation may not meet the business case of the NHS; and service users and/or professionals may not want or be able to use it. Under these circumstances the policy challenge is not to understand how to drive innovation forward at all costs, but how to identify likely early failures and manage them out of the system.

12.2. Areas for action

The case for a package of measures combining skills capabilities and leadership, motivations and accountabilities, information and evidence, relationships and networks, patient and public involvement and engagement, funding and commissioning, and policy design is as powerful as the argument against a single ‘blockbuster’ policy is weak. We have presented a series of recommendations throughout this report and we draw these together here. Tables 10 to 17 present key areas of action and specific recommendations that need to be pursued to ensure a thriving innovating health system that can deliver benefits for healthcare quality and safety, efficiency and effectiveness. These recommendations build directly on the key areas of action discussed in Chapters 4 to 11.

The ability of stakeholders to implement these recommendations is key. While it is beyond the scope and remit of this study to make decisive claims about the implementability of individual actions, we discuss some criteria that will affect this below. They include clarity in roles and responsibilities for implementation, diverse stakeholder buy-in and active engagement in implementation processes, effective governance of implementation and political will and resolve. While the research we have done identifies the relevance of the recommendations and whereas we offer some insights as to whether they are likely to be implementable in the short, medium or longer term, we recognise that there will be a need for policymakers and wider decision makers to make decisions on implementation priorities considering additional criteria. Some examples of these include resource demands and an appropriate balance of actions across different driver areas over time; implementation of a package of actions will need to unfold as a staged process. Implementation will also require attention to ensuring appropriate operational management (i.e. not only strategic oversight and governance). A compelling communications plan and leadership that can convey and help to sustain the vision of innovation as a potential aide and response to not only quality or cost-of-care concerns, but also workforce pressures and challenges, will be needed to secure engagement and buy-in from frontline staff, middle management and executive leadership in the NHS.

Implementing the recommendations would require a clear delegation of roles and responsibilities, collaboration between stakeholders and evaluation of their effect on the wider system. We also offer judgements about the short- (one to three years), medium- (four to five years) and long-term (six to ten years) nature of the recommended actions, in relation to a time frame within which they
could be actioned and implemented. These draw on the general experiences shared by study participants throughout our research as they relate to developments in the system and are reflective of a team assessment during a workshop focused on our emerging recommendations. We recognise that some drivers may be comparatively easier or more challenging to modify, but cannot draw definitive or highly specific conclusions on this. In general, and this is clear from our work, cultural and behavioural change is needed (i.e. necessary though not sufficient) to drive system change at scale. Yet cultural drivers related to motivations, accountabilities, attitudes, leadership of innovation, values and norms within and between different professional groups and hierarchies are likely to be harder to change (or likely to take longer to achieve change at scale) than some structural ones. For example, funding and resources for innovation are key to supporting uptake and for implementing an information and evidence infrastructure, and can be challenging to secure. However, without a shift in culture (and in underpinning training and education pathways, personal and organisational incentives and values), even available resources may not have full traction or be deployed to their full potential. The particular challenges of driving cultural change may in part explain why transformation efforts are often applied to areas that are easier to influence or implement in the shorter term (e.g. creating a new initiative or network, a pilot scheme, a funding scheme). That said, and as we have argued throughout this report, it is the interdependencies between different drivers of change (rather than any one driver in and of itself) that are the critical area for intervention.

All systems are characterised by interdependencies, and a substantial challenge facing policymakers is the need to balance and manage the interactions of the various parts of the innovating health system. For example, we have emphasised the importance of rebalancing previous efforts to strengthen the alignment between the supply of innovations and improvements in demand. We have noted the beneficial effects of a stronger patient and public voice, and of co-production and co-design with frontline healthcare professionals, aligned to clearly articulate innovation needs. The sustainability of innovation in the health system and the impact from innovating will depend not only on better aligning supply and demand, but also on better informing it through closer stakeholder collaboration across the innovation pathway. Impact will also depend on forums that help to connect innovation efforts, healthcare improvement efforts and service delivery with the changing needs of patients and the public (e.g. in light of multi-morbidities and interactions between health and social care pathways). Consequently, our recommendations are not always targeted at specific stakeholders but include recommendations that necessarily involve stakeholders who are jointly engaged across the innovating health system.

We have also reflected on where responsibility should lie for implementing recommendations, and note the critical role that political will and resolve will play in this regard. In a formal sense, accountability clearly lies with the Minister of State for Health and ultimately the government. But among our research participants, there was also a broad understanding that leadership in a complex system has to be distributed to be effective. However, the task of allocating responsibility for who should lead different aspects of innovation cannot always be completed through academic research; it involves a willingness to claim responsibility and creativity about how to mobilise and organise networks and relationships. This becomes even more
important when the intention is to achieve transformative innovation and deliver a step change in the effectiveness and efficiency of healthcare services. With this caveat in mind we discuss the sorts of leadership and governance arrangements that might be needed in the concluding section of this report.

It is also important to highlight that we do not wish to reinvent the wheel but instead build on learning from the past and efforts in the current landscape. Thus, some of the actions are related to scaling up and spreading good practice, building on examples of initiatives that are already in the system but at that are currently happening at a small scale and with variable practice (e.g. Innovation Champions and brokers; learning and exchange platforms enabled by programmes such as the Clinical Entrepreneur programme, NHS Innovation Accelerator and AHSNs; Test Beds, innovation and improvement initiatives and networks).

Other actions target areas where there has been comparatively less to build on (for example in relation to embedding innovation into health professional education curricula; more de-politicised cross-party and cross-department approaches to prioritising innovation needs; stronger accountability regimes; and better-coordinated national data infrastructure).

**Table 10: Recommendations, and their time frames, to strengthen skills, capabilities and leadership for innovation**

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>Time frame (short, medium or long term)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Integrate innovation-related training into continual professional development opportunities for senior managers, executives and clinical leaders in the NHS by raising awareness and encouraging participation in such programmes.</td>
<td>Medium</td>
</tr>
<tr>
<td>Policymakers should work with the Medical Royal Colleges and Health Education England to introduce innovation-related skills training into educational curricula.</td>
<td>Medium</td>
</tr>
<tr>
<td>Identify, mobilise and embed innovation champions and brokers into the health system more widely than is currently the case.</td>
<td>Medium</td>
</tr>
<tr>
<td>Establish a training programme for the private sector on how to effectively engage with the NHS.</td>
<td>Short</td>
</tr>
<tr>
<td>Create and sustain informal training and knowledge exchange opportunities, particularly around the implementation of innovations in provider organisations.</td>
<td>Short</td>
</tr>
<tr>
<td>Decide on priority areas of skills capacity-building at organisational, regional and national levels, given the evidence for key skills gap areas identified in this research.</td>
<td>Short</td>
</tr>
<tr>
<td>Introduce clear responsibilities and accountability structures for innovation in organisations and across hierarchies.</td>
<td>Short</td>
</tr>
</tbody>
</table>
### Table 11: Recommendations, and their time frames, to ensure appropriate motivations and accountabilities

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>Time frame (short, medium or long term)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consider feasible buy-out of programmed activities to support health professional engagement with innovation.</td>
<td>Long</td>
</tr>
<tr>
<td>Embed engagement with innovation into career development and promotion pathways in the health system and into the continual professional development point system.</td>
<td>Medium/long</td>
</tr>
<tr>
<td>Channel part of organisational performance-related payments into supporting and rewarding innovative activity.</td>
<td>Medium/long</td>
</tr>
<tr>
<td>Establish innovation champion roles in healthcare provider organisations with responsibility for monitoring delivery of organisational innovation-related goals and promoting an innovative mindset and culture.</td>
<td>Medium</td>
</tr>
<tr>
<td>Actively seek information on the cost and quality performance of innovations and engage with regional and national initiatives that provide such information.</td>
<td>Short/medium</td>
</tr>
<tr>
<td>Clarify Trust IP policies to healthcare professionals and support flexible risk and revenue-sharing agreements with the private sector.</td>
<td>Short/medium</td>
</tr>
<tr>
<td>Promote individual accountability through clear role specifications and performance management initiatives.</td>
<td>Short</td>
</tr>
<tr>
<td>Share examples of the impact from innovating (from other locations, organisations and contexts) with staff in organisations to help support culture change in attitudes towards innovation.</td>
<td>Short</td>
</tr>
<tr>
<td>Embed innovation remits into organisational policies and quality of service assessments, providing clear standards and guidance on accountable and responsible risk management, and instigating board-level ownership of implementation activities.</td>
<td>Short</td>
</tr>
<tr>
<td>Strengthen organisational accountability by embedding innovating activities into national regulatory and improvement regimes (e.g. CQC, GIRFT, audits), performance indicators and outcome-related payments.</td>
<td>Short</td>
</tr>
<tr>
<td>Raise awareness about existing funding schemes and resources to support the development and adoption of innovation.</td>
<td>Short</td>
</tr>
<tr>
<td>Recognise and reward innovation through awards for individuals in healthcare provider organisations and for organisations – for both entrepreneurial activity and take-up of innovations and innovative practice that makes a difference.</td>
<td>Short</td>
</tr>
</tbody>
</table>
### Table 12: Recommendations, and their time frames, to improve the information and evidence environment

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>Time frame (short, medium or long term)</th>
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</thead>
<tbody>
<tr>
<td>As part of an effort to establish a national framework and infrastructure for overseeing and coordinating information and evidence flows within the system, build an integrated data platform to be a central repository of key analytics and a signposting platform to other information sources. This would secure a unified means of sharing information about innovation opportunities, innovations and their performance. Appoint national data leads for the data platform to oversee teams of analysts that would collate and curate evidence from the diverse sources that individuals and stakeholders value and consult. Include a national library of pilots on the platform to share learning from the multiple pilot investments in the system.</td>
<td>Long</td>
</tr>
<tr>
<td>Create mechanisms for collective sense-making of data from the curated national platform (e.g. as part of existing decision-making architectures, boards, committees, meeting agendas, working with information brokers, delivery partners).</td>
<td>Long</td>
</tr>
<tr>
<td>Establish evidence standards: healthcare commissioners and providers should lead a wider consultative effort to create a unified and systematic approach to defining the type and quality of evidence needed for adoption decisions in the NHS.</td>
<td>Medium</td>
</tr>
<tr>
<td>Invest in consensus processes amongst regional and national actors across clinical leadership, NHS management and executives, policymaker, patients, public and third sector actors to identify priority innovation needs for the NHS so that innovators can respond to more stable and clear demand, in consideration of finite resources.</td>
<td>Short/medium</td>
</tr>
<tr>
<td>Identify evidence and information flow champions at regional and organisational levels.</td>
<td>Short</td>
</tr>
<tr>
<td>Create guiding principles for innovators in the private sector for effective engagement with the NHS and receptor roles for engaging with the private sector in the NHS.</td>
<td>Short</td>
</tr>
<tr>
<td>Create a framework for evaluating innovations once they are adopted, with clearly defined principles for good evaluation practice and sharing learning, recognising that innovations need time to mature.</td>
<td>Short</td>
</tr>
</tbody>
</table>
### Table 13: Recommendations, and their time frames, to nurture effective relationships and networks both locally and nationally

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>Time frame (short, medium or long term)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consider prospects for shared posts for individuals, as well as secondments and placement schemes.</td>
<td>Medium/long</td>
</tr>
<tr>
<td>Support collaborative projects and tasks to help create a shared vision of success (often facilitated by close proximity of innovating and healthcare provider organisations in some hubs).</td>
<td>Medium</td>
</tr>
<tr>
<td>Improve the alignment of existing innovation-relevant initiatives, organisations and relationships by designing the innovating health system to orchestrate alignment. Achieve this through policy interventions to improve collaboration and coordination: (1) across the innovation pathway; (2) between professions (e.g. clinical, managerial, executive); (3) between stakeholders groups (private sector, healthcare providers, academics, patients and the public, funders and commissioners, charity); and (iv) within regions, between regions and with the centre/national bodies and policymakers.</td>
<td>Medium</td>
</tr>
<tr>
<td>Ensure that organisations and initiatives have greater clarity in their roles and remits (including boundaries) and in the scale and timing of funding commitments for their activities.</td>
<td>Short</td>
</tr>
<tr>
<td>Evaluate initiatives against progress and delivery on clear remits and roles and link this to funding conditions.</td>
<td>Short</td>
</tr>
<tr>
<td>Ensure that wider actors in the health system are made more aware of the skills, capabilities and services that are integral to the roles and remits of existing initiatives and organisations (so that they can more readily identify opportunities to collaborate and coordinate).</td>
<td>Short</td>
</tr>
<tr>
<td>Pursue cross-organisational representation on committees (e.g. between AHSNs, Test Beds, Vanguards, Innovation Hubs, Quality Improvement networks and within STP structures; on national cross-governmental or cross party initiatives; on key national funding initiative selection panels).</td>
<td>Short</td>
</tr>
<tr>
<td>Appoint individuals with broker roles into initiative structures.</td>
<td>Short</td>
</tr>
</tbody>
</table>
Table 14: Recommendations, and their time frames, to facilitate meaningful patient and public involvement with innovation

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>Time frame (short, medium or long term)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Include information that is important for patients and the public (on existing innovations, on PPIE opportunities) in the national information and evidence infrastructure.</td>
<td>Medium</td>
</tr>
<tr>
<td>Establish a national strategy and implementation plan for PPIE in innovation, based on the following seven principles: (1) meaningful engagement; (2) support for engagement across the pathway; (3) diversity; (4) capacity-building for collaborative working between patients and the public and wider stakeholders; (5) a commitment to providing feedback; (6) acknowledgement and reward of contributors; and (7) evaluation.</td>
<td>Short/medium</td>
</tr>
<tr>
<td>Map and identify existing PPIE structures within regions and on a national scale to establish baseline information that can allow for more coordinated approaches to making use of PPIE capacity across research, innovation and service improvement efforts.</td>
<td>Short</td>
</tr>
<tr>
<td>Act on knowledge about what enables engagement (as reflected in the key principles summarised above) in PPIE strategies for innovation and in their implementation.</td>
<td>Short</td>
</tr>
</tbody>
</table>
Table 15: Recommendations, and their time frames, for creating a funding and commissioning environment that supports innovation across the pathway

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>Time frame (short, medium or long term)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allocate and coordinate public funding to achieve scale and complementarities in the funding landscape and to ensure promising innovations can progress through the pathway. As part of the effort to achieve this, focus on collaborative working between different government departments, arms-length bodies and other funders (e.g. through joint funding programmes, shared posts for individuals).</td>
<td>Medium</td>
</tr>
<tr>
<td>Complement pull mechanisms that respond to the supply of existing innovations with new pull mechanisms that are more responsive to demand (e.g. pre-commercial procurement commitments for innovations that respond to an articulated demand or meet quality and cost criteria; scalable and sustainable outcome-based commissioning).</td>
<td>Medium</td>
</tr>
<tr>
<td>Revisit and refresh the push and pull funding mechanisms in the system to ensure that they support the development and uptake of innovations with diverse cost and quality benefit profiles over time.</td>
<td>Short/medium</td>
</tr>
<tr>
<td>Enable an innovation portfolio strategy that balances short- and long-term considerations about upfront investments given available resources, short-term returns and longer-term cost and quality gains through a de-politicised structure.</td>
<td>Short/medium</td>
</tr>
<tr>
<td>Raise awareness and provide clarity to stakeholders about what the available funding schemes are, how one funding scheme might relate to or complement others in the pathway, and what this implies for those seeking downstream funding to develop, adopt or scale-up their innovations through time.</td>
<td>Short</td>
</tr>
<tr>
<td>Explore and evaluate the effectiveness and scalability of flexible and adaptive risk-sharing agreements between private sector innovators and the NHS (e.g. agreements that cover upfront costs of testing products for SMEs, flexible and adaptive pricing arrangements dependent on real-world performance or guaranteed market access and price-volume agreements, conditional reimbursement, deferred payments).</td>
<td>Short</td>
</tr>
</tbody>
</table>
Table 16: Recommendations, and their time frames, to better align policy design with implementation requirements and success criteria

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>Time frame (short, medium or long term)</th>
</tr>
</thead>
<tbody>
<tr>
<td>When designing new policy interventions, assess how they relate to the existing policy infrastructure to avoid unnecessary duplication, to identify opportunities for coordination and for harnessing complementarities, and to build on existing capacity. To achieve this, ensure that innovation, improvement and research policy bodies collaborate more closely around deciding on the needs for and design of new policy initiatives. These could also helpfully draw upon previous lessons to avoid serial ‘re-learning’ of the same things. Also, place greater policy focus on identifying areas where joint funding of innovation efforts can mitigate against piecemeal and fragmented investments and support critical mass and scale.</td>
<td>Medium</td>
</tr>
<tr>
<td>Specify key metrics for evaluating success upfront.</td>
<td>Short/medium</td>
</tr>
<tr>
<td>Identify implementation requirements in new policy initiative specifications and make these clear prior to a policy/scheme rollout. Specify what financial, human, relational, physical infrastructure and information infrastructure resources will be required to implement a new policy scheme or initiative.</td>
<td>Short</td>
</tr>
<tr>
<td>Identify sources of implementation support that stakeholders could access and contact.</td>
<td>Short</td>
</tr>
<tr>
<td>Communicate and raise awareness about innovation policies and associated schemes in a timely manner and in a language and style that resonates with the information needs, incentives and accountabilities of different stakeholders. Make sure that selection criteria, timelines and selection processes for successfully applying to schemes are clear, explicit and transparent in your communications.</td>
<td>Short</td>
</tr>
</tbody>
</table>

Table 17: Recommendations, and their time frames, related to measuring innovation uptake and impact

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>Time frame (short, medium or long term)</th>
</tr>
</thead>
<tbody>
<tr>
<td>We propose four types of indicators to consider when measuring innovation performance: (1) indicators of the progression of an innovation across different stages of health innovation pathways; (2) indicators of the adoption and diffusion of innovations through the health and care system; (3) indicators that track the impact on patients, the population, the health system and the wider economy; and (4) indicators of capacity for innovating in the healthcare system.</td>
<td>Medium-term to establish and prioritise indicators</td>
</tr>
<tr>
<td>The indicators should reflect concerns for assessing health innovation relevance, efficiency, effectiveness, impact and sustainability. Stakeholders evaluating health innovation performance need to balance concerns for the relevance of specific indicators with data availability and feasibility. The establishment of appropriate indicators may need to happen in parallel with capacity-building in the health system, in particular as it relates to data and evidence infrastructure, since indicators are only as useful as the quality of the data that supports them.</td>
<td>Medium-term to establish and prioritise indicators</td>
</tr>
</tbody>
</table>
12.3. Implementing our recommendations in practice: key considerations

Given the high pressures the NHS is facing, the time and attention of both those at the frontline and executives is spread across multiple firefighting fronts and multiple policy priorities. That being said, there is an increasing awareness that innovation can be seen as part of the solution in both policymaking circles and at the coalface of service delivery. We have noted that changes proposed would not take place in a vacuum but would build on already developed systems and approaches. In recent years these policies have gone beyond supply issues to begin to address the spread, adoption and adaptation of innovations. What is proposed here is evolutionary, not revolutionary, but geared at achieving tangible and lasting impact. In particular, it builds on existing national and regional infrastructure but with a renewed focus on boundary-spanning roles and rewards, organised linkages and opportunities to deliberate from early in the innovation process, and practical means to support collaborations focused on implementing service improvement based on product, technology or service model and approach innovations (and where necessary adapting the innovations to achieve this). This will also require attention to balancing individual incentives (patient-care-related, career-development-related, financial) with organisational cost and quality pressures and incentives, and making innovation more prominent in organisational policies and quality of service assessments, as well as in national regulatory regimes (as discussed in Chapter 5).

In addition to and complementing the core actions we have highlighted above, we propose the need for governance and management of the implementation of the recommendations we have set out. This could include an oversight committee with representation from relevant bodies (e.g. the Department of Health and Social Care, NHS England, NHS Improvement, the Office for Life Sciences, NHS Digital, and possibly MHRA, NICE and NIHR and UK Research and Innovation) to oversee the way in which the recommendations across different areas are implemented. In close collaboration with these bodies, industry associations (including the Association of the British Pharmaceutical Industry (ABPI) and the Association of British HealthTech Industries (ABHI)) and patient and advocacy groups should have a role.

Effective governance will require boundary-spanning roles and functions, linkage devices and a shared vision to allow groups to collaborate (Jessop 2000), not least given the need to coordinate the implementation of individual recommendations and surface any implementation-related interdependencies (e.g. in resource availability, in stakeholder engagement required). The committee we have proposed should establish leads for each of the driver areas, who would be responsible for taking forward the recommended actions and coordinating with each other around the implementation requirements – resources, infrastructure and stakeholder engagement – that are required for implementation in any one thematic area, working together with AHSNs, Test Beds, NHS Trusts, GIRFT and NHS RightCare programmes and other key public, private and third sector actors in the system. Implementing the recommendations we have set out will inevitably be a collaborative effort and the committee should at the outset agree on the respective needs and roles of systems stewards across different spaces – of clinical, industry, policy, regulator, funding body and patient and public representation – nationally and at local levels. It should also consider the interdependencies between different actions in determining their staging and the order of
potential rollout in the system. In part, the interdependencies between individual actions and whether one has to be in place before another can unfold will in part depend on how policymakers and wider stakeholders choose to pursue specific combinations of actions. For example, prioritising investments into funding schemes for adoption will be interdependent with the national evidence and data infrastructure and consensus processes for identifying key areas of innovation need and demand.

Of course, a committee on its own, whilst important, does not guarantee success in terms of implementing change. Similarly, whereas policies and institutions are clearly important in delivering transformation, so too are culture and behaviours. In this context, in order to mobilise the necessary actors, transformative leadership will have to be capable of challenging existing practices and in some cases vested interests. To achieve this, the case for implementing recommendations will need to be communicated in a clear and compelling way to stakeholders across the system. We hope that the evidence provided in our study across its diverse work streams could help towards this aim. Over the past two years, we have also witnessed a growing interest in documenting case study-based evidence of innovation adoption and impact. The accounts of adoption and impact discussed in our report can be further enriched with findings from other recent reports (see, e.g., Albury et al. 2018; Baird et al. 2018; Cox et al. 2018) and all of this can be helpful in making the case for change to both policymakers and those at the frontline. We know that different professional communities value different types of evidence (e.g. from scientific trials and guidelines, evidence-based professional experience of peers or hierarchies (see Kyriatsis et al. 2014)), and a mix of communication channels, information sources and information brokers will be key to enabling a receptive environment for innovation.

Behaviours can also be influenced by metrics and targets. There is a balance to be found between, on the one hand, using targets and performance indicators to encourage and steer innovation, and, on the other, acknowledging that targets can create perverse incentives and have unintended outcomes – especially in a complex system such as health (Mannion & Braithwaite 2012). However, our study strongly supports the need for strengthening accountability regimes and indicators have role to play in that process.

As widely noted in the innovation literature (Archibugi & Planta 1996; Gault 2013), even where unintended consequences can be guarded against, there are problems with measuring innovation simply through binary input indicators (e.g. research and development expenditures) and output indicators (e.g. patents, publications, GDP and new product sales). However, at present, these measures are often more readily available and tend to be those used by most national statistics offices. Our study suggests that a broader set of metrics is needed that recognises the processes that influence innovative performance (e.g. the flow and diffusion through measuring network nature, demand and other conditions that influence outputs and impacts) and that go beyond capturing only outputs and create a way to understand and assess a diverse set of health, social and economic impacts. In Chapter 11 we have provided a detailed overview of how the current system of metrics could be improved to ensure that indicators – of (1) the progression of an innovation across different stages of health innovation pathways; (2) of the diffusion/spread of innovations; (3) of impact on patients/the population, the health and care system and the wider economy; and (4) of capacity for innovation in the healthcare
innovation system – all inform an accountable but also learning-focused and strengthening healthcare system.

Finally, in pursuing a thriving health innovation landscape we must not forget that capturing the social and economic benefits of innovating will not be achieved if policy is centred on the support only of individual innovations. Policy to support combinatorial innovation may be different from policies designed to support the development and delivery of, for example, a single blockbuster drug. Most often it requires a balanced package of measures with effective leadership to align different agents behind a shared set of goals. Consequently, national as well as regional and local capacity to support combinatorial innovation is needed. Any effective innovation strategy for the healthcare system will need to be rooted in the whole care-pathway and whole-systems approach we have argued for, rather than focused exclusively on solutions for a siloed part of the pathway. This means identifying the needs and areas of demand across care pathway(s) and supporting the development and uptake of combinations of solutions (be they high- or low-tech products, technologies or service models) that can provide the required improvements to the service challenge. This type of approach may also enhance UK competitiveness in the global innovation landscape – with value added from offering combinations of innovations (and associated know-how) as care pathway solutions and to support wider health improvement efforts globally.

A challenge that will continue to face the system relates to resolving how the high-level priorities identified in flagship research and innovation-focused policy initiatives that talk about areas of more radical transformation and investment geared both at improving healthcare and exploiting innovation and the life sciences as a driver of economic competitiveness (such as the UK Industrial Strategy (HM Government 2017a), Artificial Intelligence Sector Deal (Hall & Pesenti 2017) and the Life Sciences Sector Deal (HM Government 2017b)) can be delivered, while simultaneously supporting processes of more incremental, ongoing clinical innovation in the NHS that are key for meeting service improvement needs (and are not always high-tech). This challenge is related to the need to balance short- and long-term vision, needs and different types of returns (e.g. quality, cost, patient experience-related) in prioritising innovation portfolios, as discussed throughout this report and in our recommendations. Addressing this challenge would also require closer alignment at the policy level between the Industrial Strategy and health innovation and health improvement policies. From a metrics perspective, it would require identifying a balanced set of key metrics reflecting the different priorities across healthcare improvement agendas (where both high-tech, low-tech and no-tech solutions can add value), scientific and technological excellence pursuits, and economic competitiveness.

The Prime Minister’s funding settlement for the NHS announced on 18 June 2018 (Prime Minister’s Office 2018) and the associated NHS Long Term Plan (NHS England 2019) create an opportunity for embedding innovation into the culture, structure and function of the health system. This involves using the creative tension that exists between having a long-term vision and plan for a transformed health and care system and supporting creativity and experimentation. Evidence from this report suggests that a stable platform for innovation in the form of a clear articulation of needs and a consistent set of accountabilities and rewards for innovation can create the sorts of creative relationships and protected niches where innovative ideas can arise and be tested. The policymaking centre has a crucial role in building this platform and this vision, but it
can neither make innovations nor spread them alone. A more balanced and ‘hybrid’ model of governance and leadership – which is both top-down and bottom-up – is already emerging and the possibility of a truly innovative health and care system is achievable. We hope that the research evidence and recommendations set out in this report can help deliver this.
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