Institute for Public Policy Research

KEEPING UP WITH THE SCIENCE

INNOVATION IN THE HEALTH AND CARE SYSTEM POST BREXIT

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and **Katy Rae**

March 2018

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ACKNOWLEDGEMENTS

This project would not have been possible without the support of Decideum, Bluebird Bio and Intuitive Surgical. The authors would also like to thank Tom Kibasi, Sofie Jenkinson, Florri Burton, Katherine Gibney, Abi Hynes, Olivia Vaughan and Natasha Wakelin for their contribution to this project.

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Citation
If you are using this document in your own writing, our preferred citation is:
Quilter-Pinner H and Rae K (2018) *Keeping up with the science: Innovation in the health and care system post Brexit*, IPPR. http://www.ippr.org/research/publications/keeping-up-with-the-science

60-SECOND SUMMARY

Innovation in health – new treatments, technologies and processes – can help drive improvements in healthcare and ultimately health outcomes. We are on the cusp of a new wave of innovation driven by robotics, big data and therapeutic breakthroughs such as cell and gene therapy.

However, the history of innovation in the UK shows that the health and care system is often slow to adopt new technologies. The government has tried to address the causes of this problem, most recently through the Accelerated Access Review (AAR) and Life Sciences (Industrial) Strategy.

Although these initiatives offer a number of sensible policy suggestions, the reality is that they will fail to deliver on their potential without a Brexit deal that prioritises health and care; a new long-term funding settlement for health and care; and a clear plan for system reform in the NHS.

KEY FINDINGS

- Innovation in health can be defined as 'the introduction of new ideas, products or processes' into the health and care system with the aim of improving its efficiency, effectiveness, quality, safety and affordability. This is desirable both because it leads to improved quality and quantity of life for patients – driving up to 50 per cent of recent life expectancy gains according to some studies – and because it creates greater wealth for our economy.
- Commentators believe we are on the cusp of a great global leap forwards in innovation in health and care. Robotics and artificial intelligence (AI), the internet of things (IOT) and big data, and new treatments such as cell and gene therapies are already transforming health and will continue to do so. Experts expect these trends – which together make up the 'convergence revolution' – to drive better prevention of ill health; lead to more precise and effective treatments; and allow patients to more effectively manage their own health.
- There is no guarantee, however, that everyone in the general population will benefit from these upcoming gains in science, technology and innovation. There is significant evidence to suggest that the NHS is slow to adopt and diffuse new innovations. The causes of this are many but include:
    - complexity – there is no one entrance into the NHS so innovators have to navigate the full complexity of the system to achieve adoption and diffusion
    - culture – incentives and accountabilities for both people and organisations within the NHS favours financial control over innovation-driving risk adversity
    - money – the funding squeeze in the NHS has driven rationing of innovation, a lack of upfront investment, and has reduced headroom for staff to innovate.

KEY RECOMMENDATIONS

Policymakers have undertaken numerous reform initiatives to try to address this challenge. The latest attempts – the Life Science (Industrial) Strategy and the Accelerated Access Review (AAR) – are steps in the right direction. However, there is a risk that they fail to deliver on their potential in the current context, so the government must ensure the following three key principles are taken into account and acted upon to ensure that this is not the case.

Recommendation 1. The government must prioritise the interests of the NHS and Life Science sector in the ongoing EU negotiations. This should include ensuring the UK's immigration policy post-Brexit allows the UK to attract top researchers and doctors; that we remain part of all EU-funded research programmes; and that we maintain adherence to the EU regulatory framework for medicines and medical devices so we can access the best new treatments as early as possible.

Recommendation 2. In order for the government to ensure that the health and care system is properly funded so it can afford to invest in – and benefit from – the best new science, technology and innovation, it must heed calls from across the political spectrum for a long-term funding settlement for health and care with additional funding used to reverse rationing decisions; provide adequate funding for digital transformation; and invest more in the diffusion of new innovations.

Recommendation 3. The NHS reform agenda – as set out in the Five Year Forward View (FYFV) – will help unlock innovation by joining up data sets; reducing fragmentation in budgets and extending the one-year commissioning cycle. If this reform agenda stalls, it will stifle innovation in the NHS. The government must review the existing legislative framework in health as well as fill notable gaps in the reform agenda (for example workforce, social care reform) to ensure it is set up to succeed.

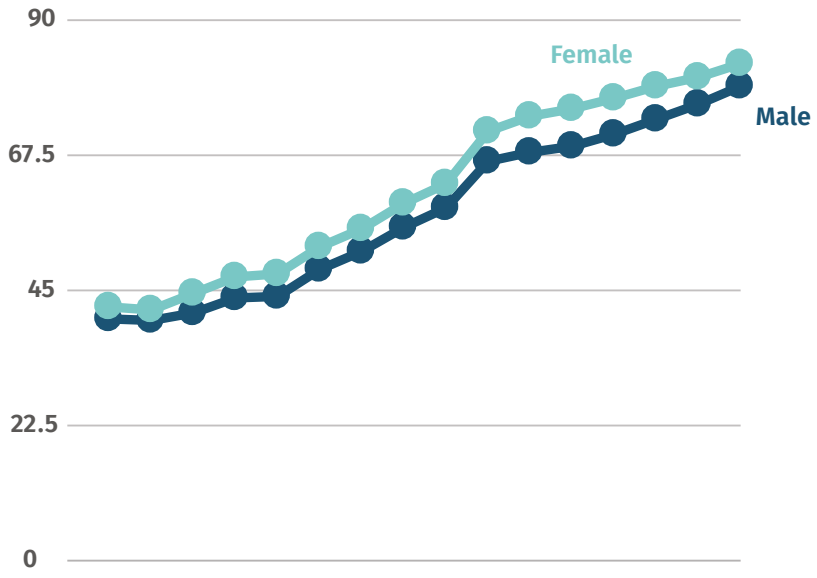
1. SCIENCE, TECHNOLOGY AND INNOVATION: POSSIBILITIES FOR HUMAN HEALTH IN THE 21ST CENTURY

1.1 WHAT IS INNOVATION AND WHY DO WE CARE ABOUT IT?

Innovation in health can be defined as 'the introduction of new ideas, products or processes' into the health and care system with the aim of improving its efficiency, effectiveness, quality, safety and affordability (Kimble and Massoud 2016). Examples of innovation include new treatments (for example, gene and cell therapies); new technologies (for example, robotic surgery); and new processes (for example, personal budgets). These advances are often – though not always – driven by improvements in our scientific knowledge and technological capabilities.

FIGURE 1.1

By the start of the 21st century life expectancy had doubled to over 80 years old
Increase in life expectancy 1841–2011



Source: Office for National Statistics, 'How has life expectancy changed over time?' (ONS 2015a)

This definition of innovation hints at why it is so desirable. Science, technology and innovation can drive improvements in our health and care system which in turn lead to better outcomes for patients. On rare occasions this may mean curing diseases or conditions that were previously chronic or untreatable, however, more often the gains - whilst still significant - are smaller (e.g. reducing time in hospital, reducing pain or side effects etc.)

In recent years, innovation has been considered one of the primary tools available to deliver 'more for less'. In reality innovation usually requires additional expenditure but in return drives improvements in the quality or quantity of life for patients (as per increasing expenditure on health as a percentage of GDP with innovation a major driver of cost) (Lichetta and Stelmach 2016).

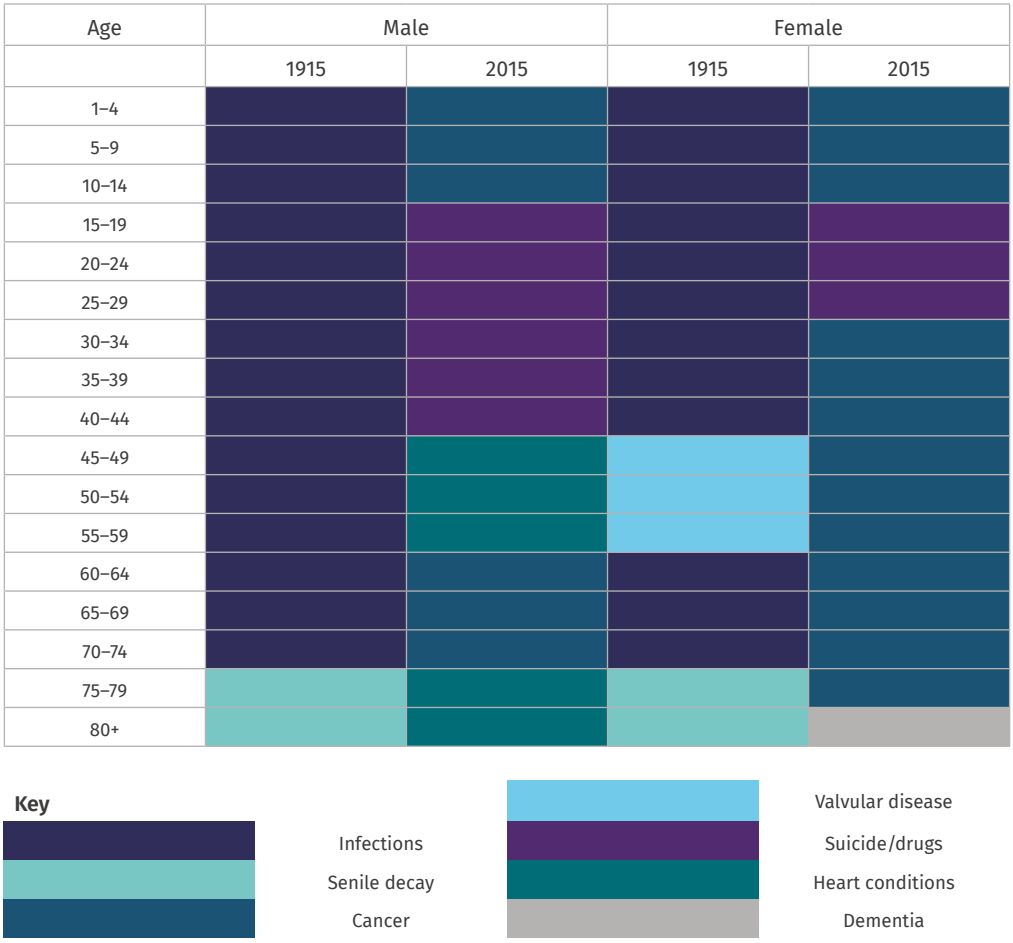
The impact of innovation can be seen most clearly in the incredible increase in life expectancy over the last century, as well as improvements in quality of life. For most of human history, life for the majority was 'nasty, brutish and short', as described by Thomas Hobbes in the mid-17th century. In 1841, life expectancy at birth in the UK was just over 40 years old. By the start of the 21st century this had doubled to over 80 years old (see figure 1.1).

There is a consensus that – alongside increased incomes, better diets (Fogel 1997) and large-scale public health initiatives (Preston 1996) – science, technology and innovation played a key role as well. This is particularly true during the second half of the 20th century as the leading cause of death shifted away from communicable diseases towards the diseases of ageing (see figure 1.2). Intuitively, this makes sense given advances such as antibiotics, X-ray technology, the polio vaccine, blood replacement techniques, anticoagulant drugs, radiation therapy and chemotherapy, and antiretroviral therapy.

FIGURE 1.2

During the second half of the 20th century the leading cause of death shifted away from communicable diseases towards the diseases of ageing

Cause of death by age, 1915 and 2015



Source: Office for National Statistics, 'Causes of death over 100 years' (ONS 2015b)

Nobel prize-winning economist Angus Deaton has gone so far as to argue that "knowledge, science and technology are the key to any coherent explanation [of increased life expectancy]" (Cutler, Deaton and Lleras-Muney 2006). Other studies have corroborated this conclusion. For example, a World Bank study found that up to 50 per cent of the increase in life expectancy between 1960–90 is attributable to science, technology and innovation (Wang et al 1999) (see figure 3).

TABLE 1.1

Sources of mortality reduction 1960–1990

	Income	Education	Science and technology
Under-5 mortality rate	**17**	**38**	**45**
Female adult mortality rate	**20**	**41**	**39**
Male adult mortality rate	**25**	**27**	**49**
Female life expectancy	**19**	**32**	**50**
Male life expectancy	**12**	**58**	**29**

Source: Wang et al, 'Measuring country performance on health' (Wang et al 1999)

Meanwhile, similar gains – albeit less easily quantified – can be seen in quality of life as a result of health and care innovation over the period as well. To name just a few: endoscopy and minimally invasive surgery have reduced the recovery time of surgery; knee and hip replacements have greatly reduced frailty among the elderly; painkillers and the analgesic pain ladder have allowed people to control and manage pain; and inhaled therapy has allowed chronic obstructive pulmonary (COPD) and asthma sufferers to manage their conditions (RSPE 2010).

HEALTH INNOVATION AND ECONOMIC GROWTH

Science, technology and innovation in health and care is also desirable because it drives increased productivity and economic growth. This effect occurs through two main channels.

1. Innovation indirectly drives economic growth through improved health

As set out in this chapter, innovation in health and care has driven better health outcomes in advanced countries (increased quality and quantity of life). In economic terms better health is an increase in human capital; that is, an increase in an individual's capabilities and assets leads to an increase in their economic potential (Grossman 1972). If a country's population as a whole sees an increase in health outcomes – and human capital – this should in turn increase productivity and economic growth.

International studies (see for example Bloom and Canning 2008) highlight four mechanisms through which this occurs:

- increased productivity in the workplace and less absenteeism
- improved educational outcomes for children
- an increase in saving – and investment – due to longer life expectancies
- a demographic dividend due to larger working populations.

Some of these effects may be weaker for developed countries such as the UK than countries at the early stage of development (Bhargava et al 2001) – and some may even turn negative as populations age (for example if life expectancy grows faster than healthy life expectancy) – but the net effect is still positive (with a particularly strong effect via higher productivity) (Black 2017).

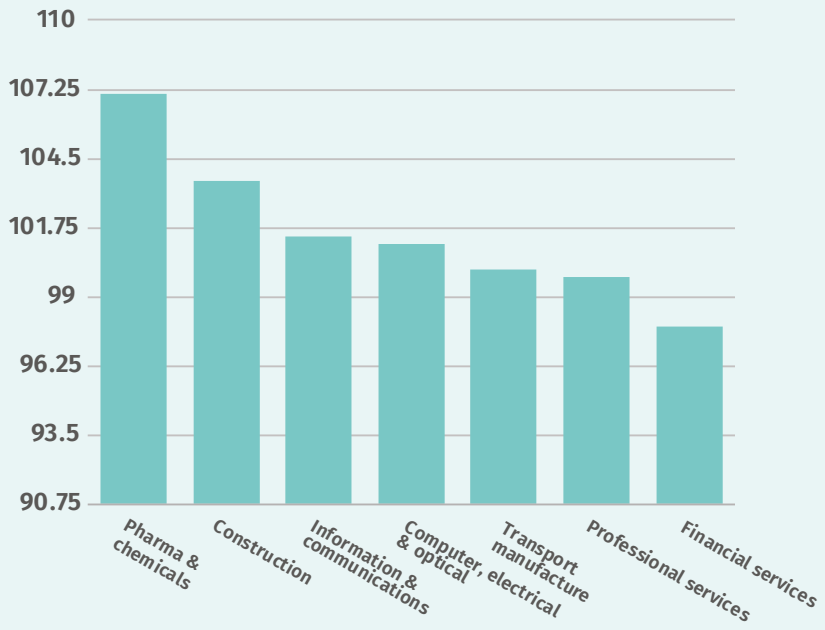
2. Innovation directly drives economic growth through productivity, employment and trade

Innovation in health and care also directly contributes to economic growth through the life science sector in the UK which applies biology and technology to the task of increasing health and wellbeing. The UK's life science sector is world leading: it already generates around £64 billion in revenue each year, employing a quarter of a million people nationwide (OLS 2016a). The sector is also one of the most productive in the UK economy (see figure 1.3). Indeed, public sector life sciences discovery activity is more than twice as productive as other countries, such as the US or Germany. It is also a major – and growing – source of UK exports (OLS 2017).

FIGURE 1.3

Life sciences is one of the UK's most productive sectors

UK productivity by sector: indexed output per hour, 2015



Source: Office for Life Sciences, *Life Sciences Industrial Strategy* **(OLS 2016a)**

1.2 SCIENCE, TECHNOLOGY AND INNOVATION: THE POSSIBILITIES OF THE 21ST CENTURY

The conclusion that science, technology and innovation has been a significant driver of improved health is exciting today because many commentators believe we are on the cusp of another great leap forwards in innovation in health and care. Robotics and artificial intelligence (AI), the internet of things (IOT) and big data, and new treatments such as cell and gene therapies all present possibilities to transform health and care.

TABLE 1.2

Three types of innovation in health and care

Digital	Physical	Biological
Big data	3D printing	Cell therapy
Artificial intelligence (AI)	Regenerative medicine	Gene therapy
Telehealth and telecare	Robotics (e.g. for surgery)	Nano-medicine (e.g. drug delivery)
Internet of things (IOT)		Combination therapies

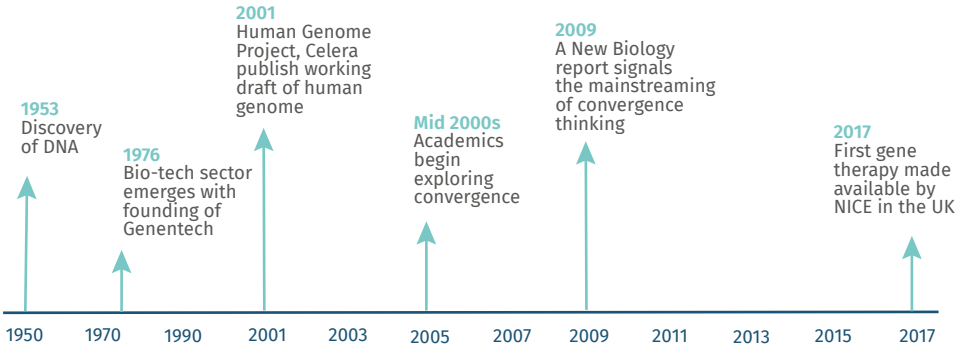
Source: Authors' own analysis

These transformations are often collectively described as 'the convergence revolution', meaning the 'sharing of methods and ideas by chemists, physicists, computer scientists, engineers, mathematicians, and life scientists across multiple fields and industries' to create integrated insights and approaches to tackle disease and ill health (Sharp et al 2016). The convergence revolution is widely considered to be the third revolution in modern medicine following breakthroughs in molecular biology and genomics (see figure 1.4).

FIGURE 1.4

We are in the midst of the convergence revolution, following breakthroughs in molecular biology and genomics

Three revolutions in the life sciences, timeline



Source: Authors' own analysis

The possibilities of the convergence revolution are significant with the potential to help us live longer, healthier lives. Three trends identified in the literature are particularly worth noting. First, through earlier diagnosis these innovations can prevent serious and acute illness. Second, if a patient does require treatment we will be better equipped to provide personalised and precise treatment that addresses the causes of the illness, increasing the chance of recovery, and reducing costs associated with complications and hospital stays. And, finally, we are drawing nearer to a time in which patients are enabled to manage their conditions independently in their homes and communities. The potential transformation in health and care is set out below.

1. More effective and earlier diagnosis and prevention:

- better personal decisions based on patient-collected lifestyle data integrated into devices – for example nutrition monitoring, exercise data, fitness status and pollution exposure
- pre-symptomatic diagnosis based on ubiquitous population data – for example birth-to-death patient data for population analyses and predictive algorithms and real-time data collection
- new detection techniques via urine and blood tests for diseases like cancer, combined with new vaccines (such as cancer immunology) to prevent disease.

2. More personalised, precise and effective interventions and treatments:

- genome and phenotype profiling and analysis will enable personalised treatments , such as targeted cell and gene therapy
- machines will enhance the ability of physicians to deliver better outcomes – for example surgical robots that outperform humans
- regenerative medicine will allow us to repair or replace damaged tissue or organs with 3D printing potentially allowing the creation of 'made to order' organs.

3. Patients are empowered and enabled to manage their health and care remotely:

- crises are anticipated through home monitoring with the assistance of AI robots and prevented through self-treatment
- remote care delivery – such as telemedicine and telecare with remote specialists, or connection to peer-to-peer support groups – when required and drone delivery of therapies
- seamless patient experience – for example patient data and treatment followed and updated through hospitals, outpatient appointments, community care and the home.

2.
KEEPING UP WITH THE SCIENCE: BARRIERS TO INNOVATION IN HEALTH AND CARE

2.1 MIND THE GAP: WHAT WE KNOW AND WHAT WE DO

While the potential gains made possible by science and technology are significant, there is no guarantee that everyone in the general population will benefit from them. This gap – between what we know and what we do – exists to varying extents in all health and care systems (and more so in poorer countries without universal health coverage).

There has long been a concern that the UK – while world leading in science and research – is relatively slow in comparison with other developed countries in terms of uptake and access to innovations (Quilter-Pinner and Muir 2015). For example, a recent government strategy on innovation in the NHS states that "whilst we are good at inventing and developing new technologies, the spread of those inventions within the NHS has often been too slow" (Liddell et al 2011).

These concerns have increased of late: there is a growing consensus that the gap between what we know and what we do in the NHS is starting to grow. These concerns have been magnified by, among other things, high-profile examples of rationing in the NHS (Campbell 2016). The fear going forward is that as science and technology develops at pace, this gap will continue to grow, limiting the ability of the majority of the population to reap its rewards.

2.2 QUANTIFYING THE UPTAKE AND ACCESS GAP

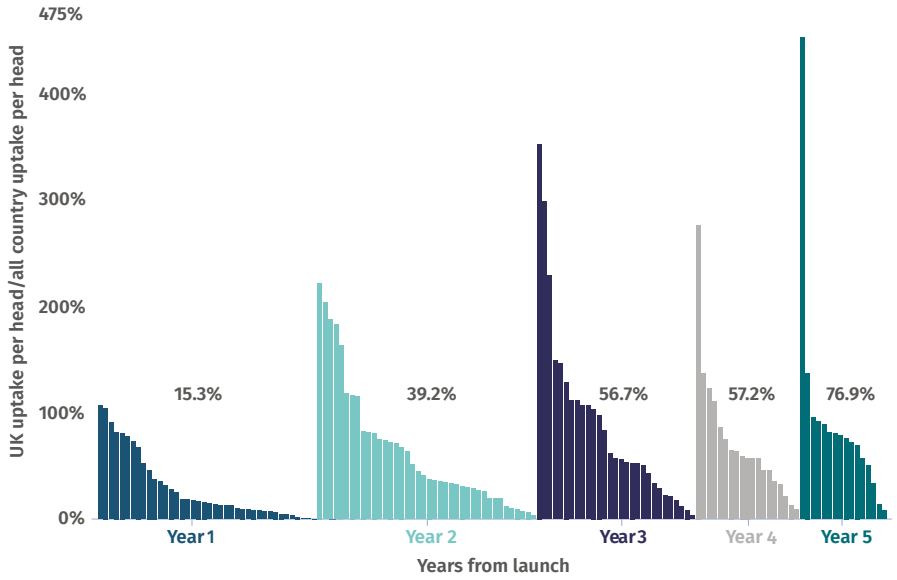
There are very few reliable estimates of the size of the gap between what we know and what we do. However, recent analysis by the Office for Life Sciences (OLS) found that three years after approval by the National Institute for Health and Care Excellence (NICE), a basket of medicines launched between 2009 and 2014 were at 56.7 per cent of average usage in the comparator countries (see figure 2.1) (OLS 2017). This figure declines further (55.5 per cent) when considering non-NICE-reviewed medicines (ibid).

Meanwhile, there is also evidence that uptake on digital innovation in the NHS is also slow. While the vast majority of GP practices have some form of electronic health record system, data shows that digitisation elsewhere in the system is much more variable (see figure 2.2). It is clear that we are some way off the government's ambitions for a 'paperless NHS' by 2020 (Wachter 2016). There is also some evidence that certain types of products (e.g. orphan drugs) have lower uptake than others (Zamora et al, 2017)

FIGURE 2.1

The UK is slow to deliver full uptake of new treatments compared to other advanced countries

Uptake of new medicines – NICE approved

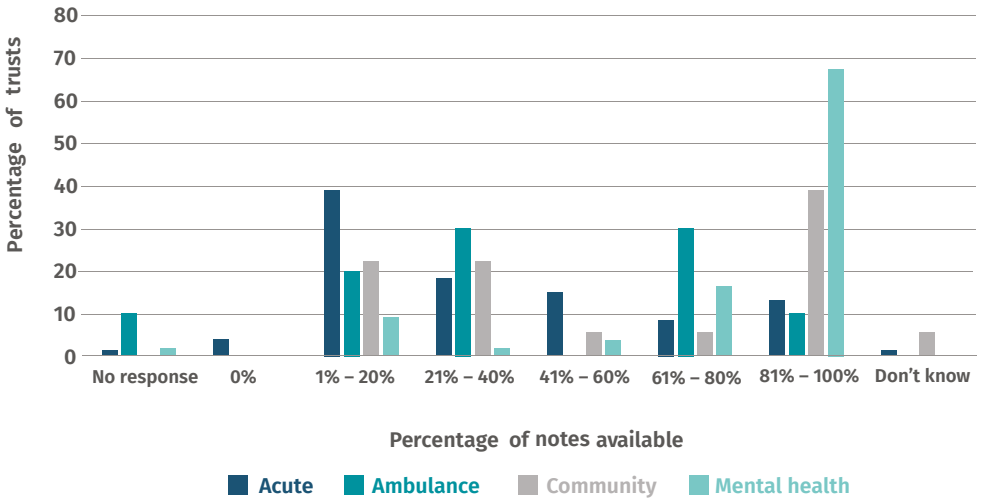


Source: Office for Life Sciences, 'Life sciences competitiveness indicators' (OLS 2017)

FIGURE 2.3

Digitisation in much of the health service, outside GP practices, is very varied

Proportion of clinical notes available digitally in trusts



Source: NHS England, 'Digital maturity assessment 2015/2016' (NHS England 2016)

Finally, best practice changes to care pathways and clinical practices are also slow to spread. For example, while the evidence is clear that London's stroke treatment reconfiguration saved money and lives (Bouverie 2017), huge variation still exists across the country as other areas lag behind in implementing reform (HSCIC 2014). Likewise, the recent introduction of New Models of Care (NMC) also have the potential to drive significant improvements in efficiency and outcomes, but do not yet cover the majority of the country (Richardson 2016).

2.3 WHAT IS CAUSING THE UPTAKE AND ACCESS GAP?

Numerous studies and reviews over the last few decades have attempted to set out the causes of slow access and uptake in the NHS. Of course, they are complex and vary from innovation to innovation, but it is clear that a number of common barriers exist across most (or all) innovations, namely: complexity; culture and money.

Complexity

Despite being called a national service, the NHS is in fact thousands of individual organisations, all of which are potential purchasers (or instigators) of innovation: hundreds of clinical commissioning groups (CCGs) and acute trusts as well as thousands of GP surgeries and community providers. This complexity within the system makes it hard for 'buyers' to match with 'sellers'. Moreover, there are limited mechanisms to spread innovation from one part of the system to other parts once this has happened (Quilter-Pinner and Muir 2015).

This has been overcome to some degree for (some) medicines by creating one central gateway into the NHS through the creation of the National Institute for Health and Care Excellence (NICE). Eligible medicines go through a centralised assessment process undertaken by NICE and, if deemed cost-effective, are guaranteed funding by the 'funding mandate' (which requires local providers to supply them to patients).

However, large numbers of medicines – potentially up to 60 per cent (ibid) – are not assessed by NICE, including most specialised and highly specialised treatments. Likewise, a critical barrier for many non-medicines – such as medical devices and technologies – is that there is no centralised route with a funding mandate.[1] At the local level, the only way to achieve uptake and access for these innovations is to persuade each CCG and provider organisation to adopt the innovation.[2]

System complexity also impacts on innovation in other ways, as fragmentation reduces the ability – and incentive – for NHS organisations to utilise new technologies. Notably, any innovations which seek to move care between organisational silos in the NHS – and thus requires money to move between silos – are disincentivised because one part of the system must foot the cost while others reap the benefits (for example innovations which reduce complications for people leaving hospital, saving community/social care money). Integrated care is beginning to overcome this challenge – but there is undoubtedly a long way to go (Quilter- Pinner 2017a).

Culture

A further significant barrier to innovation in the NHS is culture. Far too often innovation in the NHS is seen as a nice-to-have rather than a core part of the day-to-day jobs of both staff and organisations. There is a growing consensus that this

1 Although NICE does have an assessment process for non-medications.

2 Specialised and highly specialised medications can go through a centralised process run by NHS England, but this is highly opaque and is widely considered to be less effective than NICE in terms of uptake and access.

is largely driven by the way in which organisations and staff are held accountable and incentivised (Castle-Clark et al 2017).

In most cases, NHS staff and organisations are accountable for delivering outputs (for example waiting times) and financial balance rather than outcomes (which could indirectly drive innovation). As one commissioner put it, 'directors in the NHS are not fired and hospitals don't go into special measures for failing to innovate' (Quilter-Pinner and Muir 2015).

The result is that many NHS staff perceive the risk of going over budget to be greater than the risk of delivering less-effective care. This imbalance is particularly acute during periods of financial pressure when delivering 'the basics' takes priority over improving and developing care (Quilter-Pinner 2017b).

In the private sector these challenges are partly overcome by investing in people and teams whose job it is to seek out and copy best practice. For example, organisations such as Procter & Gamble have invested heavily in creating ecosystems that encourage all staff to innovate and boast specific functions aimed at scouting out and implementing new ideas (Huston and Sakkab 1996). This has been replicated in some NHS organisations, but in many organisations no one is accountable for innovation (Quilter-Pinner and Muir 2015).

Money

A final factor in the innovation challenge is money. Innovation is often considered a means of delivering 'more for less'. In reality – as set out in chapter 1 of this report – new and improved health treatments are one of the most significant drivers of increasing spend on healthcare over the long term (Lichetta and Stelmach 2016). Moreover, even when they do lead to greater efficiency, they often require upfront investment to unlock any gains (Quilter-Pinner and Muir 2015).

A lack of funding in the system – as experienced since 2010 (Quilter-Pinner 2017b) – therefore impacts on the ability of the NHS to adopt and diffuse innovation in a number of ways. First, it can lead to deliberate rationing of new innovations. Examples of this include NHS England's recent decision to introduce an 'affordability test' for new treatments (which will see up to 1 in 5 new drugs deemed cost-effective by NICE withheld from patients) (NICE 2017) as well as rationing of new Hepatitis C and HIV treatments (Campbell 2016).

Second, adoption and diffusion of innovation requires significant staff time to drive through implementation (Health Foundation and King's Fund 2015). A lack of funding in the system often results in staffing gaps and reduced capacity among remaining staff which stifles innovation. Although there are a number of schemes which aim to overcome this (such as Clinical Entrepreneurship schemes,[3] and so forth), these are relatively small in scale and cannot be expected to overcome this challenge alone.

Third, financial pressures can lead to a lack of investment in the process of adopting and diffusing innovation in the NHS. The most obvious example of this is that while the NHS spends over £1.2 billion on research and development funding via the National Institute for Health Research (NIHR), it spends just £50 million on spreading best practice via the Academic Health Science Networks (AHSNs) (Collins 2018). Likewise, while the NHS has prioritised spending on revenue in the NHS, its funding for capital and innovation has been consistently deprioritised: for example, the Wachter review's calls for an extra £3 billion investment in IT infrastructure have gone unanswered (Wachter 2017).

3 See https://www.england.nhs.uk/2017/07/entrepreneur-scheme-for-innovative-doctors-extended/

Finally, regardless of the size of the funding settlement for health and care, the way in which money is channelled into the system in the NHS also stifles innovation. Notably, many innovations – even those that will ultimately increase efficiency – require upfront investment in order to adopt and diffuse. This is often challenging for the NHS as it largely operates on a one-year commissioning cycle (Quilter-Pinner and Muir 2015)): the focus of the system is on balancing in year budgets rather than releasing long term, or upstream, cost savings. NMCs and newly created Accountable Care Organisations (ACOs) operate on longer cycles which should help overcome this, but as set out earlier these do not cover the whole country yet (Richardson 2016).

3. FUTURE-PROOFING HEALTH AND CARE: WHERE NEXT FOR THE REFORM AGENDA?

3.1 PRINCIPLES FOR FUTURE REFORM

Over the years there have been a number of attempts to address the innovation challenge in the NHS. Recent initiatives include the:

- **Life Sciences (Industrial) Strategy** – aiming to drive increased growth, productivity and innovation across the UK economy and includes an explicit objective to "make the UK the best place in the world to invest in life sciences" (OLS 2016a)
- **Accelerated Access Review (AAR)** – aiming to ensure that the most promising new science, technology and innovation in health and care is utilised across the health and care system as quickly as possible (OLS 2016b).

These initiatives both add real value to the debate about health innovation and make many sensible policy suggestions aimed at driving more innovation in the NHS. However, concerns remain about the future of innovation policy in health and care. First, these initiatives fail to address a number of significant challenges facing the system, notably they are almost entirely focused on new innovation rather than advances that are already available but not fully utilised. Second, there are significant 'headwinds' facing the system which may prevent policymakers from fully realising the vision set out in these initiatives. Going forward, we believe that the government must ensure three key principles are taken into account in order to address these concerns.

Recommendation 1. The industrial strategy will not be enough to compensate for a bad deal on Brexit.

The government's Life Sciences (Industrial) Strategy has set an explicit objective to "harness the power of innovation to help meet the needs of an ageing society", one of just four core areas 'where Britain can lead the global technological revolution' (BEIS 2017).

It rightly highlights that the UK is in a strong position to utilise our research and business capacity to pioneer the use of digital tools, robotics, artificial intelligence, and new therapeutic approaches to disease to achieve this objective.

It also sets out a number of policy initiatives to help make this happen including: extra investment into research and development; agreeing on a new 'sector deal' with the leading players in the sector; and utilising NHS data to support research and development (ibid).

However, the reality is that much of this good work could be undone if the government is unable to secure a good deal on Brexit. The UK's relationship with the EU is important for the NHS and life science sector in three key ways:

- many of the UK's best and brightest doctors and medical researchers currently come from the EU (Buchan et al 2017, PwC 2016)

- the UK receives a significant amount of investment into research and development from the EU (ibid)
- the UK currently gains earlier access to new medicines and treatments as part of the EU's regulatory framework (ibid).

It is crucial that in taking forward the negotiations with the EU the government prioritises a deal that protects these benefits as much as possible. This should include ensuring that: **the UK's immigration policy post-Brexit prioritises the NHS and life science sector; that we remain paid-up members and beneficiaries of all EU-funded research programmes; and that we maintain adherence to the EU's regulatory framework for medicines and medical devices so that we can give patients the best new treatments in the shortest possible time frame.**

> **Recommendation 2. The health and care system needs a new funding settlement if it is to keep up with the science.**

As highlighted in the previous chapter, the funding crunch in the health and care system is a growing barrier to innovation. Plans to fill the funding gap – equal to £22 billion in this parliament (NHS England 2014) – with higher productivity seem increasingly doubtful; which is perhaps unsurprising given the unprecedented nature of productivity increases targeted (Quilter-Pinner 2017b). The impact instead is more pressure on the quantity and quality of care and – crucially for this paper – an increase in rationing of new technologies and treatments.

Put simply: if this funding squeeze continues, the NHS will be unable to achieve what is required of it in order to secure the aims of either the AAR or the Industrial Strategy. Patients will not be able to gain access to the best new treatments and technologies in the shortest possible time. Likewise, the ability of the NHS to support the life sciences sector in terms of research and development or act as promising market for new innovations will be severely limited.

The government must now **heed calls from across the political spectrum for a long-term funding settlement for health and care to give the system the certainty to invest** in new technologies and innovations. Additional funds for the NHS should be used to **reverse rationing decisions such as the new 'affordability criteria' for new treatments; provide adequate funding for digital transformation as recommended by the Wachter review; investigate innovative, value-based funding models for new technologies and invest more in the diffusion of new innovations.**

> **Recommendation 3. If the Five Year Forward View (FYFV) fails then so will the AAR and Life Sciences Strategy.**

The government's reform programme for the NHS – set out in the Five Year Forward View (FYFV) (NHS England 2014) – has established a clear shared vision for the future. Widely considered 'the only game in town', it aims to more closely join up health and care; move care out of hospitals and into the community; and engage patients in their own health to prevent ill health rather than respond to it. A key part of this agenda has been the move to population-based healthcare systems overseen by Accountable Care Systems (ACSs) and Organisations (ACOs) (Quilter-Pinner 2017a).

These changes both depend on – and, crucially, will help unlock – more growth in the life sciences sector and greater adoption and diffusion of innovations within the NHS. Population-based health systems should help create large integrated data sets which could help innovators pilot, evaluate and test new treatments and technologies. These new structures should also help overcome some of the barriers to adoption and diffusion set out in this report, including the fragmentation in budgets and the one-year spending cycle.

Some progress has been made towards delivering these changes: as many as 10 areas in the country are pioneering the creation of ACOs (ibid). However, there is a widespread recognition that the success of these changes is far from guaranteed and that the pace with which other areas will follow suit is inadequate. Failure to deliver these reforms would not only be disastrous for health; it would also make it much harder to deliver on the objectives in the life sciences strategy and AAR, and therefore damage our economy as well.

To ensure that this doesn't happen, **the government must urgently revisit its health and care reform plan to ensure that the Five Year Forward View is set up to succeed**. Alongside revisiting the funding settlement for the health and care system, this should include **reviewing the existing legislative framework in health as well as notable gaps in the reform agenda (for example workforce, social care reform)**. In addition, the government should revisit reform to NICE, potentially expanding its role in assessing specialised medicines and medical devices, and giving it regulatory powers to drive better uptake.

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