Introduction

In the next 10 years the UK will need to spend between £1.2 trillion and £1.5 trillion on health and social care just maintain the current status quo. At current growth rates, real terms health spending in the UK will more than double to £230 billion a year by 2030 (Lansley, 2011). Without innovations that help to radically reconfigure the care system, it will be hard to achieve this, let alone achieve world class standards and meet the challenges of an ageing population. This will require careful thought on the new combinations of technology, services, organisations and built infrastructure that can be designed and put in place.

So what do we know about innovation in healthcare? First, it is part of the solution to the 21st century healthcare challenges but it is also part of the problem. Unlike in other industries, where innovation tends to drive down the cost of production or final costs to the consumer, innovation in healthcare is often perceived to be expensive because it increases demand – it allows you to treat more people or identify more problems can be treated (Cutler, 1995, Cutler et al., 2007, Cutler and McClellan, 2001, Skinner et al., 2006, Bodenheimer, 2005, Baker, 2010). It has been estimated that in the US the combined effect of demographic change, income growth, insurance costs, relative productivity growth and administrative expenses explains only half the total increase in healthcare expenditure between 1940 and 1999. The remainder is the consequence of technological change in medicine (Cutler, 1995).

Second, innovation in healthcare is hard partly because healthcare services are a ‘complex system’, with all the typical attributes that have been identified by complexity
theorists. These include its many interdependent constituent parts, the non-linear and
often counterintuitive behaviour it displays, and its ability to adapt to changes in the

Third, there are major problems in ensuring that innovations and recognised best practice
are diffused widely across the system. Knowledge about individual pockets of excellence
is not spread and pilot projects for innovations are often not sustained beyond their initial
phase because of insufficient local resources to develop them further. Moreover, in the
UK – and elsewhere – the overwhelming focus of policy and public support for
innovation in healthcare is for the development of new technologies, with relatively little
attention paid to their adoption and diffusion (Barlow and Burn, 2008).

While politicians, practitioners, academics and businesses involved in healthcare all
argue that innovation is essential to cope with the future, the received wisdom is that
healthcare organisations often find it easier to say ‘No’ to innovation. They might plead
lack of time, paucity of evidence, the need for a business case or just that the innovation
is too complicated.

Of course, some healthcare innovations do spread easily. Initial uncertainty about the
clinical value of MRI scanning was overcome by the clear superiority of its images
(Grigsby et al., 2002), although the number of scanners in England and Wales is still low
when compared to other countries. In the case of live polio vaccine, unambiguous
evidence for its benefits and early feedback meant that it was rapidly adopted and
diffused (Nelson et al., 2004).

However, the experience of many healthcare innovations is less encouraging. Even where
evidence in favour of an innovation is firm, it may be adopted far more slowly than
seems rational or desirable. Many advances stumble at such a multiplicity of hurdles that
the UK’s National Health Service (NHS) has earned a reputation for being ‘anti-
innovation’ – it has an organisational culture that under-values innovation, staff have few
financial or other incentives to engage in innovation, operational demands mean there is
little time for innovation, and the constant change and reorganisation induces ‘innovation fatigue’. This is all compounded by an organisational structure marked by a professional pecking order, strict demarcation, tribalism and departmental silos (Rushmer et al., 2004), and behavioural characteristics of clinicians and others that frequently inhibit innovation (Worthington, 2004, Goldberg, 2006).

This chapter outlines the emerging research that offers some clues about what precludes the sustainable adoption of healthcare innovation in public – that is, non-profit – organisations delivering healthcare. It focuses on the NHS, the largest public sector provider of healthcare in the world.

**Innovation in healthcare is not the same as best practice – but they are related**

‘Innovation’ is both an *outcome* and a *process* – a new method, idea or product and the action or process of innovating. It relates to the successful *exploitation* of new ideas rather than the act of invention itself. The notion of ‘adoption’ encompasses the processes influencing the decision to take-up a specific innovation, while ‘diffusion’ represents the spread of an innovation through a population (see chapter XXX in this book). The concepts have been much researched both in healthcare and in other industries.

Innovation has been categorised in a number of ways. It can be seen in terms of continuous or discontinuous innovation, either improving but preserving the current way of doing things or disrupting the status quo (Tushman and Anderson, 1986, Moore, 2005, Bessant, 2005). Others have seen innovation as incremental – involving change at level of individual elements of the innovation – or radical, involving change in the overall architecture of the innovation (Henderson and Clark, 1990). Recently the notion of ‘disruptive innovation’ (Christensen et al., 2000) has been much discussed, especially in relation to healthcare. This assumes that the pace of technological progress often exceeds the wishes of most customers, so the introduction of a more affordable product or service that is simpler to use may increase market demand by engaging new customers.
How ‘new’ does an innovation have to be to be classed as an innovation? Some innovations, such as an improvement to an existing product or way of doing things, may have already been widely adopted within an industry and therefore simply be new to a specific firm or organisation in that industry. At the other extreme, an innovation may be wholly new both to a firm and a market, a completely new product (Cooper, 2001).

This suggests that the boundaries between ‘innovation’ and ‘best practice’ can be somewhat blurred. What was once innovative may have become generally acknowledged best practice in one organisation (or industry or country), but may be new – innovative – in another. The concepts of best practice and innovation are therefore distinct but related. Best practice can be defined as the most efficient and effective way of accomplishing a task, based on repeatable procedures, which consistently shows results superior to a norm. When you visit your doctor you want to be sure that he or she is following best practice. Often, achieving this requires agreed evidence-based protocols to be followed. Depending on the clinical area, a degree of standardisation can lead to better outcomes. However, best practice should not be seen as fixed – it needs to evolve as new ideas emerge. And the reality is that in healthcare the influx of innovation means that best practice in many areas is constantly changing and evolving, redefining what high quality care looks like.

Understanding the adoption and diffusion of innovation

According to standard theories, the adoption and diffusion of new ideas follows a predictable pattern. A slow initial phase, in which innovators and risk-takers adopt a new idea, is followed by take-off when its benefits have been established. This surge in uptake gradually tails off as laggards adopt what is now common practice. In the NHS, a common claim is that there is an extensive lag, colloquially known as the ‘valley of death’, between the early adopters and the majority take-off.

Standard explanations for the successful uptake and spread of innovations usually focus on whether or not they possess certain characteristics. Rogers (1995) emphasises the
attributes of certain key factors which govern the adoption and diffusion rate for a new product: relative advantage (the degree to which a product is better than the product that it replaces), compatibility (the degree to which a product is consistent with the users’ context and values), complexity (the degree to which a product is difficult to understand and use), trialability (the degree to which a product may be experimented with on a limited basis prior to launch), and observability (the degree to which product usage and impact are visible to others).

Other approaches to innovation adoption and diffusion include probit models, where potential users possessing heterogeneous preferences weigh the costs and benefits of adoption, epidemic models, which stress the availability of information on an innovation for potential users, and the concept of information cascades and path dependence, emphasising the way information eventually results in an innovation becoming legitimised and network effects ensure its widespread adoption (Geroski, 2000).

**How does healthcare innovation take place? From conventional innovation research to process studies**

How applicable are conventional approaches to understanding innovation adoption and diffusion in the healthcare context? Often in healthcare research – and policy-making – ‘innovation’ tends to be narrowly defined, focusing on new medical devices or drugs, or the processes that lead to their development. But innovation in healthcare needs to be seen as a broader concept, encompassing improvements in the technologies, the institutional and physical infrastructures, and in the clinical practices and service designs that support health services. All are related. Changes in technology are likely to have an impact on service delivery models; innovation in services may have an impact on the demand for hospital beds. The boundaries around a healthcare innovation are often opaque, with new technologies commonly requiring new practices or organisational forms for their successful introduction. A variety of different strategies to encourage the adoption of innovation and manage its implementation is therefore necessary.
Although there has been a great deal research on the adoption and diffusion of healthcare innovations, this has suffered limitations. Until relatively recently most research has been on bounded, well-defined product innovations such as drugs and medical devices, rather than on the complex processes which underpin many innovations in health services. Adoption tends to be explained in relation to independent, individual decision-making, often in terms of correlations between the characteristics of the innovation and the adopters and often within a single organisational unit.

The limitations of this approach has been highlighted by several major reviews of healthcare innovation research (Greenhalgh et al., 2004, Robert et al., 2009, Fleuren et al., 2004, Rye and Kimberly, 2007, Denis et al., 2002). These point out that many studies focus on a small number of causal variables, so that little is known about relative effects and interactions between them and contextual influences. Moreover, while there is research on relationship between healthcare innovation and organisational characteristics, there are significant gaps, including the role of evidence and the impact of power and political dynamics on key stakeholders. Few studies focus on the sustainability of innovations beyond the initial implementation phase because research efforts are not ongoing (see Greenhalgh et al in this book), and there is also a lack of research on disengagement from old methods and its part in poor adoption of innovation. As Rye and Kimberly (2007) put it, ‘we still do not know as much as we would like, and what we do know, we may not know for sure’.

In reality, innovation adoption and diffusion in healthcare is not as simple as conventional studies tend to suggest. Deciding whether to take up a new idea involves multiple stakeholders and is a complex, organic and untidy process. The innovation itself may be multifaceted with several objectives, for example improving service quality, productivity and safety in various degrees. Innovations may require the coordinated efforts of numerous organisations from different parts of the care system, or they may challenge existing patterns of interdependence among individuals or groups. In healthcare, where there are tightly demarcated communities of interest such as those of different health professionals, collaborative efforts can be very difficult to negotiate.
(Ferlie et al., 2005). The evidence for the efficacy of an innovation may also be contested by different professional groups or there may be no generally agreed criteria for judging its benefits.

Even when an innovation is relatively clear-cut, with a good evidence base and involving few stakeholders, adoption and diffusion is often ambiguous, non-linear and uneven (Fleuren et al., 2004, Nelson et al., 2004, Rye and Kimberly, 2007, Ferlie et al., 2005, Robert et al., 2009, Edmonson et al., 2001). Healthcare organisations therefore should not be seen as rational decision-making machines that move an innovation through an ordered process of stages. The emerging consensus amongst researchers is that the interactions between the innovation itself, local actors and contextual factors are very important (Champagne et al., 1991, Denis et al., 2002, Dopson et al., 2002, Ferlie et al., 2005, Fitzgerald et al., 2002). This is echoes mainstream innovation research, where it is argued that successful and sustainable implementation requires compatibility between an innovation and its wider context (Rogers, 1995).

There has therefore been a tendency towards ‘process’ studies of healthcare innovation, particularly on UK settings. According to Kimberly and Cook (2008) this has provided ‘some of the most highly visible and innovative work on the effect of organisational variables on change in healthcare organisations’.

Process research in healthcare focuses on the dynamic behaviour within organisations, especially the way organisational context, activity and actions unfold over time. It argues that far more importance needs to be placed on interactions between social or professional groups than previous, largely non-healthcare based, research acknowledges (Fitzgerald et al., 2002). History, culture and the quality of inter-professional relationships are also very important (Ferlie et al., 2005).

Robert et al. (2009) have brought together this body of work in a major report which identifies a key component of successful innovation in health services as the way an innovation’s ‘outer context’ and ‘inner context’ are related. This echoes Denis et al.
(2002), who argue that a complex healthcare innovation is not something with fixed boundaries, but has a ‘hard core’ of well-defined irreducible elements, which have to be in place for it to succeed, and a ‘periphery’ of elements that are negotiable. They argue that the components and constituent parts of an innovation and its adopting context do not exist in isolation but in dynamic relation to the system as a whole and that not all the elements behave predictably. This therefore implies there may be several different routes to adoption for a given innovation.

**Applying healthcare innovation research lessons to the NHS**

Drawing this work together, what can we say about the adoption and diffusion of innovation in the NHS? Six factors are crucial to our understanding of the way innovation processes play out: complexity and the healthcare system, its costs and financing, its organisational structure, the capacity of NHS organisations for innovation, the importance of evidence-based decision-making in healthcare, and the role of communications and social networks.

**1. Complexity and the healthcare system**

Healthcare is frequently described as a ‘complex system’ because of the presence of many interdependencies between its constituent parts. This means that changes in one part can trigger changes in other parts, often with counterintuitive consequences (Plsek and Greenhalgh, 2001, Bar-Yann, 2004). There has been interest in applying ‘complexity theory’ to healthcare systems, which has provided insights into the organizational and behavioural changes needed to accelerate quality improvement and the dynamics across the boundaries of different services (Barlow and Dattee, 2010). A complex systems approach also implicitly permeates some government health policy and its translation into practice (Locock, 2003).

It is undeniable that the health and social care systems are hugely complex, where lines of communication and spheres of responsibility are messy, power struggles and cultural
silos are common, and the economics of innovation often unpredictable and perverse. For example, caring for elderly people with long-term chronic conditions requires effective communication and collaboration between different professional teams that span the somewhat artificial divide between health and social care. Even in the absence of technological or organisational innovation in the health services for those with long-term conditions this has proved challenging. But these difficulties are multiplied when complex innovations such as telecare (the remote monitoring of patients) are involved. The costs, risks and benefits of the effort are often spread unevenly, yet every organisation must be satisfied that it is getting a good deal if a telecare innovation project is to succeed (Barlow et al., 2006, Hendy and Barlow, 2011).

2. Costs and financing

The effects of health system complexity on the way the costs and benefits of an innovation are distributed are compounded by financial economics. This is certainly the case in the NHS but also common in most developed health systems. The financial apparatus of NHS health trusts (local hospital and primary care organisations) is inflexible because the control of budgets is devolved to different departments. Financial planning is restricted by the annual budgetary cycle and trusts are limited in their ability to accumulate discretionary funds or generate a financial surplus. High start-up costs for an innovation may inhibit long-term financial gains, or gains may be spread unevenly across organisations in the health system (Barlow and Burn, 2008).

These factors leave very little room for investment in innovation projects that may require significant up-front expenditure or involve a contribution from different departmental budgets. The focus of management tends to be on initial costs, so expensive innovations are less likely to be adopted even if they may have significant benefits further down the line. The result is a short-term outlook and generally risk-averse behaviour, a serious barrier to the adoption of new practices. Added to this problem are the uncertainties over the future environment, in which major policy shifts are perceived as
commonplace. There is a fear that the freedom to invest in innovative new business strategies and create new income streams could be withdrawn at any time.

The system of payment and reimbursement for medical procedures that operates within the NHS also causes problems for innovation. NHS providers are paid for their activity according to a tariff system, based on the average cost of a group of procedures. This is based on current practice and does not subsidise the cost of innovative, and possibly more expensive, procedures that would improve quality over time. If an innovation improves efficiency by reducing activity, a trust may be penalised because it will receive less under the tariff system. Furthermore, trusts do not have accurate costing systems giving them detailed information on what they pay per patient to provide a service. This means that trusts struggle to identify potential savings, giving them less reason to drop outdated practices and adopt new ones.

3. Organisational structure

It is often argued that innovation adoption is not a one-off, all or nothing event but an adaptive process, especially so in healthcare. As argued above, a typical complex healthcare innovation comprises a core of well-defined irreducible elements and a periphery of negotiable elements, allowing different routes to adoption. Successful and sustainable implementation requires compatibility between the innovation and its wider context, and possibly also the capacity to adapt features of the innovation to meet the needs of users (Robert et al., 2009).

Some healthcare innovations may lead to major modification to existing ways of working and involve collaboration across established organisational groups. In a complex healthcare system like the NHS, a degree of flexibility may therefore increase the likelihood of building coalitions that support the successful adoption of an innovation. Another important factor is how an innovation’s risks and benefits are distributed across a given NHS trust and the wider organisational system of which it forms a part. The more
these coincide with the interests, values and power of the various stakeholders, potentially the easier it is to build support for adoption.

4. Organisational capacity for innovation

An organisational culture that encourages innovation is influenced by strong leadership, a clear strategic vision and collective attitudes that are conducive to experimentation (Dopson et al., 2002, Ham and et al., 2002). Building such a culture in the NHS has proved problematic. For more than a decade, NHS reforms have attempted to change a system dominated by top-down central control to one in which decision-making is devolved to a local level as much as possible. But changing the organisational structure of the health service does not automatically change cultures that have developed over many decades, under conditions of tight budget control and a rigid hierarchy of decision-making.

Historically managers in the NHS have not been judged by how innovative they are. Rather, they are judged by how well they stay within their budget and carry out the tasks demanded of them. According to a King’s Fund (2011) report there is evidence that the NHS is over-administered as a result of extensive, overlapping and duplicating demands from regulators and performance managers. Effective leadership involves acknowledging the challenges, supporting managers and medical staff involved in innovation, and fostering learning through trial and error without the fear of penalties. But although it is recognised that leadership development needs to extend ‘from the board to the ward’, one of the biggest weaknesses of the NHS has been its failure to engage clinicians in management and leadership (Turnbull James, 2011). The need for complicated leadership arrangements, often across NHS entities, with negotiated authority between clinicians and managers, and between clinicians from different professional backgrounds, makes it hard for individuals to be open to innovation and experimentation.

5. Evidence-based decision-making
Innovations need to demonstrate unambiguous relative advantages over existing technologies, products or practices. The motivation to innovate partly depends on whether the organisation is rewarded for the effort it will expend on managing the change and realising the benefits. Evidence for costs and benefits is therefore important in decision making about whether to commit resources to an innovation. However, there are particular issues relating to the collection and interpretation of evidence within healthcare. Because of the powerful position of doctors, there is a bias towards scientific fact and a positivist epistemology in the evaluation of new innovations, while epistemologies from social sciences often carry less credence (Rogers and Copeland, 2004). This can lead to a view that anything short of the randomised controlled trial – the gold standard of evidence – lacks credibility. Yet healthcare innovations involving multiple interventions to modify a service are not amenable to this approach and the evidence base for such changes is therefore usually less clear cut.

Nevertheless, since the early 1990s across healthcare there has been increasing emphasis on evidence-based clinical practice, mirroring a shift to evidence-based policy across government. The quality and rigour of health technology assessments and clinical practice guidelines from the National Institute for Health and Clinical Excellence (NICE) are widely praised around the world. But there are two problems with this approach. First, NICE recommendations are not always quickly and uniformly adopted. In part, this is due to the sheer quantity of evidence and the finite resources of the NHS available to efficiently collect, assess and disseminate it. Moreover, NICE tends to focus on new drugs rather than medical devices or evaluation of service delivery innovations.

Second, much evidence-based practice has been criticised because research results may be too context-specific to be generalisable (Black, 2001). There is concern that too much emphasis on ‘evidence’ may lead to a myopia whereby only what is measurable is believed, while health policy making requires a more pluralist and diverse approach involving compromise between competing viewpoints (Marmot, 2004).
Given the potential costs and the focus on evidence creation, healthcare organisations often look more favourably on innovations that can be introduced on a trial basis before a binding decision to adopt because this reduces the risk and increases the visibility of benefits (Greenhalgh et al., 2004). However, a balance needs to be struck between trials necessary to demonstrate the impact and safety of an innovation and the excessive repetition of these trials in different localities. In the NHS findings from a large proportion of innovation pilot projects never see the light of day. Not only does this waste resources, but it can stifle the market for a given innovation, with the developers of new medical products often facing demands for repeated trials as different local healthcare authorities wish to test the product in their own context (Barlow and Burn, 2008). In the field of remote care for people with long term conditions, the results from over 8000 trials had been reported in scientific journals by 2006, yet the evidence base still remained comparatively weak (Barlow et al., 2007).

6. Communication and social networks are vital

The influence and membership of professional and social networks can determine how well new knowledge spreads and create normative and institutional pressures for adoption (Rogers, 1995). However, rigid delineation between professional networks may limit spread if important stakeholders are excluded, so the configuration of networks is important.

Clinical reputation is an important currency in the NHS and, together with professional networks, it can form the basis of efforts to spread innovation and best practice (Locock et al., 2001). Opinion leaders in healthcare can have a strong influence on the beliefs and actions of their colleagues. These may not be the initial enthusiasts for an innovation but are the senior professionals who throw their authority and status behind it, based on their expert judgment. There are different forms of network in healthcare, with differing implications for the spread of innovation. Doctors tend to have informal horizontal networks that are effective at spreading peer influence and constructing and reframing the meaning of innovations, while nurses tend to have formal, vertical networks that are
effective at transferring codified information and passing on decisions from higher authority (West et al., 1999, Ferlie and Pettigrew, 2005, Ferlie et al., 2010).

However, networking arrangements in the NHS do not function as an especially effective mechanism for communication and knowledge transfer. Innovations that require different professional groups to work together or originate outside a particular group can find it harder to win the necessary support. Communities of practice in healthcare tend to involve one profession only. The groups can be highly institutionalised, with their own rules, norms and objectives, and it takes a great effort to create functioning multi-disciplinary communities of practice.

Conclusions

The adoption of healthcare innovations can be a tortuous process, nowhere more so than the NHS. There are several reasons for this. First, healthcare is immensely complex – and the organisational structure and economics of the NHS are no different. It has many stakeholders, professional silos, commissioning and provider organisations, each with their own sets of interests. Its payment and reimbursement arrangements are convoluted and there are unpredictable spillovers when it comes to the way the costs and benefits of innovation are distributed. This can inadvertently act as a disincentive to innovation, reinforcing historically risk-averse cultures.

Second, healthcare tends to be deeply political, so seemingly rational innovations leading to changes to services can rapidly become the subject of populist disquiet, unsettling local politicians. And, in the case of the NHS, repeated attempts by governments at organisational reforms have not only resulted in ‘innovation fatigue’, but have also tended to disrupt multi-disciplinary networks that are essential if professional and departmental resistance to innovation is to be overcome (Barlow and Burn, 2008).

Third, some of the difficulties around healthcare innovation are partly attributed to the high status of ‘gold standard’ empirical evidence in healthcare. When combined with inadequate institutional means for testing innovations and for advocating and
implementing recommendations about adoption, this focus on evidence can slow change. The repeated trials and pilots of innovations both waste resources and often produce results which are locally specific and cannot be applied widely.

Together, these characteristics can make it easier to say ‘no’ to an investment in a healthcare innovation than to say ‘yes’ – with the typical response being ‘give me a business case’ or ‘what’s the evidence base for the benefits?’ Yet the current context for healthcare – demanding higher quality and more cost-effective service delivery – requires that these issues are addressed.

Lowering the barriers to adoption, embedding, sustaining and spreading innovation in the NHS requires moves simultaneously on a number of fronts. In a system that increasingly places an emphasis on evidence-based policy, the institutional basis for gathering, analysing, disseminating and advocating and monitoring what works and where is weak. Improvements to the methods and institutional framework for doing are needed. Greater transparency in information about the relative performance of healthcare organisations would highlight best practice. Changes to the financial incentives to adopt innovative technologies and processes could help to eliminate perverse behaviours. Fostering of multidisciplinary networks and better understanding of how professional peer networks operate could overcome cultural barriers to change. Enhancement of managerial skills, capacity and leadership would make innovation smoother and less traumatic.

More broadly, attention needs to be paid to identifying the best leverage points for influencing the potential to effect change and innovation in the NHS. This will require a much better understanding of the dynamics of the system to avoid triggering counter-intuitive consequences (Forrester, 1995). While ‘whole system’ thinking – i.e. one which accounts for the structure of the entire system – has become increasingly influential in the NHS (Rogers and Copeland, 2004, Audit Commission, 2002, Rogers et al., 2008), the interdependencies between different health and social care subsystems, and how they inhibit innovation, are poorly understood.
The moves towards NHS system reform launched by the Coalition Government in 2010 carry both challenges and opportunities. The opportunity is that devolved governance could reduce the risk aversion of a system where passivity has sometimes been the safest leadership option. The challenge is to ensure that all NHS stakeholders understand where and how best – world-class – practice is occurring and ensure that competition between healthcare providers does not reduce the communication and spread of good ideas.

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