

Delivering the benefits of digital health care

Research summary

Candace Imison, Sophie Castle-Clarke,

Robert Watson and Nigel Edwards

February 2016

Supported by



About this summary

Clinically led improvement, enabled by new technology, is transforming the delivery of health care and our management of population health. Yet strategic decisions about clinical transformation and the associated investment in information and digital technology can all too often be a footnote to NHS board discussions. This needs to change. This summary sets out the possibilities to transform health care offered by digital technologies, with important insight about how to grasp those possibilities and benefits from those furthest on in their digital journey. This research summary provides an overview of the key findings from the report. The full report can be accessed at www.nuffieldtrust.org.uk/digital.

Suggested citation

Imison C, Castle-Clarke S, Watson R and Edwards N (2016)
Delivering the benefits of digital health care. Research summary.
Nuffield Trust

Acknowledgements

We would like to thank Mark Britnell, Richard Bakalar, Ash Shehata and Jonty Roland at KPMG for their insights and guidance throughout this research. We are also very grateful to those we interviewed during the course of the project, who were very generous with their time and knowledge. We thank those who reviewed the report in its near final stages: Ruth Thorlby (Associate Director of Policy, Nuffield Trust), Daniel Reynolds (Director of Communications, Nuffield Trust), Sasha Karakusevic (Visiting Senior Fellow, Nuffield Trust), Brent James (Chief Quality Officer, Intermountain Healthcare), Robert Wachter (Professor and Interim Chair of the Department of Medicine, UCSF), Matthew Swindells (previously of Cerner; incoming National Director for Commissioning Operations and Information, NHS England), Tracey Bullock (Chief Executive, Mid Cheshire Hospitals), Bridget Fletcher (Chief Executive, Airedale NHS Foundation Trust), Stuart Bell (Chief Executive, Oxford Health NHS Foundation Trust), Jonathan Serjeant (Director of Business Development and GP, Brighton and Hove Integrated Care Service) and Rebecca George OBE (Vice Chair and Lead Partner, Public Sector Health, Deloitte). Finally, we would like to thank KPMG for funding the study.

KPMG International's Trademarks are the sole property of KPMG International and their use here does not imply auditing by or endorsement of KPMG International or any of its member firms.

The views presented in this summary are those of the authors and do not necessarily represent the views of the Nuffield Trust or our partners. All product and company names mentioned throughout the report are the trade marks, service marks or trading names of their respective owners, and do not represent endorsements.

Contents

	Delivering the benefits of digital health care	3
①	Why has it been so difficult to deploy digital technology in health care?	5
②	Seven opportunities to drive improvements	9
③	Seven lessons for success	19
④	Maximising the benefits from a digital strategy	21
⑤	Messages for NHS boards	23
⑥	The future of health care: digital heaven or hell?	24
	References	26

Delivering the benefits of digital health care

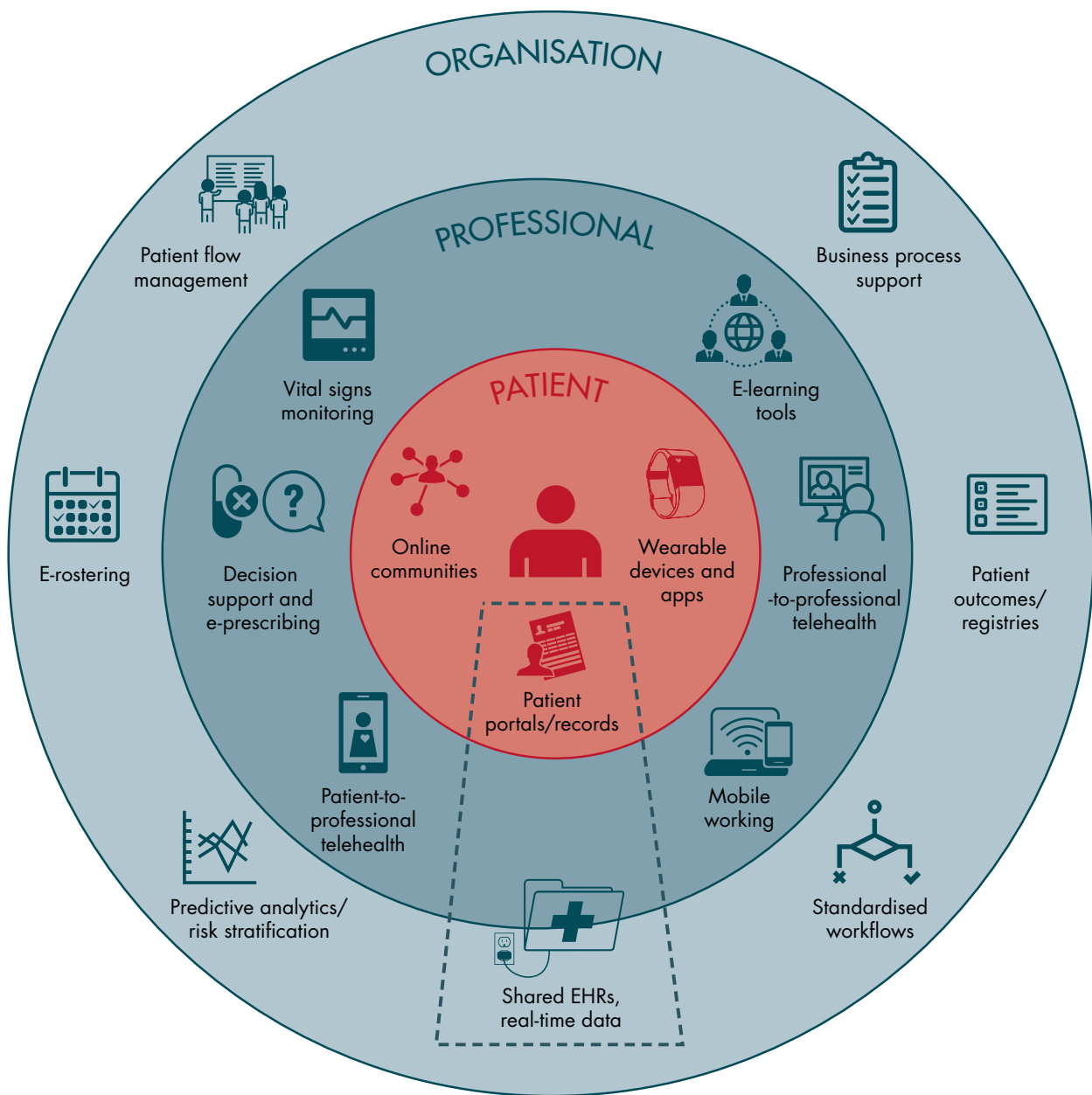
Clinically led improvement, enabled by new technology, is transforming the delivery of health care and our management of population health. Yet strategic decisions about clinical transformation and the associated investment in information and digital technology can all too often be a footnote to NHS board discussions. This needs to change. These decisions need to move centre stage.

In what follows, we set out the possibilities to transform health care offered by digital technologies, with important insight about how to grasp these possibilities and benefits from those furthest along their digital journey. We draw on an extensive literature and evidence review, and on interviews with leaders of health care organisations who have been actively pursuing a digital strategy over many years.

Many reports about technology-enabled change tend to focus on the large number of exciting future opportunities, but less on how to avoid common pitfalls. We aim to fill this important gap. We want leaders of NHS organisations to deepen their understanding of the digital terrain and the possibilities it offers, particularly to meet the immense productivity challenge ahead, and also to gain practical insights that will help avoid expensive mistakes.

Figure 1 provides a high-level overview of the future digital health care landscape. The patient or service user is at its centre, surrounded by the patient-facing technologies that provide them with opportunities to manage their health and engage with health care providers. These include wearable devices, apps, online communities and patient portals. The electronic health record (EHR) straddles the system as a whole, reflecting the pivotal role it plays in any digital strategy. It is the foundation on which many of the other tools are built. Next are the technologies that provide tools for health care professionals. These include decision support, the capacity to access other professionals' expertise, tools to prioritise and manage their clinical workload and tools to identify the patients at greatest risk. Finally, the outer circle shows the technologies that support organisations, including tools for business process support, predictive analytics, flow management and e-rostering, which give new resource and clinical management capabilities to health care providers.

Figure 1: Overview of the future digital landscape



This research summary¹ sets out why it has been so difficult for health care to capitalise on technology, before presenting seven opportunities for digital solutions to transform the sector and seven fundamental lessons for success. Finally, we provide insight on how to maximise your digital strategy and what the future looks like.

1. The full report is available at www.nuffieldtrust.org.uk/digital

1

Why has it been so difficult to deploy digital technology in health care?

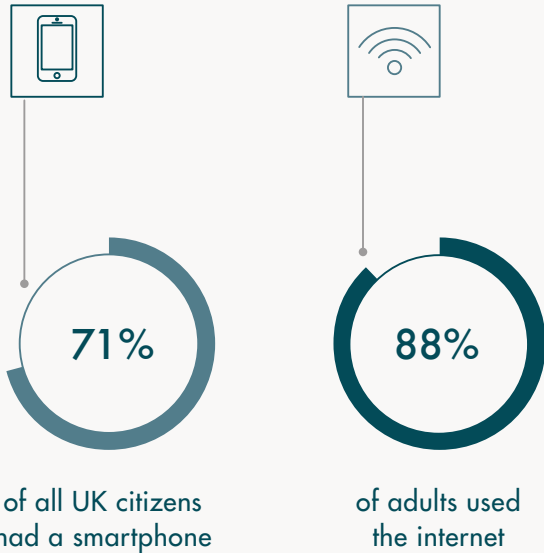
Around the world there is agreement that health care is at least a decade behind other industries in the use of information technology. This gap is certainly visible in the NHS. While 88% of adults in the UK use the internet, only 2% report a digitally enabled transaction with the NHS. But there is a large appetite for health care technology, and the app market is booming (see infographic on next page).

The NHS did benefit from the National Programme for Information Technology (NPfIT) in some areas, but it ultimately failed to digitise the hospital and community sectors, despite an investment of nearly £10 billion (House of Commons Committee of Public Accounts, 2013). However, we believe the NHS is heading towards a digital tipping point. The majority of the NHS acute trust CEOs surveyed for this report revealed that they have the technology to support mobile working, e-rostering, patient-flow software and EHRs. A small number have systems for telehealth, remote monitoring and tracking.

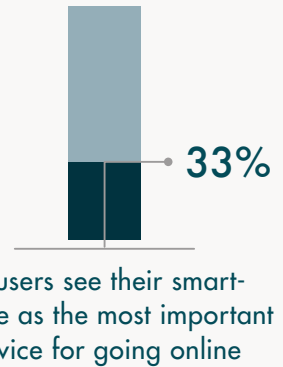
The world of digital health in numbers

Consumer IT

In 2015

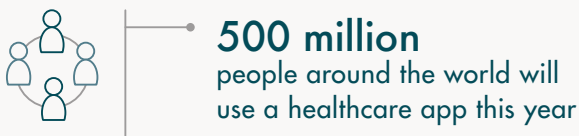
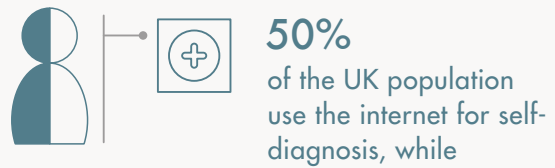


The average adult spends almost **2 hours** a day online on a smartphone

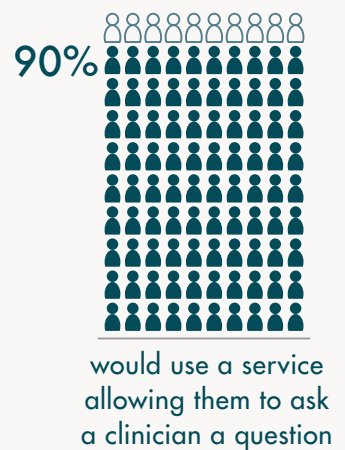
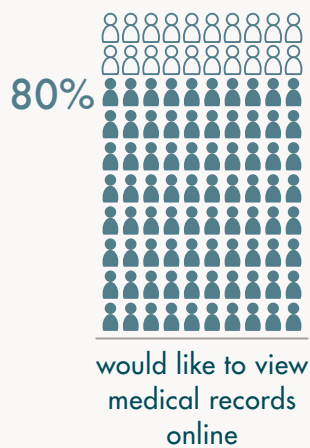
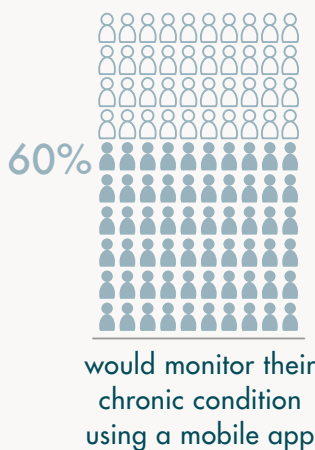


But only 2%

of the population report any digitally enabled transaction with the NHS



A 2012 survey of 7,000 patients found that



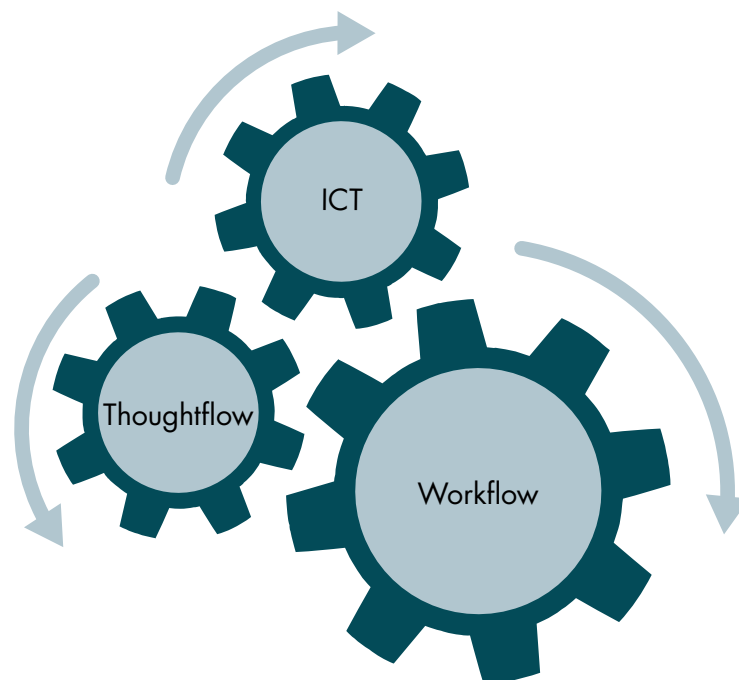
The speed with which benefits either have been or are likely to be achieved varies considerably. It is also clear that contextual and implementation factors play a big part in determining the ultimate impact. Striking examples of digital innovations that can deliver significant benefits relatively rapidly include:

- Apps that monitor vital signs and enable clinicians to identify and prioritise patients who require the most urgent attention
- Apps that support staff working peripatetically in the community.

The early evidence also suggests that these apps deliver a high return on investment.

The area that has created the greatest challenge is the implementation of the EHR. Organisations at the digital frontier have spent decades building and refining their EHR. Deriving the full benefits from information technology in health care requires a sophisticated and complex interplay between the technology, the ‘thoughtflow’ (clinical decision-making) and the ‘workflow’ (the clinical pathway) (see Figure 2) – and this is particularly important for EHRs, which usually have multiple functions. Poorly designed information technology can disrupt thoughtflow and workflow; well-designed information technology can optimise them. Benefits will also be increased with systems that, as far as possible, automate data entry, for example with direct feeds from equipment that monitors vital signs.

Figure 2: Interplay between ICT, thoughtflow and workflow



Becoming a digitally enabled health care provider is not about replacing analogue or paper processes with digital ones. Where technological interventions have failed, technology has simply been layered on top of existing structures and work patterns, creating additional workload for health care professionals. The technologies that have released the greatest immediate benefits have been carefully designed to make people’s jobs or the patient’s interaction easier, with considerable investment in the design process. Those we interviewed talked time and again about the importance of using technology to reimagine current work processes.

“I call it ‘The Safety Deposit Box Theory’ – you need two keys to unlock this... one of them is that the work needs to be reimaged... the second is the adaptation of technology.” (Robert Wachter, UCSF)

2

Seven opportunities to drive improvements

We believe that the ingredients are now in place for technology to help deliver the ‘Triple Aim’ of health care and make significant gains in quality, efficiency and population health. Information technology can also provide the route to a model of care that generates new value for patients, professionals and organisations by meeting previously unmet needs.

“I think we’re about to come to the next era of medicine... as much as 30% of what we do today we will do differently... how we evaluate patients, how we follow up on patients, how we bring the expertise in between clinicians, how we manage patients in a hospital, how we think about even the role of the hospital.”
(Robert Pearl, Kaiser Permanente)

We have identified seven opportunities to drive improvements in productivity and quality of care, listed below:

- | | |
|-----------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------|
|  More systematic, high-quality care |  Greater patient engagement |
|  More proactive and targeted care |  Improved resource management |
|  Better-coordinated care |  System improvement and learning |
|  Improved access to specialist expertise | |

On the next page, we explore each of these opportunities in turn.



More systematic, high-quality care

SHARED EHRs, REAL-TIME DATA · DECISION SUPPORT & E-PRESCRIBING ·
STANDARDISED WORKFLOWS

“When you talk about consistency of care, most... physicians think... you’re taking it down to the level of the lowest common denominator – a level that is acceptable to 100 physicians. I’m talking about the opposite – I’m saying let’s build the system around the three physicians that get the best results, and get the other 97 to increase their performance... we know how to do that.”
(Robert Pearl, Kaiser Permanente)

Keeping up with the ever-growing body of medical research and new ideas around best practice is challenging. Diagnostic and prescribing errors are common. Technologies that aid clinical decision-making and help clinicians to manage the exponential growth in medical knowledge offer substantial opportunities to reduce variation and improve the quality of care.

Decision support tools include clinical decision support systems (CDSSs), computerised physician order entry (CPOE) and e-prescribing technology. CDSSs range from very passive electronic aids, such as hyperlinks to guidelines, to extremely proactive one-click flow mechanisms. There is strong evidence that they can improve the quality of clinical decision-making (Garg and others, 2005; Jaspers and others, 2011; Kawamoto and others, 2005) and some evidence they can lower cost (Fillmore and others, 2013). They are often combined with CPOE systems and used to order medications, tests or procedures. These integrated systems can reduce the likelihood of medication error and the use of hospital resources, and can improve pharmacy and radiology turnaround times (Chaudhry and others, 2006; Radley and others, 2013; Steele and DeBrow, 2008).

Standardised workflows and ‘one click flows’ can consistently limit variation in the system. These systems involve taking a best-practice process and integrating it into the EHR by asking clinicians to enter data as they go along. This means

organisations can see where clinicians have varied from protocol, and the associated clinical outcomes, thereby enabling continuous learning. Of course, no protocol will ever be right for every patient, so clinicians still need to use their own judgement. The idea is to hold on to variation across patients (to meet the needs of individual patients) and to limit variation across clinicians. Standardised workflows can be taken a step further through ‘one-click flows’. Information is pushed through a ‘workflow engine’ to initiate the process, which triggers the tasks and processes for each member of staff involved in the care pathway.



More proactive and targeted care

VITAL SIGNS MONITORING · PREDICTIVE ANALYTICS/RISK STRATIFICATION · SHARED EHRs, REAL-TIME DATA

“[Productivity] doesn’t just come from putting an electronic medical record in, it comes from... [using] the data across the continuum to predict and prompt, and it’s a whole different ballgame.” (Matthew Swindells, Cerner)

Technology offers the opportunity for care to become proactive, rather than reactive, and allows resources to be targeted at those that need them most.

Predictive analytics uses computer algorithms to analyse electronic patient records, draw on individual clinical data and generate risk scores to highlight those that are likely to be re-admitted in the near future. This allows for targeted interventions to be put in place, potentially mitigating risk. Northern Arizona Healthcare in the US has found that by sending scores to the nurses managing discharge, it has reduced emergency readmissions by 45% (Matthew Swindells, Cerner, personal communication). Digital technology will also augment the current practice of ‘case finding’ – facilitating the use of up-to-date electronic clinical information.

Electronic vital signs systems have been developed that can record vital signs data, calculate early warning scores and combine these data with laboratory tests to immediately alert staff to risks of deterioration, sepsis, acute kidney injury

or diarrhoeal illness. This can facilitate early rescue and prompt initiation of treatment, saving lives, preventing harm and potentially reducing costs. VitalPAC and Nervecentre are two examples of this software being used in the NHS; peer-reviewed evaluations of VitalPAC demonstrated that the introduction of its vital signs software was associated with 769 fewer deaths across two NHS hospitals (Schmidt and others, 2015), while the introduction of its infection prevention software was associated with a 90% reduction in norovirus outbreaks (Mitchell and others, 2015). In the US, Cerner estimates that its sepsis prediction tool could reduce in-hospital patient mortality by 24% and reduce length of stay by 21%, saving US\$5,882 per treated patient.

Remote community monitoring technologies use a similar principle to anticipate deterioration of patients at home and intervene to prevent a hospital attendance. The SENSOR project aims to develop and evaluate early warning systems for community-based patients with chronic respiratory disease. A suite of medical devices, along with an iPad, monitor a person’s lung function, physical activity, oxygen levels and weight. The manufacturers predict a reduced number of admissions and readmissions, and this technology is currently undergoing clinical trials in Portsmouth.²



Better coordinated care

MOBILE WORKING · PROF-TO-PROF TELEHEALTH · SHARED EHRs, REAL-TIME DATA

“Another huge opportunity with complex patients with the multiple morbidities patients have today, then when they go from primary care to secondary care and social care systems, we can coordinate care and make sure information is exchanged seamlessly without repeating constant tests, without constantly writing history notes but also understanding what has happened with previous conditions to a sufficient level to make a decision.” (Dr Harpreet Sood, NHS England)

2. SBRI Healthcare, 2014; www.activ8rlives.com/sensor/

The growing population of people with multiple conditions, many of whom are old and frail, makes effective care coordination a central challenge for any health and social care system. Health information about individual patients is frequently stored in a number of different and inaccessible silos across primary care, community and hospital systems. If all health care professionals had access to all patient information in real time, there would be significant potential to expedite necessary care and to reduce waste in the system. There are a number of ways that technology can help realise this aim.

Integrating data within hospitals can be achieved with software solutions, such as The Mayo Clinic’s Synthesis app.³ Instead of clinicians having to access a different programme for each different piece of clinical information (e.g. one programme for blood results, another for imaging etc.), the app combines data from numerous clinical systems within the organisation, creating one port of call for all information relevant to the patient.

Integrating data across providers and sectors will allow for improved care coordination for those with multiple health and social care needs. South Somerset Symphony is a primary and acute care system that uses a shared electronic system to allow all providers to view a single patient record. Preliminary outcomes show a reduction in the number of admissions, A&E attendances and length of stay (Castle-Clarke and others, 2015).

Integrating data via the patient is a third approach for ensuring that all relevant professionals have immediate access to clinical data. By putting the entire clinical record in a patient-owned electronic account, the complete record is wherever the patient is. Examples include: Patients Know Best,⁴ Microsoft HealthVault,⁵ Get Real Health⁶ and Epic’s ‘Lucy’ system.⁷

3. www.apple.com/iphone/business/profiles/mayo-clinic/

4. <https://www.patientsknowbest.com/>

5. <https://www.healthvault.com/gb/en-GB>

6. www.getrealhealth.com/

7. <https://www.epic.com/software-phr.php>



Improved access to specialist expertise

SHARED EHRs, REAL-TIME DATA · PROF-TO-PROF TELEHEALTH · TELEHEALTH/TELECARE

“I do think... the one under-emphasised area where we see an opportunity for a very, very large productivity gain, not just in health care but in any kind of dealing with public services, is the movement of... conversations to video consultation.” (David Furniss, BT Global Services)

Technology can provide remote access to professionals whenever it is needed. Patients can consult their care team from their own home via telephone, videoconference, email or web platforms, and clinicians can call on specialist expertise at the point of care.

Patient-to-professional telehealth can reduce A&E attendances and hospital admissions (Hex and others, 2015); reduce the specialist’s workload (Caffery and Smith, 2010); and improve patient outcomes (Zhou and others, 2010). The introduction of telemedicine solutions in care homes at Airedale NHS Foundation Trust resulted in a 14% reduction in A&E attendances, and emergency hospital admissions decreased by an additional 6% compared with a control group without telemedicine (Hex and others, 2015). Telehealth apps can be particularly helpful in large, sparsely populated geographical areas. They enable a small number of clinicians to cover a large geographical area and even to act internationally – although this raises questions about regulation and accountability. However, there remains a risk of increasing demand.

Professional-to-professional telehealth means generalists can receive specialist support when they need it. Some centres have introduced ‘hotlines’ or email addresses for GPs to seek specialist advice, which can result in reduced specialist referrals.

e-ICUs or tele-ICUs are intensive care units that receive support from a remote critical care team through patient surveillance and monitoring as well as remote consultations. They can reduce mortality, reduce ICU length of stay rates and improve staff outcomes.



Greater patient engagement

SHARED EHRs, REAL-TIME DATA · WEARABLE APPS · TELEHEALTH/TELECARE · PATIENT PORTALS/RECORDS · ONLINE COMMUNITIES

“Engage patients at a very early stage of their lives when they are very well or if they’re just at risk and we can start helping them get into patterns of behaviour and behavioural changes that are going to put them on a course or trajectory to minimise chronic conditions in the future. That’s where the huge savings are going to be in the long term. That’s where the huge productivity improvements will be as well.” (Richard Bakalar, KPMG)

Technology is rewriting the relationship between patients, professionals and care providers. Patients are taking greater control over their health, and tools for patient empowerment and self-management provide opportunities for patients’ active participation in their care. However, one note of caution: some people could be disadvantaged in a world that relies on high levels of general and computer literacy.

Patient portals give patients access to their electronic medical records. More advanced portals enable patients to develop and track their personal care plans, request prescription renewals, schedule non-urgent appointments, access their health education library and exchange secure messages with their provider. Hurley Group, a London-based GP organisation, has developed a platform called WebGP,⁸ designed as a ‘first port of call’ for patients seeking primary care. In a pilot study, 18% of patients self-managed an issue for which they had planned to see a GP (WebGP, 2014).

Patient networks, facilitated by digital technology, are becoming an important source of advice and information for patients. Online networks, such as

8. <http://webgp.com/>

PatientsLikeMe,⁹ signpost other resources and put the insight and experience of patients themselves to effective use.

Videos of consultations can be made more accessible using technologies that allow secure storage and access to large files. Evidence suggests that patients who are given a video recording of their consultation find them helpful and have improved recall of the advice and information given (Meeusen and Porter, 2015; Tsulukidze and others, 2014).

Wearables and apps have exploded onto the health care technology scene. However, it is not clear what impact these have on people’s health and their interaction with health care providers. There are mixed feelings among health care professionals, and developers may shy away from developing apps for complex patients. As such, existing apps focus on wellness and devices such as FitBit collect huge amounts of data. Knowing how to meaningfully interpret and act on this data presents a significant challenge. There also remain security concerns around the use of app technology, particularly in unregulated markets.



Improved resource management

MOBILE WORKING · BUSINESS PROCESS SUPPORT · PATIENT FLOW MANAGEMENT · E-ROSTERING · SHARED EHRs, REAL-TIME DATA

“We should be tracking all materials... tracking the time of our procedures and automating our scheduling... The more analysis we have on that... the more clinicians can make efficient decisions, which will then improve their productivity.” (Joel Haspel, GE Healthcare Finnamore)

There are significant opportunities to improve productivity by introducing tools that are widely used in other sectors for improved resource management. Examples include intelligent rostering, managing patient flow and mobile working.

9. <https://www.patientslikeme.com/>

e-Rostering systems, when well-implemented, can significantly reduce the time taken to develop the staff roster, reduce agency staff use, provide more flexible and less stressful working patterns and support automatic monitoring of workforce activity. Taken one step further, this software can not only create rosters but can allocate workload, track tasks and match staffing levels to acuity levels in real time.

Mobile working can transform the way that community-based teams deliver care. By equipping staff with mobile devices, there is no need to start and end the day at a central hub, while remote access to records can facilitate more coordinated care and apps can include decision support tools. One community midwife team in London saved five hours per midwife per week following the introduction of a mobile working system.

Patient flow technology can track room status, patient status and wait times, staff status and mobile equipment location. Such systems can help spot at-risk patients and patients waiting within the system, allowing staff to act quickly and manage problems. At Royal Wolverhampton NHS Trust, following the introduction of a real-time location system, beds are becoming available to new patients in less than 40 minutes and finding a tagged asset takes just 25 seconds.



System improvement and learning

STANDARDISED WORKFLOWS · PATIENT OUTCOMES/REGISTERIES · SHARED EHRs, REAL-TIME DATA · PREDICTIVE ANALYTICS/RISK STRATIFICATION

“Electronic health records are dumb. They are not the major source of productivity or value enhancement. They are a mechanism for entering and storing data. It’s what you do with the data that creates the value.”
(David Blumenthal, The Commonwealth Fund)

Data collected through clinical and non-clinical processes should be fed back into the system to support system improvement and learning. Large clinical databases

and disease registries with vast numbers of data points allow for powerful analyses and provide health care organisations with the information they need to improve their processes. Intermountain Healthcare is particularly advanced in doing this. It captures data on intermediate and final clinical outcomes, cost, and patient satisfaction and uses a team of data analysts to run bespoke reports. It has already reduced its costs by 10% in the last three years and leaders believe that these systems will reduce the cost of care by 50% in the future.

Education and training can be significantly enhanced through technology. For example, AT Medics (a large primary care organisation in London) uses WebEx technology to deliver training sessions to its staff, including fortnightly teaching given by hospital consultants. The videoconferencing software has enabled the organisation to efficiently deliver the same training sessions across multiple sites, engendering a feeling of connectedness between practices and fostering relationships with secondary care colleagues.

3

Seven lessons for success

To make the most of these opportunities, our research revealed seven lessons that all health care organisations embarking on a digital strategy should know.



1. Transformation first

Technology will only succeed if it supports new ways of working. Where technological interventions have failed, technology has simply been layered on top of existing structures and work patterns, creating additional workload for health care professionals. You need a transformation programme supported by new technology, not the other way round. This is the fundamental lesson that underpins everything else.



2. Culture change is crucial

You need to invest at least as much in programmes of organisational change as the technology itself (and ideally significantly more). You will need leaders with a deep knowledge of both clinical and technological systems, a culture that is receptive to change and an environment where all staff feel empowered to spot opportunities to improve. Clinical champions and active staff engagement can help with this. Training is critical. It should be provided to all staff interacting with new technology before it is introduced, alongside real-time support once it is in place. As systems become easier to use, training needs for routine use should subside.



3. User-centred design

Technological systems should solve problems for their users, not create them. They should support a clinician's 'workflow' (their tasks and processes) as well as their 'thoughtflow' (their process of clinical decision-making). For example, a decision support system needs to provide prescribing advice at the exact moment the clinician is thinking about prescribing. When systems meet clinical needs they are much more likely to succeed, and when clinicians experience technology making their lives easier, they are much more likely to be supportive of ongoing change. To this end, you should involve clinicians in developing systems. You should also customise the information you present depending on who is looking at it.



4. Invest in analytics

You need to invest in analytics to learn from data collected in clinical and non-clinical systems. This is likely to improve operational and clinical processes as well as population management and treatment optimisation. Sophisticated search tools will help. You will also need a team of highly qualified analysts and data scientists. This may not be a quick or cheap solution, but the potential for long-term gain is enormous.



5. Multiple iterations and continuous learning

Even if you follow all of this advice, you won't get it right first time. You should see this as an ongoing process with several learning cycles – some quite painful – before all of this investment starts to pay off. You will need people who can adapt both clinical practices and the supporting technology as you improve and evolve. It is now routine for large health care organisations in the US to have chief medical and chief nursing information officers.



6. Support interoperability

Sharing data across multiple settings is fundamental to realising the benefits of a paperless NHS. A lot of work needs to be done at a national level, but there are also things providers can do. Firstly, while customising your EHR is likely to make it more useful to your needs, changing lots of things is likely to inhibit data sharing – so think carefully about what you adapt. Secondly, weigh up the benefits of a single integrated system versus multiple, bespoke specialist systems that are linked together. There is no consensus on what is most effective. A single system will always be the second-best option compared to a purpose-built solution for a particular specialty, but it is more likely to support integration.



7. Strong information governance

Concerns about patient data entering the wrong hands or being lost in error has historically made patients and professionals alike resistant to digital systems. Robust data security will improve public acceptance. Make the most of tools available to you, such as the Health & Social Care Information Centre information governance toolkit. Whatever processes you put in place, make sure they are clearly articulated to patients – particularly when seeking permission for non-clinical uses of data, such as improving how you work.

4

Maximising the benefits from a digital strategy

“One of the big challenges now for myself and the leadership team is to... get that deep engagement and understanding of what an EHR can do and get it aligned with strategic priorities, rather than what has been described as the ‘hobbyist’ approach.” (Dr Gareth Thomas, Salford Royal NHS Foundation Trust)

Grasping the opportunities described here requires new skills and capabilities at all levels of an organisation. It also requires NHS trust boards to think about the development and use of technology in an entirely different way.

Figure 3 on the next page shows the potential path to acquiring full maturity as a digitally enabled organisation.

Figure 3: Organisational and leadership capabilities

	1	5
Leadership and improvement capacity	<ul style="list-style-type: none"> • Head of information technology (not at board level) • No improvement lead 	<ul style="list-style-type: none"> • CEO leadership with support from chief medical information officer, chief nursing information officer and leads within each clinical area for joint improvement and information technology strategy
Board focus and attention	<ul style="list-style-type: none"> • Firefighting technical problems • Information governance 	<ul style="list-style-type: none"> • Maximising benefits from digital and improvement capabilities at all levels – patient, clinical team, organisation and system
Technical infrastructure	<ul style="list-style-type: none"> • Picture archiving and communication system (PACS) • Some bespoke clinical and business systems • Robotic pharmacy 	<ul style="list-style-type: none"> • EHRs integrated with a variety of systems and applications, including: clinical monitoring, RFID tracking and asset management, patient portals, CDSS and knowledge management • Interoperability across the system
Analytical capacity	<ul style="list-style-type: none"> • Focus on key performance metrics • No dedicated analytic capacity 	<ul style="list-style-type: none"> • Systems support continual improvement and learning at all levels and across the system • Informatics capability at all levels of the organisation

The most advanced level requires:

- engaged leaders who are deeply knowledgeable about the clinical and technological systems in place
- a commitment to maximising the benefits of technology from leaders at board level and below
- an advanced technological infrastructure
- dedication to using data for continuous improvement and learning.

5

Messages for NHS boards

- NHS boards need to deepen their understanding of the new capabilities that technology gives them, and align their technology and transformation programmes – this will require significant strategic investment, not only in technology but also in the workforce.
- Boards need to develop clinical leaders to support the integrated programmes of technology and transformation.
- Boards may want to consider leasing rather than buying technology as a more cost-effective and affordable route to acquisition.
- Early strategic priorities should be the areas where technology is able to facilitate some relatively easy and significant wins, for example vital signs monitoring and support for mobile working.
- In the short to medium term, the use of EHRs, telehealth, patient portals and staff rostering apps can generate savings and improve quality, but these require sophisticated leadership, organisational development and change management to ensure that the full benefits are realised.
- In the longer term, the really big benefits will come from the transition to a system and ways of working premised on continual learning and self-improvement.

6

The future of health care: digital heaven or hell?

Some will look at the years ahead and see a glorious nirvana in which the messy and inefficient services of today are transformed into predictive, coordinated and personalised care. Others will see a dystopia of doctors becoming slaves to algorithms and patients drowning in a sea of data and additional expectations. Both are possible, but a look at what leading providers have already achieved – described in this report – should be cause for optimism.

There are three main areas for change. First, although there is a lot of interest in new models of care, the most significant improvements in productivity over the next few years are likely to come from the combined impact of large numbers of small changes and extracting the full benefit from the technologies currently available.

Second, doing the current work more efficiently, with fewer errors and in ways that are easier and more convenient for staff, would get many organisations a long way. Additional opportunities come from the redesign of complete pathways both within organisations and beyond their traditional boundaries.

The third shift is a move from pathways to populations. This involves a change of focus from the effective management of the patient through the pathway to maintaining the health of populations over time.

We conclude with our own vision of how health care is likely to change in the next 10 years:

- **Patient outcomes will be improved** because technology intelligently supports long-term health management and short-term episodes of illness or injury.
- Clinical professionals and their organisations will be **spending their time on their core competency** – treating patients – rather than wasting time managing processes. They will have access in real time to all the information they need.
- **Computing will be much more ubiquitous, but much less visible.**

- A lot **less time will be spent by staff on administrative tasks and routine communication**, as automation, voice recognition and natural language processing become more commonplace.
- **New roles and competencies will be added** to the managerial cadre in health care – most importantly that of analytics.
- **Professionals will develop a wider range of consulting and coaching skills**, to account for the increased ways in which they can interact with and empower their patients.
- **Organisational and professional boundaries will be far less visible**, as integrated information and communication systems dissolve many of the current divides between primary, secondary and tertiary care.

References

- Caffery LJ and Smith AC (2010) 'A literature review of email-based telemedicine', *Studies in Health Technologies and Informatics* 161, 20–34.
- Castle-Clarke S, Kumpunen S, Machaqueiro, Curry N and Imison C (2015) *The future of primary care: New models and digital requirements*. www.nuffieldtrust.org.uk/documents/future-primary-care-new-models-and-digital-requirements
- Chaudhry B, Wang J, Wu S, Maglione M, Mojica W, Roth E, Morton SC and Shekelle PG (2006) 'Systematic review: impact of health information technology on quality, efficiency, and costs of medical care', *Annals of Internal Medicine* 144(10), 742–52.
- Fillmore CL, Braye CE and Kawamoto K (2013) 'Systematic review of clinical decision support interventions with potential for inpatient cost reduction', *BMC Medical Informatics Decision Making* 13, 135.
- Garg AX, Adhikari NK, McDonald H, Rosas-Arellano MP, Devereaux PJ, Beyene J, Sam J and Haynes RB (2005) 'Effects of computerized clinical decision support systems on practitioner performance and patient outcomes: a systematic review', *Journal of the American Medical Association* 293(10), 1223–38.
- Hex N, Tuggey J, Wright D and Malin R (2015) 'Telemedicine in care homes in Airedale, Wharfedale and Craven', *Clinical Governance: An International Journal* 20(3), 146–54.
- House of Commons Committee of Public Accounts (2013) *The Dismantled National Programme for IT in the NHS: Nineteenth report of session 2013–14*. The Stationery Office. www.publications.parliament.uk/pa/cm201314/cmselect/cmpubacc/294/294.pdf. Accessed December 2015.
- Jaspers MWM, Smeulers M, Vermeulen H and Peute LW (2011) 'Effects of clinical decision support systems on practitioner performance and patient outcomes: a synthesis of high quality systematic review findings', *Journal of the American Medical Association* 18(3), 327–34.
- Kawamoto K, Houlihan CA, Balas EA and Lobach DF (2005) 'Improving clinical practice using clinical decision support systems: a systematic review of trials to identify features critical to success', *British Medical Journal* 330, 765.
- Meeusen AJ and Porter R (2015) 'Patient-reported use of personalized video recordings to improve neurosurgical patient–provider communication', *Cureus* 7(6), e273.
- Mitchell C, Meredith P, Richardson M, Greengross P and Smith GB (2015) 'Reducing the number and impact of outbreaks of nosocomial viral gastroenteritis: time-series analysis of a multidimensional quality improvement initiative', *BMJ Quality and Safety*, doi: 10.1136/bmjqs-2015-004134 (epub ahead of print).
- Radley DC, Wasserman MR, Olsho LEW, Shoemaker SJ, Spranca MD and Bradshaw B (2013) 'Reduction in medication errors in hospitals due to adoption of computerized provider order entry systems', *Journal of the American Medical Association* 20(3), 470–6.

- Schmidt PE, Meredith P, Prytherch DR, Watson D, Watson V and others (2015) 'Impact of introducing an electronic physiological surveillance system on hospital mortality', *BMJ Quality and Safety* 24, 10–20.
- Steele AM and DeBrow M (2008) 'Efficiency gains with computerized provider order entry', in Henriksen K, Battles JB, Keyes MA and others (eds) *Advances in Patient Safety: New directions and alternative approaches* (Vol. 4: Technology and Medication Safety). Agency for Healthcare Research and Quality (US).
- Tsulukidze M, Durand MA, Barr PJ, Mead T and Elwyn GP (2014) 'Providing recording of clinical consultation to patients – a highly valued but underutilized intervention: a scoping review', *Patient Education and Counseling* 95(3), 297–304.
- Zhou YY, Kanter MH, Wang JJ and Garrido T (2013) 'Improved quality at Kaiser Permanente through e-mail between physicians and patients', *Health Affairs* 29(7), 1370–5.

Infographic references

- 'In 2015, 71% of all UK citizens had a smartphone; 88% of adults used the internet'. Ipsos MORI (2015) *Ipsos Connect Tech Tracker Q3 2015*. www.ipsos-mori.com/Assets/Docs/Publications/Ipsos_Connect_Tech_Tracker_Q3_2015.pdf
- 'The average adult spends almost 2 hours a day online on their smart phone; 33% of users see their smartphone as the most important device for going online'. Ofcom (2015) *The Communications Market Report*. August. http://stakeholders.ofcom.org.uk/binaries/research/cmr/cmr15/CMR_UK_2015.pdf
- 'Only 2% of the population report any digitally enabled transaction with the NHS'. National Information Board/UK Government (2014) *Personalised Health and Care 2020: Using Data and Technology to Transform Outcomes for Patients and Citizens. A Framework for Action*. www.gov.uk/government/uploads/system/uploads/attachment_data/file/384650/NIB_Report.pdf
- '43,000 medical apps are now available on iTunes; 500 million people around the world will use a healthcare app this year'. Becker's Healthcare (2013) Becker's Health IT and CIO Review: 'How to Further Integrate Patient-Facing Apps in Healthcare (and the Top-Rated Apps)'. <http://www.beckershospitalreview.com/healthcare-information-technology/how-to-further-integrate-patient-facing-apps-in-healthcare-and-the-top-rated-apps.html>
- '50% of the UK population use the internet for self-diagnosis, while 75% search the web for health information'. Department of Health and UK Trade and Investment (2015) 'The UK: your partner for digital health solutions'. <https://www.gov.uk/government/publications/the-uk-your-partner-for-digital-health-solutions>
- 'A 2012 survey of 7,000 patients found that...'. Patient.co.uk (2012) Patient survey, 2012.



For more information about Nuffield Trust, including details of our latest research and analysis, please visit www.nuffieldtrust.org.uk



Download further copies of this research summary from www.nuffieldtrust.org.uk/publications



Subscribe to our newsletter: www.nuffieldtrust.org.uk/newsletter



Follow us on Twitter: [Twitter.com/NuffieldTrust](https://twitter.com/NuffieldTrust)

Nuffield Trust is an independent health charity. We aim to improve the quality of health care in the UK by providing evidence-based research and policy analysis and informing and generating debate

59 New Cavendish Street
London W1G 7LP
Telephone: 020 7631 8450
Email: info@nuffieldtrust.org.uk

Published by the Nuffield Trust.
© Nuffield Trust 2016. Not to be reproduced without permission.

ISBN 978-1-910953-07-5