



Delivering value with digital technologies
Briefing: July 2021



Introduction to digital healthcare technologies



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Digital technologies such as digital medicine, genomics, artificial intelligence and robotics have a huge potential to transform the delivery of healthcare.

These technologies can empower patients to participate actively in their care, with a greater focus on wellbeing and prevention. They also support the prediction of individual disease risk and personalise the management of long-term conditions.

The HFMA, supported by Health Education England, is delivering a 12-month programme of work to increase awareness amongst NHS finance staff about digital healthcare technologies, and enable finance to take an active role in supporting the use of digital technology to transform services and drive value and efficiency.

Finance managers have a major role in investment decisions, and therefore need to be aware of how these technologies will transform services in future. This briefing provides NHS finance staff with an introduction to the role of digital in healthcare transformation.

The CPD Standards Office
CPD PROVIDER: 50137
2020-2022
www.cpdstandards.com



Introduction

Digital healthcare technologies, such as digital medicine, genomics, artificial intelligence and robotics, provide the NHS with an opportunity to reimagine how care is delivered. This is sometimes known as ‘digital transformation.’

‘The digital transformation agenda is not about implementing electronic staff records – it’s about putting the citizen/patient at the centre of healthcare delivery and using digital technology to transform the service.’ Patrick Mitchell, Health Education England (HEE) director of innovation, transformation and digital

‘The only way the NHS can meet the challenges of rising demand, costs and expectations is to use digital technology to transform itself. There is huge potential to improve productivity, safety, experience and outcomes for patients, people in care, and the workforce’

Dr Simon Eccles, national chief clinical information officer for health and care, deputy chief executive, NHSX

Digital technologies are increasingly being used within the NHS for a range of purposes, with healthcare organisations varying considerably in their digital maturity. This briefing explains what some of the key technologies are and how they will change the way care is delivered in future. The adoption and spread of innovation is still at an early stage, but this will change over time.

This briefing is about the digital technologies involved in the direct care of patients, and therefore does not cover the fundamental elements of information technology (IT) infrastructure required for the overall management of healthcare, for example electronic health records, back office systems and the requirement for IT systems to be interoperable with one other.

At a recent HFMA roundtable¹, Patrick Mitchell, HEE director of innovation, transformation and digital listed three particular applications of technology that in his view could provide a paradigm shift in how healthcare is delivered in future:

- the use of data to drive clinical decision-making and improve clinical productivity, including artificial intelligence (AI) in trend and predictive analysis
- wearables for remote monitoring and diagnostics
- the use of AI for image recognition as a major productivity opportunity.

The following sections describe some of the key types of digital healthcare technology, using the three categories described in the *Topol review: preparing the healthcare workforce to deliver the digital future*²

- digital medicine
- artificial intelligence and robotics
- genomics.

¹ HFMA, *Roundtable: digital role*, May 2021

² NHS, *The Topol review: Preparing the healthcare workforce to deliver the digital future*, February 2019

Digital medicine

Digital medicine includes digital products and services that are used in the diagnosis, prevention, monitoring and treatment of disease. Some of the technologies are described below.

Telemedicine

Telemedicine is the use of telecommunication and information technology for the purpose of providing remote health assessments and therapeutic interventions. This includes texts, audio and video consultations.

Luton and Dunstable University Hospital NHS Foundation Trust has established a virtual ward, which allows patients to be assessed via video conference. Patients in care homes have direct and quicker access to their care team, and people with complex needs living at home can be seen remotely rather than in hospital. This has resulted in a reduction in attendances to the emergency department.³

Wearables and sensors for remote monitoring and diagnostics

Wearable technology in healthcare includes electronic devices that people can wear, like Fitbits and smartwatches, and are designed to collect the data of the user's personal health and exercise. Examples include wearable electrocardiogram (ECG) monitors and blood pressure monitors⁴.

For patients with type 1 diabetes, the NHS has been prescribing wearable sensors since 2019. The sensor is worn on the arm and relays glucose levels to a smartphone or e-reader. Researchers at Imperial College, London have developed new robotic sensor technology that has the capability to diagnose women's reproductive health problems in real-time.⁵

Smartphone Apps

The NHS Apps library⁶ holds a wide range of apps to help people to manage their health and wellbeing, for example:

- [mySugr](#) supports patients with diabetes to manage their condition
- [My House of Memories app](#) allows people living with dementia and their carers to explore objects from the past and share memories together.

Virtual and augmented reality

Virtual reality

Virtual reality (VR) is a technology that allows a user to simulate a situation or experience, using a VR headset, within an interactive computer-generated environment.

VR is starting to be used in medical training, for example when studying human anatomy or surgical procedures. The Royal College of Surgeons have accredited a VR platform which provides doctors with a 'flight simulator' for total hip replacement training. The platform provides visual aids, and also uses haptics⁷ to simulate the feel of tissue, bone and muscle⁸.

³ FutureNHS Collaboration Platform, *Global Digital Exemplar Blueprints*

⁴ NHS, *Blood pressure monitoring*

⁵ Imperial College Healthcare NHS Trust, *New sensor technology can diagnose reproductive health problems in real-time*, February 2019

⁶ NHS Apps library

⁷ Haptic technology creates an experience of touch by applying forces, vibrations or motions to the user.

⁸ Digital Health, *VR surgical simulator first to receive Royal College accreditation*, April 2019

VR is also starting to be used as part of patient care. Oxford Health NHS Foundation Trust piloted an avatar-based virtual reality supported therapy to assist service users address common mental health issues. During therapeutic sessions, service users enter a secure, virtual landscape where they manipulate avatars and props to explore different perspectives, visualise futures and solve problems, helping to build resilience and support recovery. It was found to be particularly useful for engaging with children and young people who were reluctant to talk or who had autistic spectrum disorders.⁹

Examples are emerging of VR technology being used to help patients manage pain, reducing the need for opioid prescriptions. A study at the Cedars Sinai hospital in Los Angeles found that patients wearing VR goggles that immersed them in relaxing rides through Icelandic scenery or swimming with whales reported a 24% drop in their pain scores¹⁰.

Augmented reality

Augmented reality (AR) is a technology that lets people superimpose digital content (images, sounds, text) over a real-world environment. It is being explored as an approach to improve the quality of surgical interventions, either by training or as live guidance. AR technology allows multiple people in remote locations to virtually interact in a way which mimics what they would experience if they were in the same operating room. They can physically show each other where to make an incision or use physical gestures to illustrate a technique.

The British Army is testing technology that allows medical specialists thousands of miles away from the battlefield to instruct frontline surgeons how to operate on injured soldiers using AR. The technology involves a camera mounted on a frontline surgeon which provides a view of the procedure being undertaken. Images are transmitted to a distant specialist who shares real-time instructions on a computer or directly into AR glasses that the battlefield surgeon is wearing.¹¹

Artificial intelligence and robotics

Automated image interpretation using AI

AI technologies applied to diagnostic imaging, such as cancer screening, are among the most advanced uses of AI in healthcare. There are currently five major areas under development:

- breast screening mammography
- chest X-ray and chest CT interpretation
- diabetic retinopathy screening
- stroke imaging
- cardiac imaging.¹²

Speech recognition and natural language processing (NLP)

Speech recognition technology converts speech audio to text. Some trusts have started to use speech recognition technologies for inputting data into electronic health records, for example the A&E department at South Tees Hospital NHS Foundation Trust introduced clinical speech recognition as a way of dealing with the rising volume of clinical documentation. The technology freed up clinician time and improved the quality of documentation.¹³

⁹ FutureNHS Collaboration Platform, *Global Digital Exemplar Blueprints*

¹⁰ Cedars Sinai, *Virtual reality offers real pain relief*, May 2017

¹¹ The Defense Post, *UK army medics to use AR glasses for remote battlefield surgical assistance*, January 2021

¹² NHS England, *Diagnostics: recovery and renewal, Report of the independent review of diagnostics services for NHS England*, October 2020

¹³ NHS, *The Topol review: Preparing the healthcare workforce to deliver the digital future*, February 2019

Natural language processing (NLP) is a branch of AI that allows computers to understand spoken or typed words. NLP has many uses, for example it can process unstructured data in electronic health records, converting it to structured data which is machine interpretable. It can also enable predictive analytics to improve population health. One study used NLP to predict suicide attempts by monitoring social media.¹⁴

Interventional and rehabilitative robotics

Robot-assisted surgery is now becoming more common in orthopaedic, laparoscopic and neurosurgical procedures. Snake robots for reaching peripheral areas in the lungs or for performing gastrointestinal surgeries are now available, expanding the scope of robotics in surgery.

The Royal Surrey NHS Foundation Trust has four surgical robots. Three are used for performing surgery, while the fourth helps with training. The machines allow surgeons to perform complex procedures with increased precision, whilst using a minimally invasive approach, meaning that the patient is not left with a large scar on the skin. Patients benefit from a shorter hospital stay, faster recovery, reduced blood loss and less discomfort post-surgery.¹⁵

Robots can also be used in rehabilitation. The University of Leeds has developed *MyPAM*, a planar joystick system designed to provide targeted assistive exercise for children with cerebral palsy and adults who have had a stroke. Designed to be used in a community setting, they can be installed in schools, community stroke units and in a patient's home to provide improved access and engagement with therapeutic intervention.¹⁶

Predictive analytics using AI

Applying machine learning, predictive models use large volumes of data to predict the most likely outcomes for individual patients. This can allow clinicians to provide tailored care. One research study demonstrated the potential of machine learning to differentiate chronic pain patients between those who would benefit from non-opioid treatments and those who would not.¹⁷

Genomics

Genomic technologies have the potential to speed up diagnosis for patients with a rare disease; match people to the most effective medications and interventions; and increase the number of people surviving cancer each year.¹⁸

The genome, or genetic material, of an organism is made up of deoxyribonucleic acid (DNA). Each organism has a unique DNA sequence, which is composed of bases (A, T, C and G). If you know the sequence of the bases in a particular organism, you have identified its unique DNA fingerprint. Determining the order of bases is called sequencing. Whole genome sequencing is a laboratory procedure that determines the order of bases in the genome of an organism in one process.

The NHS Genomic Medicine Service in England aims to be the first national health care system to offer whole genome sequencing as part of routine care, starting by sequencing 500,000 whole genomes by 2023/24, focusing on children with cancer or children who are seriously ill with a likely genetic disorder. Future plans include offering genomic testing routinely to all people with cancer, and linking and correlating genomic data to help provide new treatments and diagnostic approaches.

¹⁴ HealthCatalyst, *Healthcare NLP: the secret to unstructured data's full potential*, April 2019

¹⁵ Royal Surrey NHS Foundation Trust, *Surrey hospital leading the way on robotic surgery*, January 2020

¹⁶ University of Leeds, *Assistive and rehabilitation robotics*

¹⁷ Dovepress, *Reducing opioid prescriptions by identifying responders on topical analgesic treatment using an individualized medicine and predictive analytics approach*, May 2020

¹⁸ NHS, *NHS Genomic Medicine Service*

The HM Government report *Genome UK – the future of healthcare*¹⁹ notes that the cost of sequencing is falling, and is now quick and efficient enough to inform clinical care. The report sets out the government’s strategy to create the most advanced genomic healthcare system in the world.

Conclusion

This briefing provides a brief introduction to the digital technologies which will change how frontline healthcare is delivered in future.

The introduction of such technologies is not straightforward. How do you gain the buy-in of clinicians? How do you ensure patients remain engaged? Does the NHS workforce and the general population have the right digital skills? As the Wachter²⁰ report notes ‘digitising effectively is not simply about technology, it is mostly about people.’ Starting with the person (the patient and the healthcare professional) rather than the technology is key.

From an investment perspective there are additional challenges. Healthcare organisations vary significantly in their digital maturity, and for those with poor IT infrastructure there is a need to get the basics right first, for example sufficient well-functioning computers and an electronic health records system.

‘Once you have got the IT basics right, you can allow the clinician and others to reimagine how they deliver care’

Andrew Griffiths, chief executive office, Federation of Informatics Professionals in Health and Social Care

Participants at the recent HFMA *Delivering value with digital* roundtable²¹ highlighted the challenges of putting together a business case for digital technology that supports service transformation. How do you describe the financial and non-financial benefits? How much do you need to invest in change management to support service transformation, rather than the direct cost of the technology? How do you effectively articulate the new models of care and the impact on workforce? Addressing these challenges requires close working between finance, informatics and clinical teams.

‘...becoming a digitally enabled health care provider is not about replacing analogue or paper processes with digital ones. It is about rethinking what work is done, re-engineering how it is done and capitalising on opportunities afforded by data to learn and adapt. 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.’

‘Transformation comes from new ways of working, not the technology itself. A transformation programme supported by technology is needed, not the other way round.’

The Nuffield Trust²²

¹⁹ HM Government, *Genome UK - the future of healthcare*, 2020

²⁰ Government website, *Making IT work: Harnessing the power of health information technology to improve care in England*, September 2016

²¹ HFMA, *Roundtable: digital role*, May 2021

²² Nuffield Trust, *Delivering the benefits of digital health care*, February 2016

'Digital technologies must be fully integrated into NHS care and prevention pathways, otherwise their introduction will risk fragmentation, duplication and inefficiency of care delivery'

The Topol review²³

Delivering value with digital technologies

The HFMA is delighted to be launching the 12-month *Delivering value with digital technologies* programme in July 2021 in association with HEE. The aims of the programme (set out below) will be achieved through a number of deliverables, including publications, events, a HFMA Delivering value with digital technologies award and new HFMA Bitesize courses.

The *Delivering value with digital technologies* programme will:

- raise awareness of the digital transformation agenda within the NHS finance community
- develop an active network of NHS finance professionals with an interest in the digital agenda, working closely with informatics and clinicians, to support the sharing of knowledge and expertise
- explore how digital technology can support improvements in value through service transformation, waste reduction and efficiency programmes
- develop examples of how to make the case for investment, including business cases
- consider smarter solutions to procurement
- work with NHS finance to come up with solutions to some of the financial barriers, for example revenue and capital accounting, future funding models and benefits realisation.

Many of the new digital healthcare technologies have only recently been adopted in the NHS, which means it is hard to find examples of case studies where service transformation is fully embedded, or where value and efficiency gains have already been delivered. Working with organisations who have started on the digital transformation journey, the HFMA will identify examples of good practice and highlight the challenges that services face. This will include specific challenges relating to NHS finance.

If you have examples of digital transformation to share, and/ or want to become involved in the *Delivering value with digital technologies* programme, please contact Catherine Mitchell, HFMA head of costing and value catherine.mitchell@hfma.org.uk.

²³ NHS, *The Topol review: Preparing the healthcare workforce to deliver the digital future*, February 2019

This briefing is part of the *Delivering value with digital technologies* programme that the HFMA is undertaking, supported by Health Education England. The programme aims to increase awareness amongst NHS finance staff about digital healthcare technologies, and enable finance to take an active role in supporting the use of digital technology to transform services and drive value and efficiency. [For more information click here.](#)

About Health Education England

Health Education England (HEE) is part of the NHS, and we work with partners to plan, recruit, educate and train the health workforce. HEE exists for one reason only: to support the delivery of excellent healthcare and health improvement to the patients and public of England by ensuring that the workforce of today and tomorrow has the right numbers, skills, values and behaviours, at the right time and in the right place.

HEE's Digital Readiness Programme, commissioned by NHSX, aims to uplift digital skills, knowledge, understanding and awareness for all our health and care workforce. This includes:

- Supporting the right culture and environment, for example by ensuring digital is understood, embedded and championed at trust and ICS board level.
- Professionalising the digital workforce through support for professional bodies, regional Informatics Skills Development Networks, and collaborative community networks.
- Establishing learning and development through the NHS Digital Academy and specific learning and development initiatives, for example the Florence Nightingale Digital Nurse Scholarship, and through access to tailored, appropriate online learning for all.
- Building our future digital workforce by undertaking workforce analysis and demand forecasting, and sustainable models to recruit talent, for example through graduate schemes, as well as opportunities for nurturing existing talent, for example through the Topol Digital Health Fellowships.

For more information visit the [Digital Readiness Programme website](#) or follow the programme on Twitter [@HEE_DigiReady](#).

About the HFMA

The Healthcare Financial Management Association (HFMA) is the professional body for finance staff in healthcare. For over 70 years, it has provided independent and objective advice to its members and the wider healthcare community. It is a charitable organisation that promotes best practice and innovation in financial management and governance across the UK health economy through its local and national networks.

The association also analyses and responds to national policy and aims to exert influence in shaping the wider healthcare agenda. It has particular interest in promoting the highest professional standards in financial management and governance and is keen to work with other organisations to promote approaches that really are 'fit for purpose' and effective.

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