BMJ Future Health

Building Trust in Digital Transformation of Healthcare

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DNV

Introduction

The healthcare sector is under pressure. Demand for care is outstripping supply, and despite significant public and private investment, healthcare delivery is at risk of becoming increasingly inequitable. Patients are finding access to care more difficult, and healthcare workers are becoming overstretched and burned out.[1]

To address these issues, the sector needs to deliver more care more efficiently, making the best use of precious and expensive human resources. It is hoped that digital solutions can play a major role in transforming the healthcare sector, improving resource management, enhancing patient care, and ultimately creating more sustainable and accessible healthcare systems.

The potential for digital health to transform healthcare delivery and outcomes is gaining momentum. But a growing body of research suggests progress has been slow compared with other safety-critical industries.[2] Examples include the energy and aviation sectors, which have come further in deploying advanced digital systems for safety and efficiency management, such as real-time data analytics and predictive maintenance, and in managing the risks emerging from operating these technologies.

The BMJ Group and DNV, an independent assurance and risk management provider, have launched the BMJ Future Health Commission to examine the state of digital transformation in healthcare and identify what is needed to accelerate adoption. This report draws on survey data from 306 healthcare professionals across northern Europe (including 57% in clinical, 20% in managerial, and 16% in technology roles, with the remainder in other professional categories), complemented by 14 semi-structured interviews. UK-based professionals constituted 64% of respondents (196 individuals), with 54% of participants reporting more than 21 years of healthcare experience. It provides a snapshot of the healthcare technology landscape as of late 2024.

More than three-quarters of respondents are optimistic about digital innovations, with most reporting improved patient data accessibility (83%) and better care delivery (80%) in their organisations over the past three years. However, healthcare professionals are concerned that technology is not reducing the administrative burden, with 47% reporting eased administrative tasks, 38% a reduced clinical staff workload, and 44% considering that it lowers healthcare costs.

Healthcare systems face the challenge of reliably and safely implementing digital technologies at scale, a feat reliant on professional adoption driven by trust. The survey highlighted the concerns of respondents: while 59% of healthcare professionals considered digital technology trustworthy, 11% disagreed and 30% were undecided.

This report outlines the survey's findings and provides recommendations for healthcare organisations to build trust in digital transformation, ensuring technological advances translate into meaningful improvements in patient care.

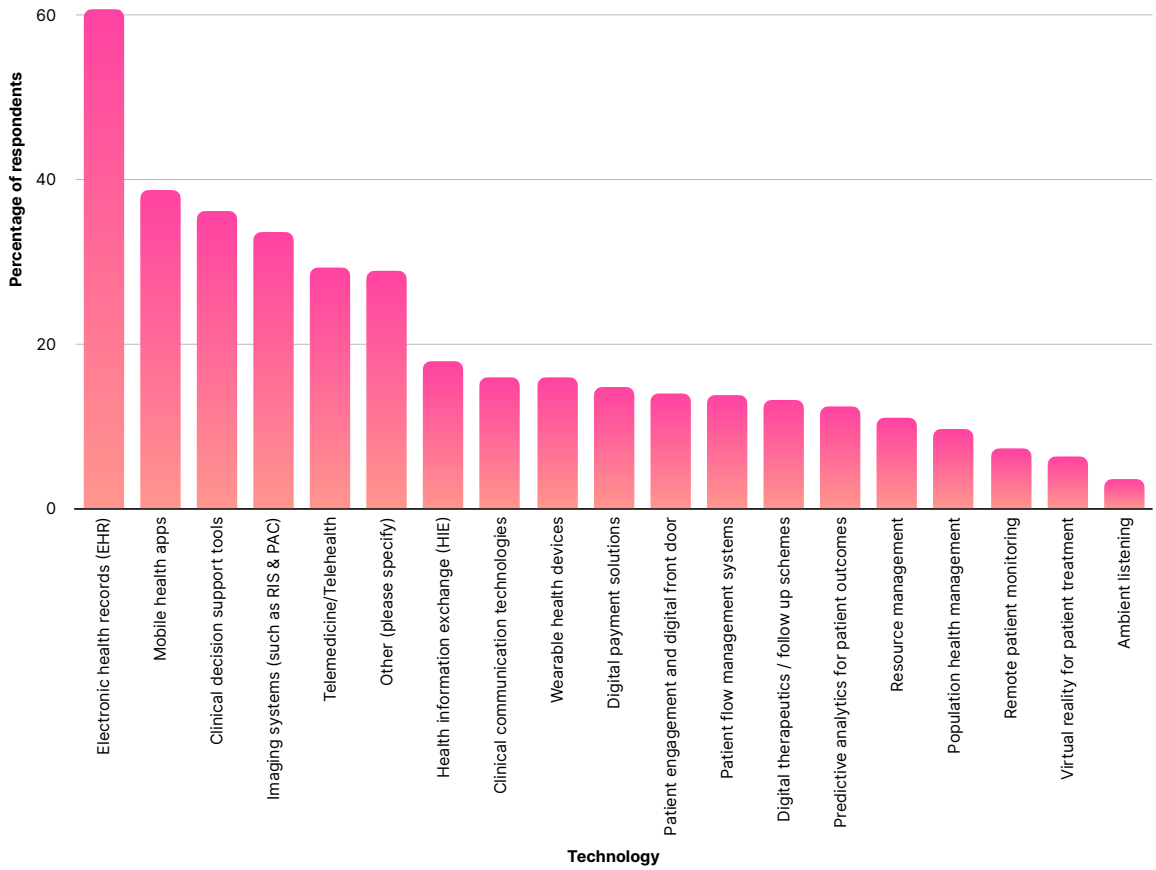
Chapter 1

Getting electronic health record systems right builds trust in digital transformation

For decades, 'digital health' largely equated to electronic health record (EHR) systems; the stalwart of healthcare's digital technologies. The survey indicated that 97.7% of respondents had used at least one listed technology or a self-described alternative, with 92.5% using one of the digital technologies daily.

The portfolio of digital health technologies on the market extends much further, however. More recently, technologies such as clinical communication and decision support tools, predictive analytics, remote monitoring systems, patient flow and population health management systems, and mobile health applications have started to show promise for more personalised and efficient patient care, as well as improved health outcomes. Our survey finds that these technologies and other digital health innovations are used by far fewer healthcare professionals than EHR (see figure). These emergent technologies are near to creating significant value, but have yet to be adopted at scale.

Percentage of respondents using each technology



Healthcare professionals who frequently use EHRs are far less likely to believe that digital technologies reduce administrative burden and reduce the workload of clinical staff (each by 14 percentage points) than those who do not. They are also more likely to disagree that digital technologies have been adopted too slowly within their organisation (50%) compared with those who do not (27%). The concern is that poor experiences with EHR systems do little to incentivise healthcare organisations to adopt and scale other digital technologies in the workplace.

"My experience of [electronic health record systems] was that it increased the amount of time everything took" said a clinician interviewed for this report. "It was a learning curve to try and work out where everything was. I mean, the people who were selling it to us spend their whole lives, day in, day out, in front of computer systems. As a clinician you haven't got time to be doing that."

"We spend quite a lot of time on the computer, even if we work in clinical practice, It feels like it moves us more away from patient care, which is what we are supposed to do."

This challenge is exacerbated by a rocky relationship between the healthcare sector and EHR system implementations over recent decades. The National Programme for IT (NPfIT)[3] was one of the most ambitious EHR projects in the UK. Launched in 2002, it aimed to create a centralised electronic health record system for all NHS patients. However, the project faced numerous challenges[4], including technical issues, cost overruns, and resistance from healthcare professionals. It was eventually dismantled in 2011 having cost approximately £10 billion.

Similarly painful EHR implementation failures and delays have been reported across Europe. Denmark struggled with its Sundhedsplatformen project, launched in 2016[5]; and Germany's electronic health card (eGK) faced multiple delays and technical problems[6]. Regions in Norway and Sweden faced similar concerns, some of which have been linked to serious patient safety issues. Healthcare technology projects experience a failure rate of up to 70%.[7] Failure in this context is defined as any unintended negative consequences, including project delays, significant cost overruns, failure to achieve intended goals, or complete abandonment of the project.

Given the dominance of EHR systems in today's healthcare technology landscape, and the potential of many more technologies in development, our survey suggests that getting EHR implemented and operating well is an important prerequisite to healthcare organisations' appetite for adopting and scaling other digital health technologies.

Chapter 2

Standardisation can overcome distrust in a fragmented tech landscape

Healthcare professionals are burdened with the hassle of logging in to – and working within – multiple separate digital systems in their department, and across multiple departments in their organisation. Frequently, these systems do not talk to each other, meaning clinicians waste valuable time navigating between different platforms, re-entering data, and cross-checking information across disconnected systems.

This technological fragmentation forces healthcare professionals to compensate for system shortcomings, adding to rather than alleviating their workload, creating inconvenience for patients and providers, and compromising trust in technology.

"If you're having to log in to four or five different systems for each [patient], one for bloods, one for clinic letters, one for x-rays, it becomes quite cumbersome compared to what it could be," said a clinician interviewed for our study.

Interviewees also reported challenges accessing records when patients receive care across multiple facilities. "It is quite frustrating for me in clinical practice that you can see a patient that had surgery in a neighbouring hospital, maybe only 10 miles away, but the systems didn't talk to each other, so I have no access to any of their records," said a clinician.

This can put patient safety at risk. When systems fail to share critical patient information, the resulting gaps lead to potential risks and errors. Clinicians may make decisions without complete data, medications can be duplicated across systems, and test results critical to clinical decision-making may not reach the appropriate care provider.

These results indicate there is still a keen need for healthcare providers to invest in both improving interoperability as well as enhancing infrastructure with systems that facilitate Single Sign-On (SSO) and Role-Based Access Control (RBAC). RBAC ensures that staff access only the information necessary for their roles, protecting sensitive patient data. SSO simplifies the log in process, reducing password fatigue and saving time. Together, these systems create a secure, streamlined environment that supports compliance and improves patient care.

Poor interoperability – which allows computer systems or software to exchange and make use of information – appears as the second highest barrier to adoption of digital health technologies, according to the healthcare professionals we surveyed, coming narrowly behind funding constraints. The ability for a new technology to integrate with patient records across different systems appears as one of the top five most important factors for adopting digital health technologies within an organisation, according to our survey.

Enhanced regulation and use of standards, particularly around interoperability requirements, could play a significant role in overcoming this barrier. Standardisation ensures that different systems and devices adhere to common protocols and formats for seamless data exchange, enhanced compatibility, and reduced integration costs.

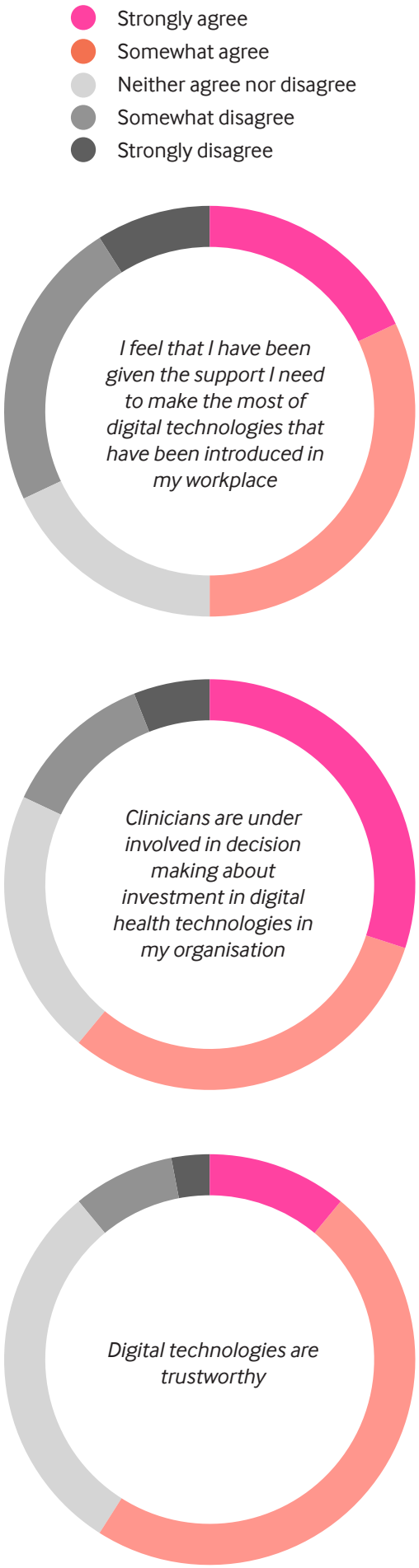
Technology interoperability standards have already been broadly adopted across many safety-critical industries, helping to ensure that systems are compatible, reliable, and safe for use in high-stakes environments. In the automotive industry, for example, ISO 26262 provides guidelines for functional safety of electrical and electronic systems in

vehicles. And in the aviation sector, DO-178C is a standard for software considerations in airborne systems and equipment certification. Governments and regulatory bodies require organisations to follow specific safety standards to ensure public safety. Compliance with such standards is often a legal requirement for certification and market entry.

The healthcare sector is no stranger to interoperability standards and regulatory requirements. This has been a focus for European policymakers for many years and a milestone was reached in March 2025 when the text for the European Health Data Space[8] was published. This regulation introduces a requirement for vendors of EHR systems and software designed to integrate with them to comply with the interoperability requirements to be laid down in the European EHR exchange format.

While progress is being made at a policy-making level to set interoperability standards and requirements, our survey highlights the urgent need for them to come into practice. Healthcare professionals cite a lack of sector-wide standards for implementing and operating digital health technologies among the three largest barriers to health technology implementation in their organisations.

"I like to describe it as we're all singing the same song, but someone's brought the jazz version, and someone's doing a choral version. It's the same song, but totally different hymn sheets. Standardising data and standardising how we do stuff is critical," said an administrative professional interviewed for this report.



Chapter 3

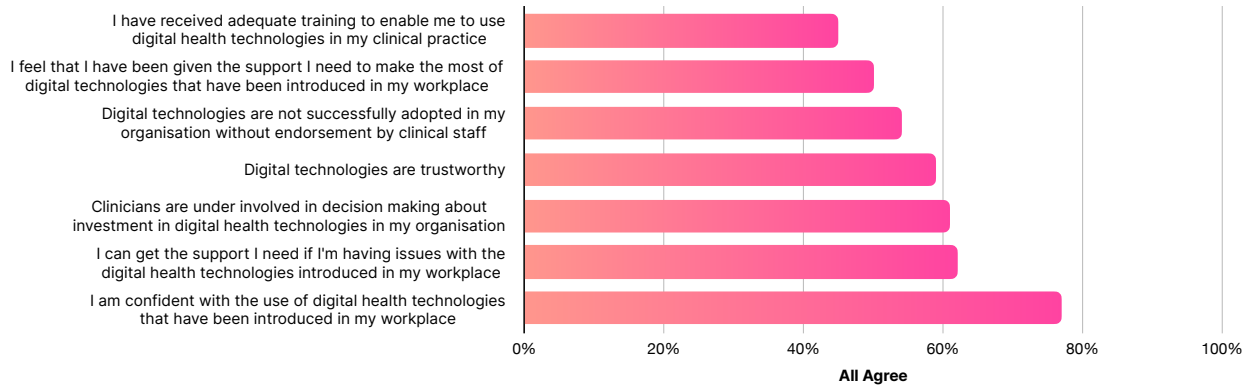
Managing change well builds trust in technology

A significant challenge to building trust in the adoption and scaling of digital technology stems not from the technology itself, but from healthcare professionals who are required to work with it.

"There's always a cultural problem and a human element involved, such as requirements for retraining, repurposing and redeploying people. Despite initial resistance, most drawbacks are manageable by focusing on the people aspects of technology," said an administrative professional interviewed for this report.

Technology is of maximum benefit when users feel confident using it. Yet only half of the healthcare professionals participating in our survey believe that they have been given the support they need to make the most of the digital technologies introduced in their workplace. As cultural shifts appear when new technologies are introduced, our survey highlights the need to invest in two important areas to build trust in the digital transformation of healthcare: training and clinician involvement.

Digital technologies in the workplace



Training

Healthcare professionals believe staff training to be the most important factor in the effective adoption of digital technology within their organisation, according to our survey. Without sufficient training and user skill, knowledge gaps can lead to inefficient technology use, eroding trust when digital tools fail to outperform existing systems or compromise patient care. In such cases, promising innovations struggle for traction and cannot scale.

"Thorough training is an important success factor. It takes time to implement a new technology, not because it is bad, but simply because it takes time to absorb everything," said a clinician interviewed for this report.

Agreement on adequate digital technology training was low among both clinician and non-clinician groups who we surveyed. However, clinician's reported less confidence in the use of technology (45% agreed, 37% disagreed, 18% were undecided) compared to non-clinical healthcare workers (43% agreed, 24% disagreed, 33% were undecided).

Healthcare professionals interviewed for this report stressed that having ongoing training over a prolonged period before deploying new technology is crucial.

"There was a whole year of getting people trained up before we adopted a big system, and then six months before you went for repeat training. There were drop-in sessions where you could book in. And in the first month, a team who would walk the floors of the hospital 24/7 just troubleshooting," said a clinician who we interviewed.

Competent staff serving as 'champions' for peer-to-peer teaching can also help to build trust and drive adoption, according to a clinician, who recalled that "sitting down and using the tech in a dummy session was far more useful than watching hours of videos". These champions demonstrate technology's value to hesitant colleagues through practical examples and outlining technology benefits.

After deployment, ongoing investment in training is essential as the day-to-day realities of a healthcare professional become apparent.

"If you have quite a lot [of training] over a short period of time, you get training fatigue. You start to give up on learning all the details that you probably should have learned, because you have too many concerns in just running [the technology] daily. And if you have the training in, say, March, and you start using it in June, you have forgotten half of what you learned at the training as well," said a clinician.

Where digital health technologies have been effectively adopted within your organisation, to what extent were the following factors important?

Clinician involvement

While training is critical to building trust in technology, it must complement systems that users can navigate intuitively to do their job accurately and efficiently. 'Ease of use' is among the top three most important success factors for adopting digital technology for health professionals, according to our survey. However, those we interviewed believe that this is an area where digital technology falls short.

"It is a mammoth task to get over to a new system. The trouble is that it's not intuitive. These systems are designed to be obstructive to you," said a clinician interviewed for this report.

"I'm reasonably literate," added another. "I can go onto my electronic banking, eBay, Amazon, and Google, and I can find things without having to go on a training course. But a lot of [healthcare technology] systems still to this day are not intuitive. They're not sensible in the way they've been designed, because they have not been designed by the people who use them. They've been cobbled together by IT guys with an idea of how it should look, but it doesn't reflect how clinicians work."said a clinician we interviewed for this report.

The idea that digital health technology is viewed differently by healthcare professionals depending on whether they perform clinical or non-clinical roles can also be seen in our survey. Clinicians are far less likely to agree that the technologies in their workplace enhance patient care co-ordination (by 13 percentage points), reduce workload for clinical staff (by 11 percentage points) and have a positive impact on patient experience (by 15 percentage points).

The concern is that poor user interfaces can create patient safety risks because critical information is not easy for clinicians to find.

"In a system that I depend on, there is a little marker to say the patient has an allergy. When you hover over it, it just says 'patient has allergies', but it doesn't tell you what the allergy is. You've then got to go down another rabbit hole to find out. Things as important as that are not made clear and that's quite key information" said a clinician who we interviewed.

Our survey suggests that involving clinicians more closely in investment decisions, process design, deployment planning and implementation of technologies could help to overcome these hurdles. More than half (54%) of the healthcare professionals surveyed said digital technologies require clinical staff endorsement for adoption in their organisation. Yet nearly two-thirds (61%) report clinicians remain under-involved in digital health technology investment decisions.

Chapter 4

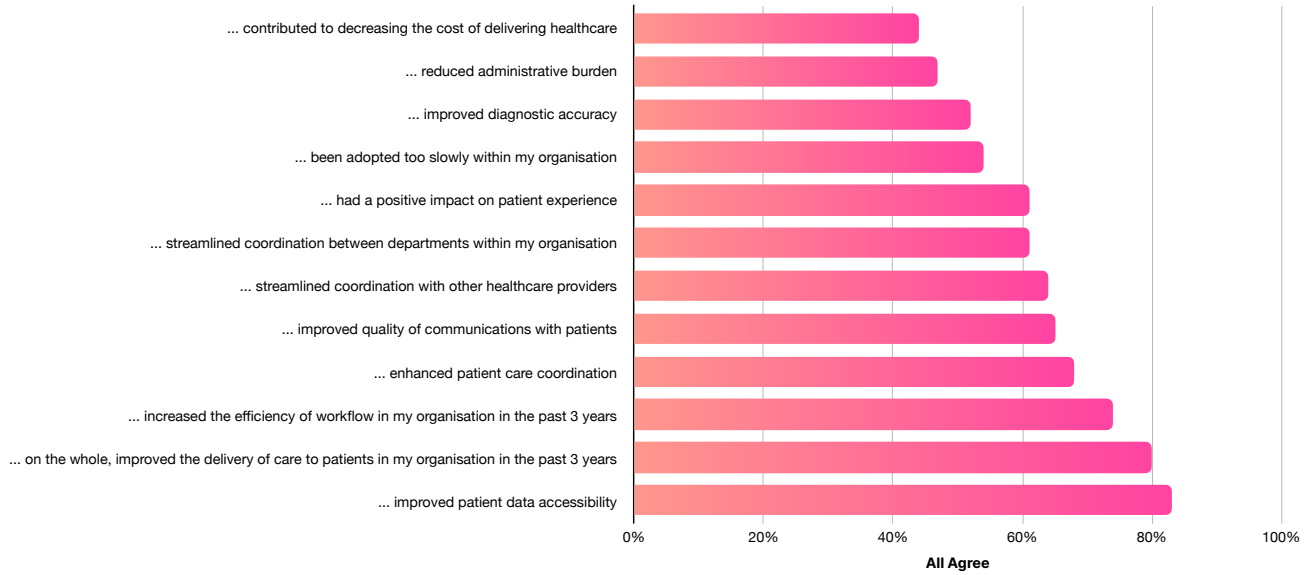
Emergent data risks must be managed to build trust

According to the World Health Organisation, approximately one in every 10 patients in Europe experiences harm in healthcare settings. In primary and ambulatory care, this figure rises to as many as four in 10 patients. It is estimated that at least 50% of this harm could be prevented.

The increasing adoption of digital technology in healthcare introduces new risks to the sector that add to this challenge. Our survey finds that nearly half (47%) of healthcare professionals have experienced patient safety risks arising from the implementation and use of digital health technologies. Many of these risks stem not from the technology itself, but rather the quality and security of data that run through it.

"[Our sector] must pay consideration to issues around information governance and keeping data safe. It absolutely must be done, and that is a barrier to rolling out digital technology. If it went wrong, or if it wasn't done, then there would be a safety concern," said an administrative professional interviewed for this report.

Digital technologies in my workplace have ...



Data quality

Our survey indicates that more focus on information governance is needed to assure the quality and accuracy of data housed in the healthcare sector's digital technologies. Nearly two-thirds (64%) of healthcare professionals think that patient data held within digital health technologies in their organisation is incomplete, and half (49%) need to double check that information provided by digital technologies is correct before acting upon it.

"I have seen instances of incorrect patient letters in our systems, so that the wrong patient identifier was put to the wrong detail. I'm aware of colleagues that certainly made the wrong assumption after an operation was done," said a clinician we interviewed.

The concern is that if healthcare professionals don't trust the quality of data flowing through systems designed by humans, the risk of scaling artificial intelligence in the sector will be too great to accept.

Several of our interviewees were concerned that AI models trained on inaccurate or biased datasets risk perpetuating systemic inequalities. Without careful oversight, the integration of AI into healthcare could magnify existing disparities and create new safety risks.

Data security

Cybersecurity has become one of the fastest-growing risks arising from healthcare's digital transformation. In 2022, healthcare was the sixth most cyber-attacked industry in the world, according to IBM's X-Force Threat Intelligence Index. Just two years later, it shot up the ranking to third place, at a time where the volume of cyber attacks against business and society is gathering pace. Europe saw a 31% rise in cyber attacks in 2024.

Some of the world's highest-profile cyber-attacks targeted healthcare providers in 2024. For example, Guy's and St Thomas' NHS Foundation Trust and King's College Hospital Foundation Trust – two of London's largest healthcare providers – experienced a significant ransomware attack targeting their pathology service provider. It led to the cancellation of more than 800 planned operations and 700 outpatient appointments in the first week following the incident alone, and forced the service provider to destroy most of the 8,000 blood samples it had received since the incident, severely limiting its ability to process blood tests.

Emergent cyber risks are of growing concern to the healthcare professionals we interviewed. "The general concern regarding digital health technology is that someone could hack the system and introduce malicious software," said one clinician. "Cybersecurity is the number one concern [arising from digital technology]. No discussion about it."

Tightening regulations are compelling European healthcare providers to increase investment in cybersecurity. The EU action plan on cybersecurity for hospitals and healthcare providers[9] mandates enhanced risk management, threat detection, and incident response measures, for example. And the NIS2 Directive will impose stricter requirements for data protection, incident reporting, and compliance with cybersecurity standards.

Chapter 5

Recommendations for healthcare providers

Evaluate organisational confidence in EHR systems

Healthcare professionals are more likely to adopt new digital health technologies if they trust electronic health record systems. Invest in assessing where people, process and technology improvements could be made to enhance effectiveness and user experience of your EHR system.

Implement standards that get systems talking to each other

Poor system interoperability can cause significant trust issues with digital technologies among healthcare professionals. European policymakers are at the early stages of developing regulation that will eventually require the implementation of standardised processes that will enable digital systems to talk to each other more effectively. But this doesn't stop healthcare providers from introducing systems and standards that will help today. An example is using good design principles to create single views to present integrated data to healthcare professionals and patients, such as the Danish health portal.

Commit to long-term staff training in digital technologies and improvement methodologies that support implementation

Implement dedicated programmes that allow healthcare workers to absorb information over time through various methods. After deployment, provide one-on-one troubleshooting support. Ensure training targets both clinical and non-clinical professionals to enhance the adoption and effective use of new systems.

Involve clinicians, citizens and patients in technology design and implementation

Closer involvement of clinicians in a healthcare organisation's digital transformation is likely to pay dividends. Leadership positions like Chief Medical/Clinical Informatics Officer (CMIO) can bridge the gap between medical and IT departments, enhance data accuracy, patient safety, and clinical efficiency, and analyse medical data to improve patient care and operational workflows. User experience is a fundamental success factor for technology, so must be in healthcare technology too.

Boost investment in managing emergent risks

Failure to identify and manage data security and quality risks can undermine trust in digital technologies. Assess your organisation's data vulnerabilities, determine an acceptable risk appetite, and implement measures to comply with regulations and manage risks effectively, whether deploying new systems or operating existing technologies.

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Editorial Statement

The survey was conducted by BMJ Group and an expert-led commission board. The results were analysed and summarised by BMJ in the summary document, found in the appendix. This narrative report, based on the summary, and board recommendations, has been formed by DNV and BMJ Group. Please note that this is not an editorially independent BMJ report.

We would like to thank the BMJ DNV Future Health Commission Board for their advice in devising the survey and report.