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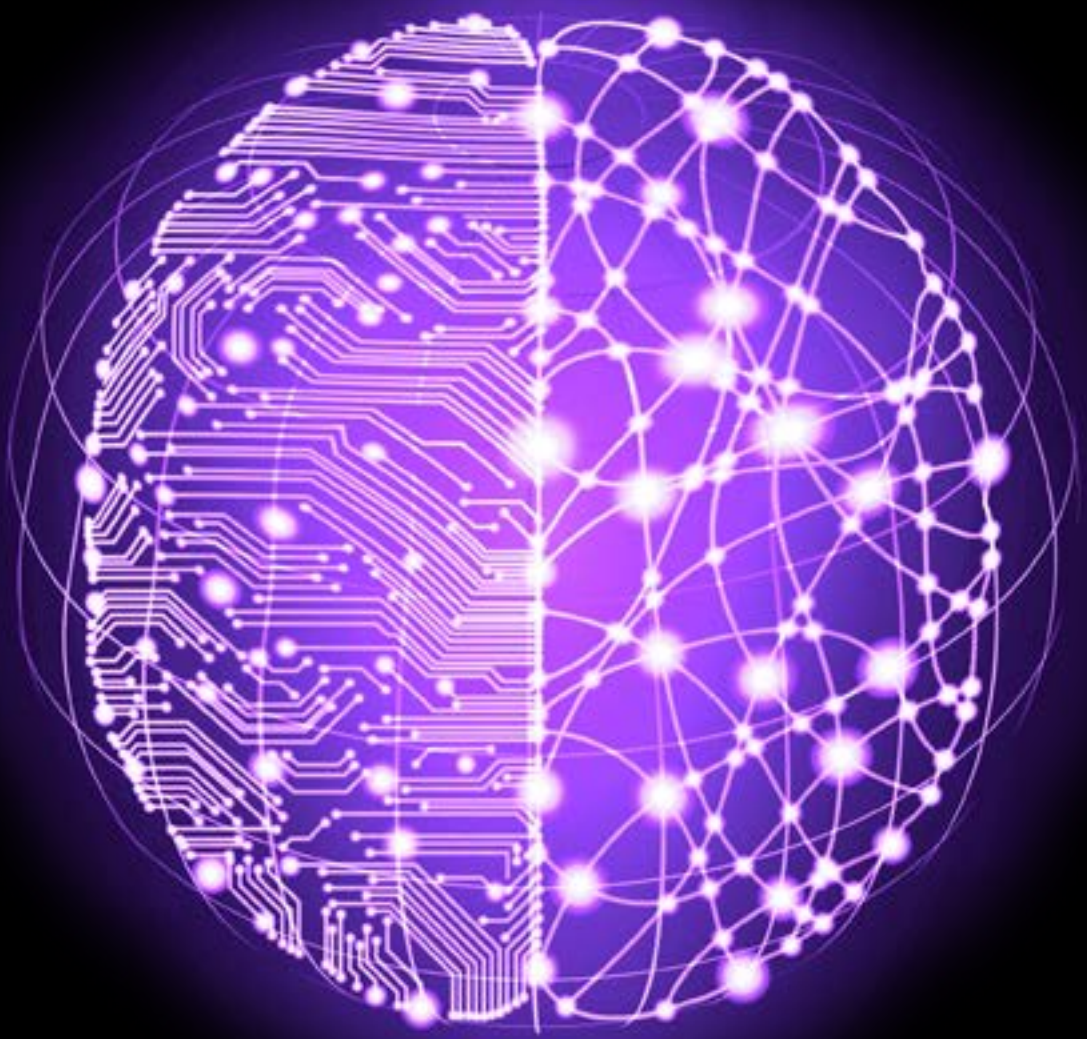

Digital transformation

Shaping the future of European healthcare

September 2020

Deloitte Centre *for* Health Solutions

Contents

Deloitte Centre *for*
Health Solutions

The Deloitte Centre for Health Solutions: Turning evidence into action

We are the research arm of Deloitte's Life Sciences and Health Care practices. Our aim is to be a trusted source of relevant, timely and reliable insights on emerging trends, challenges and solutions. We combine creative thinking, robust research and our industry experience to develop evidence-based perspectives on some of the biggest and most challenging issues to help our clients to transform themselves and, importantly, benefit the patient. At a pivotal and challenging time for the industry, we use our research to encourage collaboration across all stakeholders, from pharmaceuticals and medical innovation, health care management and reform, to the patient and health care consumer.

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Foreword

Welcome to the Deloitte Centre for Health Solutions report: Digital Transformation: Shaping the future of European healthcare. This is the third report in our series of reports looking at the current state of digitalisation across healthcare and role of technology in transforming ways of working and improving the patient and clinician experience. While our first two reports focused on the UK, this report explores the potential for digital transformation to address the current and future challenges facing healthcare systems in Europe.

Across Europe, there is a growing gap between the demand for healthcare and the supply of staff and other resources to meet demand and a realisation that digital transformation is crucial in helping to bridge the gap. While numerous policies to help drive digital transformation have been initiated at both European Commission and individual country level, progress has been slow and the digital maturity of provider organisations varies both within and between countries.

Our research shows that although an increasing number of technology-enabled systems and services are used by healthcare providers, the scale of adoption and the types and capabilities of digital technologies differ widely across Europe. Moreover, citizens are no longer prepared to be passive recipients of care but expect healthcare services to be available when and where needed. While they are prepared to use technologies to access these services and monitor their own health, many also want to own their own data and decide who to share it with. Regrettably, a growing divide in digital health literacy risks exacerbating health inequalities.

Throughout the first half of 2020, the global COVID-19 pandemic has had a significant and unparalleled impact on the health, social and economic condition of every country. For healthcare, the imposition of lockdowns and social distancing has undermined the traditional face-to-face healthcare delivery model in most non-emergency situations. However, this has led to a rapid acceleration in the adoption of digital solutions, especially the use of telehealth, such as virtual consultations and remote patient monitoring.

It is crucial that clinicians and patients trust and have confidence in using digital health technologies, and that no one is excluded, especially given the growing role that technology will play in the future of healthcare. As a next step, leaders across the health system will need to agree how innovation is funded, decide which technologies are most effective, and establish a robust IT infrastructure that provides safe, secure and equitable access to both the technology and the data generated. This is particularly important if healthcare is to have a sustainable future and become truly predictive, preventive, personalised and participatory.

As always we welcome your feedback.

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Executive summary

Digital healthcare solutions, if designed purposefully and implemented in a cost-effective way, have the potential to reduce health inequalities and increase the well-being of millions of citizens by changing radically the way in which health and care services are delivered to patients. To date, the pace and scale of digital transformation in Europe has varied both within and between countries. Key challenges are the complex structures of healthcare systems, different funding models, and multiple stakeholders with differing views and expectations.

While the COVID-19 pandemic has disrupted healthcare and caused radical shifts in delivery models, it has also accelerated the pace of digitalisation by at least a decade. This digital transformation will be pivotal in shaping the future of healthcare.

Rationale for digital transformation

Healthcare systems across Europe face unprecedented pressure. While the quantity and quality of care has improved, the scale and complexity of healthcare needs have grown due to larger and ageing populations, rising multi-morbidity, and public expectations of more personalised and convenient services. While the European Union expects all citizens to have access to high quality healthcare at an affordable cost, countries differ in their capacity to deliver services (such as the number of doctors, nurses and beds per head of population) and in the proportion of GDP spent on healthcare. Many clinicians are struggling to cope with increasing workloads, and the gap between the supply of resources and the demand for healthcare is widening.

Most countries are looking to digital transformation to close this gap but progress has been slow, and the digital maturity of providers, both within and between countries, varies widely. Digital technologies can integrate care, identify and reduce risks, predict and help manage population health needs, and improve the quality of data flow to deliver timely, efficient and safe care. However, digital transformation is not simply about technology. It is about change management enabled by technologies to help increase the efficiency and effectiveness of service delivery and the benefits to patients and clinicians.

Over the past decade numerous European Commission (EC) policies, directives, regulations and funding programmes have emerged to support the digitalisation of healthcare systems. Specifically, in April 2018, the European Commission (EC) published a definitive communication that included a comprehensive overview of previous actions taken to promote the digitalisation of health and a number of commitments to drive digital transformation further.

The EC noted that the uptake of digital solutions 'remained slow and varied greatly across member states'. It identified health data as a key enabler for digital transformation but emphasised that it was still under-developed and that market fragmentation and lack of interoperability were impeding an integrated approach to disease prevention, care and cure. Its commitments included the development of EU-wide data quality and security standards and giving patients access to their own interoperable electronic health record (EHR).

While individual European countries have taken their own policy initiatives to provide patients with a more seamless, integrated and digitally-enabled experience of care, the reality is that the digital maturity of providers and the experience of staff and patients vary widely (both within and between countries).

Current state of digitalisation and actions taken to close the digital gap

Our primary research included a survey of 1,800 clinicians and interviews with over 40 stakeholders across seven countries (Denmark, Germany, Italy, the Netherlands, Norway, Portugal and the UK). When asked about the current state of digitalisation in their country, the most frequently mentioned negative words were 'Slow, Complex and Bureaucratic'; the three most frequently mentioned positive words were 'Fast, Innovative and Efficient'. Moreover the top three challenges faced by clinicians were bureaucracy in healthcare (57.2 per cent), the cost of technologies (50.3 per cent) and finding the right technologies (49.0 per cent). While the responses were broadly similar across the seven countries, training staff to use technology was highlighted as a challenge by clinicians in Italy and Portugal and sharing patient data by those in the Netherlands.

Indeed, over a quarter of clinicians receive no formal training in the use of digital technologies: this is most pronounced among general practice doctors and clinicians in Italy and Portugal. This highlights a need for improvements in digital training, education and support strategies.

We found that usage of the main types of digital health technologies varies widely: the most commonly-used are EHRs, ranging from 97 per cent in the Netherlands to 74 per cent in Portugal, and e-prescribing, ranging from 97 per cent in the Netherlands to 13 per cent in Germany. However next-generation technologies such as robotics, genomics and artificial intelligence (AI) are used only in pockets of European healthcare systems; for example, 14 per cent of Danish clinicians say they use genomics data to support care compared to just one per cent of Dutch clinicians.

We identified the following five actions to help close the digital gap:

- implement accessible open EHRs and invest in basic digital technologies that accelerate digitalisation
- adopt interoperability standards underpinned by transparent consent processes and robust privacy and security arrangements
- create a robust health IT infrastructure that includes connectivity safe data storage and consented access to health data and data sharing
- establish a robust governance framework to support a culture of digital transformation, including training of staff and support of patient engagement
- develop digital leadership skills and improve the digital literacy of staff and patients.

Improving the experience of digital health

Increasing numbers of citizens across Europe are no longer prepared to be passive recipients of care: instead they expect to be able to access care quickly and easily when it suits them, and to have choices based on trusted advice and reliable information. They also wish to own their own healthcare data and decide who to share it with and for what purposes. However, patients have access to their health data in only a few countries in Europe (Denmark, Estonia, Finland, France, Iceland, Norway, Scotland, Sweden and, recently, England)

There is growing use in Europe of digital technologies to access healthcare including using the internet to search for health information, book appointments, have virtual health consultations, and use digital technologies to manage their health remotely. Moreover, many more individuals are embracing technology to track and maintain their health and engage with

Digital transformation | Shaping the future of European healthcare

treatment, and are willing to share healthcare data if they see it as a value exchange. Nevertheless, the use of digital technologies varies across Europe. Deloitte's Global Healthcare Consumer Survey found that 27 per cent of Danish respondents had made a virtual visit to a doctor/clinician in 2019, compared to just 13 per cent of those in Germany.

Organisations such as the WHO and the EC are attempting to improve the digital skills of citizens in order to support the wider deployment of digital health technologies. However a significant number of people lack digital skills and /or have problems with accessibility and connectivity. Many people are also unaware of how digital technologies could help them manage their own health, how health data is used, or that they can access their own records. Age, education status, income levels, and rurality affect digital health literacy, and those who would benefit most are least likely to be able to use digital tools effectively. Tackling the gap in digital health literacy should be a key priority for all countries.

COVID-19 and an acceleration in the adoption of SMART technologies

Since the WHO's declaration of a pandemic in March 2020, billions of citizens and millions of healthcare staff across the world have seen their services and lives disrupted, and more than three-quarters of a million people have died. Health systems had little time to prepare but rapidly reorganised their services to meet the acute needs of patients with COVID-19, whilst also maintaining routine care for people requiring new or ongoing support, and also managing social distancing and reducing face-to-face appointments and footfall in care settings. Many staff had to be trained to work in new ways and in unfamiliar teams, while attempting to reduce the risk of cross-infection in the absence of any known treatments.

The response has been an unprecedented change management programme implemented in weeks that would otherwise have taken years. Stakeholders across the health system have rapidly formed collaborations to develop much needed medical technology and treatments, and produce personal protective equipment in sufficient quantities.

The take-up of digital health technologies has accelerated during the ongoing COVID-19 pandemic. Some 65 per cent of the clinicians we surveyed said their organisation had increased its adoption of digital technologies to support their ways of working and as a way of providing access to patients. Among primary care clinicians, around three-quarters reported that their organisation had increased digital adoption; this probably reflects the fact that most providers see telehealth and virtual visits as a crucial way of maintaining services for those who need them. Adoption of technology to change ways of working was highest in Norway (83.6 per cent of clinicians) and lowest in Germany (39.6 per cent).

For all European healthcare systems, working in new ways has been a crucial part of the response. Healthcare providers now have the opportunity to capitalise on these changes and identify which technologies will help them to build long-term resilience. We believe that the most effective technologies in helping healthcare systems to recover are those that are straightforward and easy to use, measurable, agile, reliant on collaboration, and tailored to end-users' needs ('SMART') — especially if they are interoperable and can be delivered at scale.

A sustainable future for healthcare in Europe

The COVID-19 pandemic has accelerated the pace of digitalisation of some aspects of healthcare by at least a decade but in other areas action is still needed to embed and sustain technology adoption. A legacy of the pandemic is likely to be new relationship paradigms based on collaboration, 'goodwill' and heightened levels of trust. Attitudes to care have changed and boundaries that have been in place for a long time have been removed, creating the opportunity for new healthcare behaviours and more effective collaboration among stakeholders, with new combinations of services offered by incumbents and new entrants (disruptors).

A sustainable, efficient and cost-effective future for health also requires a population health management (PHM) approach with an emphasis on prevention, reducing health inequalities and improving the health and wellbeing of the population. This requires robust interoperable data, analytics and insights about defined populations, across multiple care settings, to identify healthcare needs and align services accordingly. PHM also requires a new approach to funding based on value based outcomes. Through digital transformation and the adoption of technologies at scale, the health system can realise a future that is predictive, preventive, personalised and participatory.

About this report

While our research focusses on the healthcare systems of seven European countries, representing a diverse mix of health care delivery and funding models, and differences in the size and nature of the population and the availability of healthcare resources (see Figure 1); our findings have implications for all countries.

Our methodology comprises:

- Extensive literature reviews to understand the policies and practices driving digital transformation.
- A survey of some 1,800 clinicians (doctors and nurses) working across primary and secondary care in Denmark, Germany, Italy, the Netherlands, Norway, Portugal and the UK, which was conducted on our behalf by M3 Global Research.
- A series of semi-structured interviews with stakeholders in each of the selected countries to help understand the challenges they faced and identify examples of good practice.
- Discussions with Deloitte colleagues working across the selected countries to obtain their insights on the challenges their clients face in digitalising their healthcare systems (see Appendix 1 for more details).

The report has five parts:

Part 1 examines the pressures facing healthcare systems across Europe and the systems and policies driving digital transformation to help systems respond.

Part 2 considers the challenges faced by provider and payer organisations in closing the digital gap.

Part 3 evaluates the potential for digital technologies to improve accessibility and outcomes for citizens.

Part 4 examines how digital transformation has helped healthcare respond given the indiscriminate spread of the novel coronavirus and the need for social distancing and to isolate vulnerable populations.

Part 5 considers what this means for the future of healthcare.

Key facts about the countries covered in this report

Figure 1. Key facts on European countries covered in the report

European Union (EU)*

- 513,471,676
- 81.0 / 63.6
- 8.5%* / $4,096*
- 5.0 (2018)
- 2.0* (2017)
- 4.6* (2017)

Denmark

- 5,818,553
- 81 / 60.9
- 10.0% / $5,568
- 2.6 (2019)
- 3.1 (2018)
- 7.2 (2018)
- 5.4 (2018)

Germany

- 83,132,799
- 81 / 65.8
- 11.7% / $6,646
- 8.0 (2017)
- 2.4 (2017)
- 5.6 (2017)
- 8.9 (2017)

Italy

- 60,297,396
- 83.4 / 66.8
- 8.7% / $3,649
- 3.1 (2018)
- 2.2 (2018)
- 4.4 (2018)
- 7.9 (2018)

Netherlands

- 17,332,850
- 81.9 / 59.2
- 10.0% / $5,765
- 3.2 (2018)
- 1.3 (2018)
- 4.5 (2018)
- 4.5 (2018)

Norway

- 5,347,896
- 82.8 / 70.4
- 10.5% / $6,647
- 3.5 (2018)
- 2.7 (2019)
- 9.2 (2019)
- 5.3 (2019)

Portugal

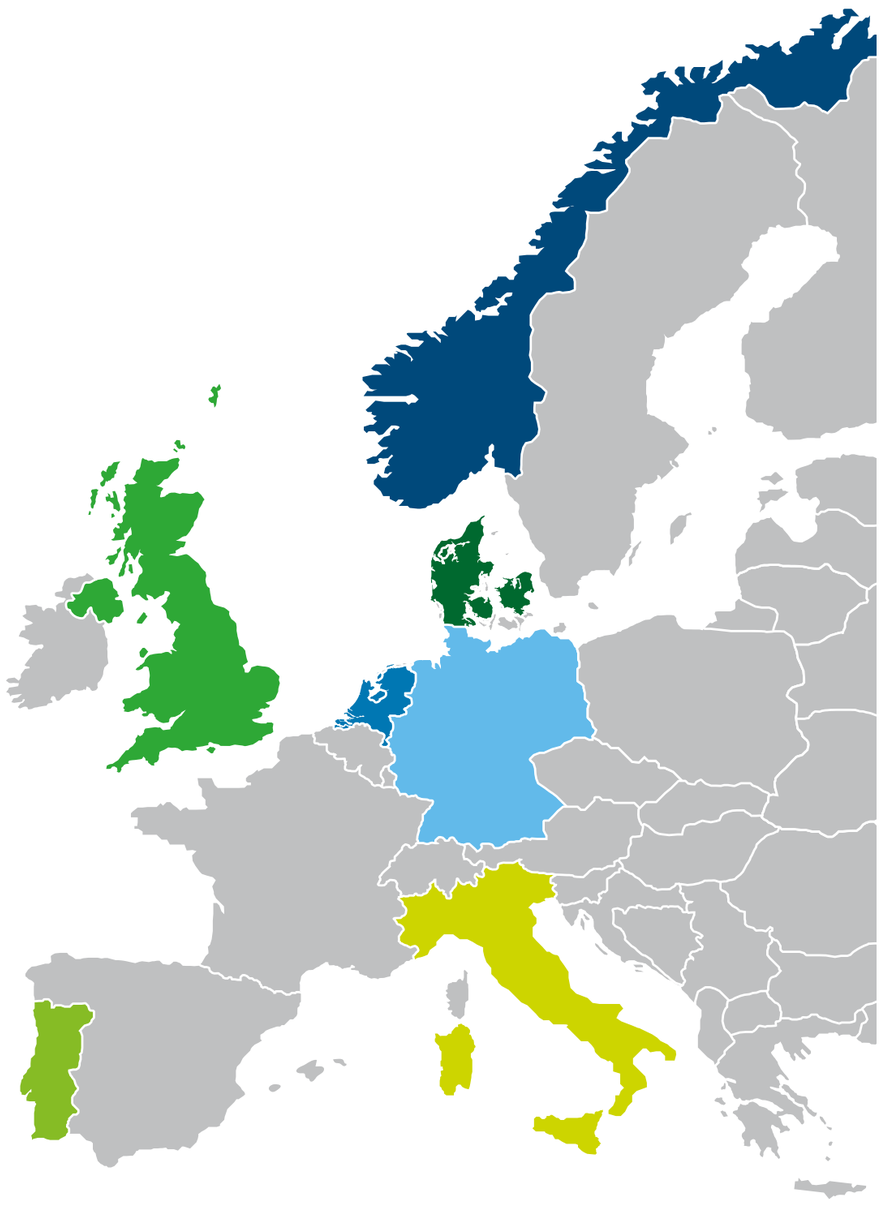
- 10,269,417
- 81.5 / 58.6
- 9.6% / $3,379
- 3.5 (2018)
- 2.6 (2018)
- 4.2 (2018)
- 7.9 (2018)

UK

- 66,834,405
- 81.3 / 61.2
- 10.3% / $4,653
- 2.5 (2019)
- 2.2 (2019)
- 6.3 (2019)
- 6.6 (2018)

Key

- Population (2019)
- Life expectancy at birth (2018) / Healthy life years at birth (2018)
- Percentage GDP on health care (2019)/ Expenditure on health care per capita (current prices, PPP, $USD) (2019)
- Number of hospital beds, per 1,000 population
- Number of medical doctors working in hospitals, per 1,000 population
- Number of nurses and midwives working in hospitals, per 1,000 population
- Average length of inpatient stay in hospitals (days)



Note: *EU correspondence to EU-28;
Bulgaria, Croatia, Cyprus, Malta, and Romania are excluded from 'percentage GDP on health care (2019)/ expenditure on health care per capita (current prices, PPP, $USD) (2019)' due to comparable data not being available. Finland, Luxembourg, Slovakia and Sweden are excluded from 'number of medical doctors working in hospitals, per 1,000 population and number of nurses and midwives working in hospitals, per 1,000 population' due to comparable data not being available.
Source: OECD, Eurostat, The World Bank 2020.

Part 1

The drivers of digital transformation in healthcare

Healthcare systems across Europe are facing unprecedented pressure. While the quantity and quality of care has improved, the scale and complexity of healthcare needs have grown, together with public expectations of more personalised and convenient services. At the same time staff and other resources have become increasingly constrained and the gap between supply and demand has grown. Most countries are looking to digital transformation to close this gap but progress has been slow and the digital maturity of providers, both within and between countries, varies widely.

The increasing pressure facing healthcare systems across Europe

Healthcare systems in Europe are complex and diverse, with countries differing in how they organise and fund their services, and in the extent and types of care that are publicly provided. Barriers to access include waiting times and travelling distance, as well as socio-economic and cultural factors.

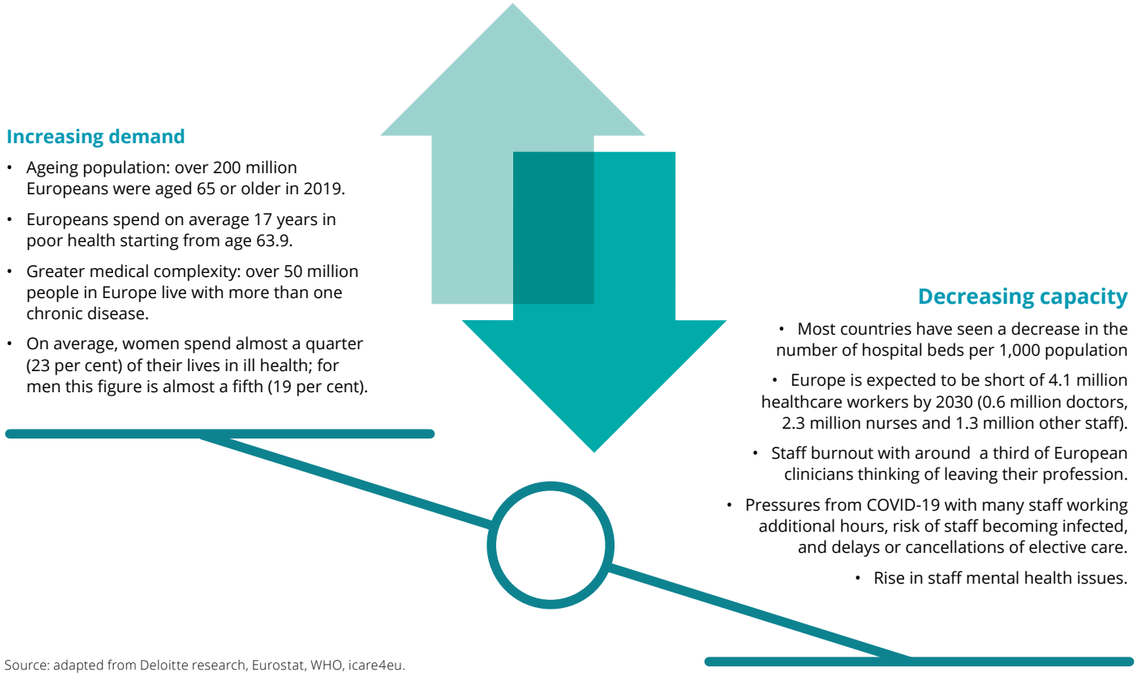
The European Union (EU) expects all its citizens to have universal access to high quality healthcare at an affordable cost. However, countries differ in their capacity to deliver services (such as the number of doctors, nurses and beds per head of population) and in the proportion of GDP spent on health (see Figure 1).[1,2] In 2019, average health spending, as a proportion of GDP across European countries, was around 8.8 per cent. This figure has remained largely stable since 2009, with growth in line with overall economic growth.[3]

Health spending as a percentage of GDP is now projected to continue to increase, driven by a combination of tight fiscal constraints, demographic pressures and technological advances. During the COVID-19 pandemic public spending on healthcare has increased markedly while the overall GDP has contracted (GDP across the EU fell from -3.1 per cent in first quarter to -12.1 in second quarter of 2020).[4] Healthcare's share of GDP is therefore likely to rise quite sharply.[5] The level of healthcare spending is likely to come under increasing scrutiny and major reforms will likely be needed to safeguard the contribution of health systems to population health.[6]

While life expectancy has improved in all countries over the past decades; an increasing proportion of people over 65 are experiencing a reduction in healthy life years and an escalation in healthcare needs due to co-morbidities and chronic illnesses.[7] These needs, together with the costs of developing and maintaining the health infrastructure and investing in new medical technologies and breakthrough therapies, have placed increasing financial pressures on healthcare systems, with many countries struggling to contain them.[8]

Health and care provision is also highly labour-intensive, more than in many other sectors of society, and the contribution of clinicians to the provision of health services is crucial. Some 70 per cent of healthcare budgets are spent on staff pay.[9] Rising labour costs and staff shortages constrain the ability of health systems to meet their population's healthcare needs. Nineteen EU countries report difficulties with the supply of a sufficient healthcare workforce, with problems in recruitment, retention, geographical distribution, and the skills balance of the workforce (see Figure 2).[10,11]

Figure 2. European healthcare systems face increasing demands and decreasing capacity



Source: adapted from Deloitte research, Eurostat, WHO, icare4eu.

More specifically, the demand for nursing staff in European countries is growing.[12] Job vacancies in some of the countries that are the focus of this report are increasing (for example in the UK, the Netherlands and Germany). Furthermore, Denmark, Norway, Italy, Portugal and the UK face growing shortages of doctors due to ageing of the workforce and difficulties recruiting in rural and remote locations (see the individual country profiles).

Even before the challenges that have arisen as a result of the COVID-19 pandemic, clinicians were facing unrelenting workloads, stress and burnout.

For example, our 2017 report *Time to Care, Securing a future for the hospital workforce in Europe,* which included a survey of 1,364 clinicians working in hospitals across 11 countries, found that the majority of doctors in eight out of the 11 countries said that their workload had become more difficult to manage compared to five years before, and the majority of nurses in 10 out of the 11 countries held the same view. Around half of all doctors and nurses indicated that workload pressures were having a negative effect on their mental and physical health, and nearly a third (32 per cent) were thinking of leaving their profession.[13]

The rationale for digital transformation of healthcare

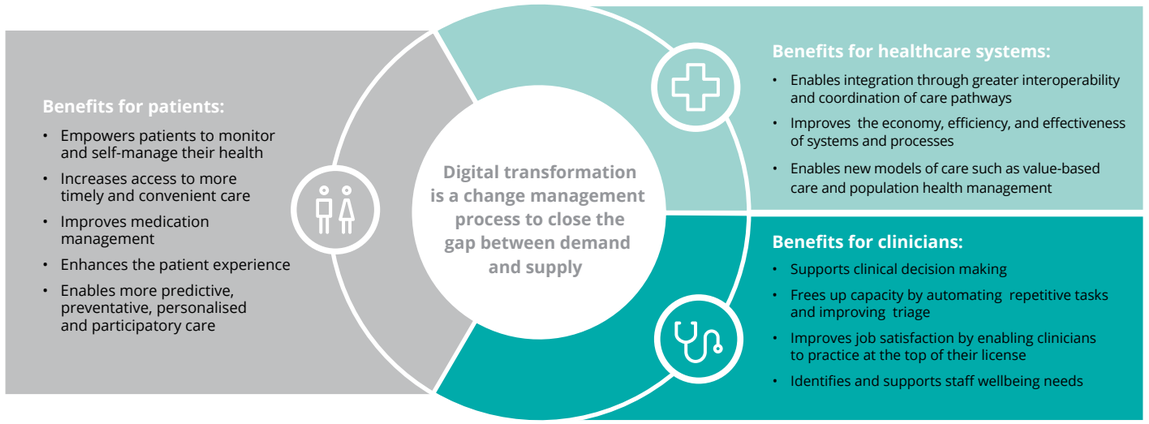
In most countries the COVID-19 pandemic has exacerbated these workforce pressures. Hospitals had to reorganise their services in the shortest of time frames, and many staff had to work in new ways, in unfamiliar teams. Moreover, the absence of suitable treatments and the risks and fear of contracting the virus have increased both physical and mental health pressures, impacting the capacity of the workforce still further.[14]

Over the past decade, healthcare has been shaped by the emergence of a growing number of life-extending and life-enhancing therapies and medical technologies, leading to improvements in health outcomes but also increasing costs. The pace and scale of innovation have accelerated with the development of health technologies such as digital medicine (health apps, wearables, implantables and digital diagnostics), genomics, robotics and artificial intelligence (AI) (including machine learning). While healthcare has historically lagged other industries in the adoption of digital technologies, innovations such as telehealth and remote patient monitoring have led some providers and payers to rethink their healthcare delivery models.

The medical technology industry has been driving healthcare innovation through deploying advances in wireless technology, miniaturisation and computing power, to develop medical devices that can collect, analyse and transmit large amounts of health data. These devices and data, combined with IT systems and software, connectivity technologies and health systems and services to create the Internet of Medical Things (IoMT). The IoMT is now accelerating digital transformation of healthcare using a range of technologies aimed at diagnosing, monitoring, treating and managing patients more effectively.[15]

However, digital transformation is not simply about technology. It is about adopting a change management process enabled by technologies to increase the benefits for patients, clinicians and healthcare systems as a whole (see Figure 3). In 2018, the European digital healthcare market was valued at an estimated USD 30 billion and it is expected to exceed USD 172.6 billion by 2025.[16] Globally, the digital healthcare market is expected to grow from an estimated USD 147 billion in 2019 to USD 234.5 billion in 2023.[17]

Figure 3. The benefits of digital transformation

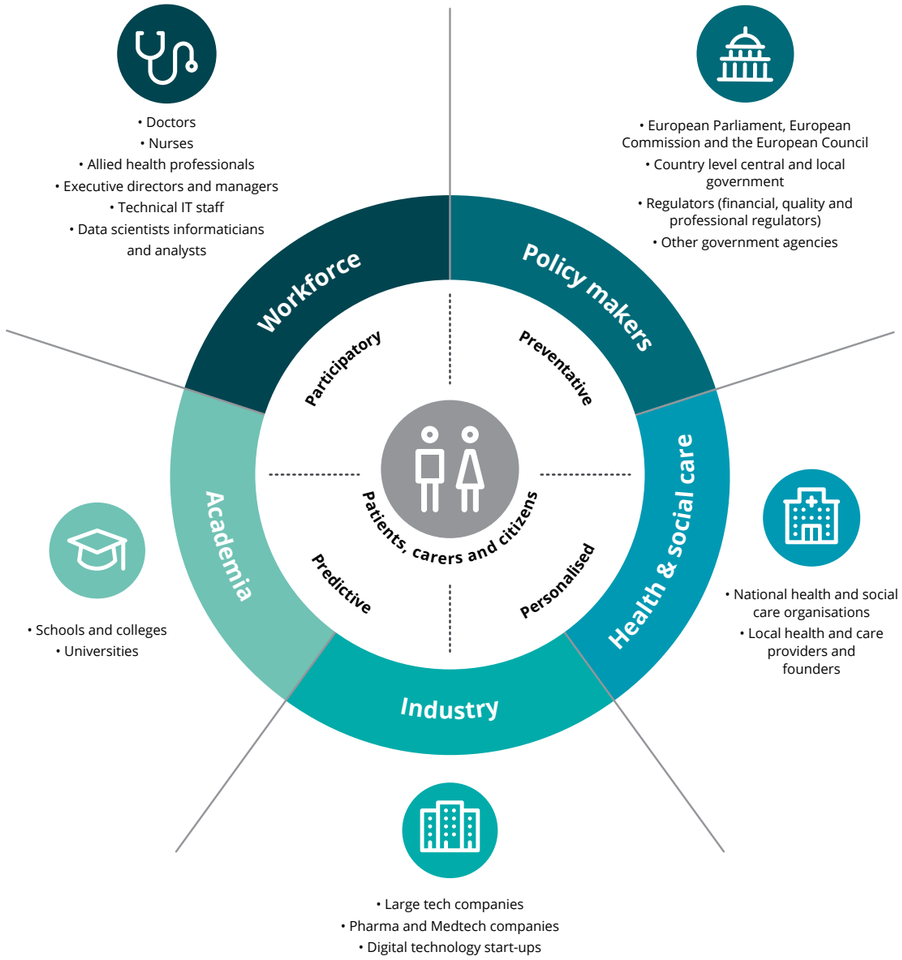


Source: Deloitte research and analysis, 2020.

European and country level policies driving the digital transformation of healthcare

While health IT systems and infrastructure in Europe have been evolving for more than forty years, the levels of digital maturity vary between and within countries. Digital transformation of healthcare involves multiple stakeholders with different interests (see Figure 4). Moreover, there is a growing recognition, at global, regional and individual country level of the importance of digital transformation in tackling many of the gaps between supply and demand.

Figure 4. Stakeholders involved in the digital transformation of healthcare



Source: Deloitte LLP

The European Commission's evolving policy and funding to support digital transformation.

Over the past decade numerous European Commission (EC) policies, directives, regulations and funding programmes have emerged to support digitalisation of healthcare systems.18 Specifically, in April 2018, the European Commission (EC) published 'Communication to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: on enabling the digital transformation of health and care in the Digital Single Market; empowering citizens and building a healthier society'. This provided a comprehensive overview of previous actions taken to drive the digitalisation of health (including directives and regulations), but noted that the uptake of digital solutions 'remained slow and varied greatly across Member States and regions'. In identifying health data as a key enabler for digital transformation, it emphasised that the use of patient-centred health data was still under-developed across the EU. Moreover, market fragmentation and lack of interoperability were standing in the way of an integrated approach to disease prevention, care and cure, to meet people's needs more effectively.[19]

The EC made a number of commitments to drive digital transformation further, namely:

- The development of EU-wide standards for data quality, reliability and cybersecurity giving citizens secure access to a comprehensive electronic record of their personal health data
- EU-wide standardisation of electronic health records (EHRs)
- Better interoperability through open exchange formats.[20]

The EC also highlighted the need to take account of emerging technologies such as blockchain, innovative identity management and certification mechanisms, in line with the General Data Protection Regulation (GDPR) provisions.[21] Specific programmes underlying the drive for digital transformation across the EU include:

- Horizon 2020, launched by the EC in June 2012, providing funding of €80 billion (2012-2020) to support the development of research and innovative solutions in digital health and care, including harnessing patient data in order to improve the management of complex chronic conditions.[22] About 1,100 digital health projects have been funded since its inception.[23]
- Recommendation on a European Electronic Health Record exchange format (February 2019), to facilitate the cross-border interoperability of EHRs within the EU.[24]
- Horizon Europe, the successor to Horizon 2020, launched on 1 January 2020 as a new €100 billion research and innovation programme (2021-2027). Horizon Europe aims to unlock the potential of new tools, technologies and digital solutions and ensure access to innovative, sustainable and high-quality healthcare in the EU.[25]

The EC has also developed a number of policies and laws that underpin digital transformation. Examples include:

- The GDPR (2018) establishes the rights of citizens to access all their personal data, including health data, and provides the legal framework for the protection and processing of personal data.[26]
- The 2019 Cybersecurity Act strengthened the ability of the EU's Agency for Network and Information Security (ENISA) to help member states address cybersecurity threats and establish an EU-wide cybersecurity certification framework.[27]
- The new Medical Devices Regulation (MDR) is intended to enforce stricter clinical evaluation processes, and the safety, classification and performance of medical devices as a requirement to market them in the EU. Originally due to come into force in May 2020, this regulation has been postponed by one year due to COVID-19.[28]

In its next long-term budget, the EC plans to allocate funds strategically to drive digital transformation, including investing in innovation from blue-sky research and driving the roll-out of Horizon Europe's proposed €100 billion funding and the Digital Europe Programme (€9.2 billion). Investment will be in five key sectors: high performance computing, AI, cybersecurity and trust, advanced digital skills, and ensuring the wide use and deployment of digital technologies across the economy and society.[29]

In line with these EC initiatives, the governments and leading health authorities of all European countries have implemented their own plans for driving the adoption of digital technologies in healthcare. The digital health policies and programmes of the specific countries covered by this report are detailed in Appendix 1.

Evaluating the digital maturity of individual healthcare systems in Europe

Assessing the progress of digital transformation is difficult given the numerous technologies and areas in which transformation is taking place across the healthcare system. Various digital maturity assessment models exist, but there is not yet a single comprehensive framework or approach to evaluating the impact of digital transformation. Some individual countries and independent organisations, however, have developed digital maturity assessment models, largely focused on hospitals.

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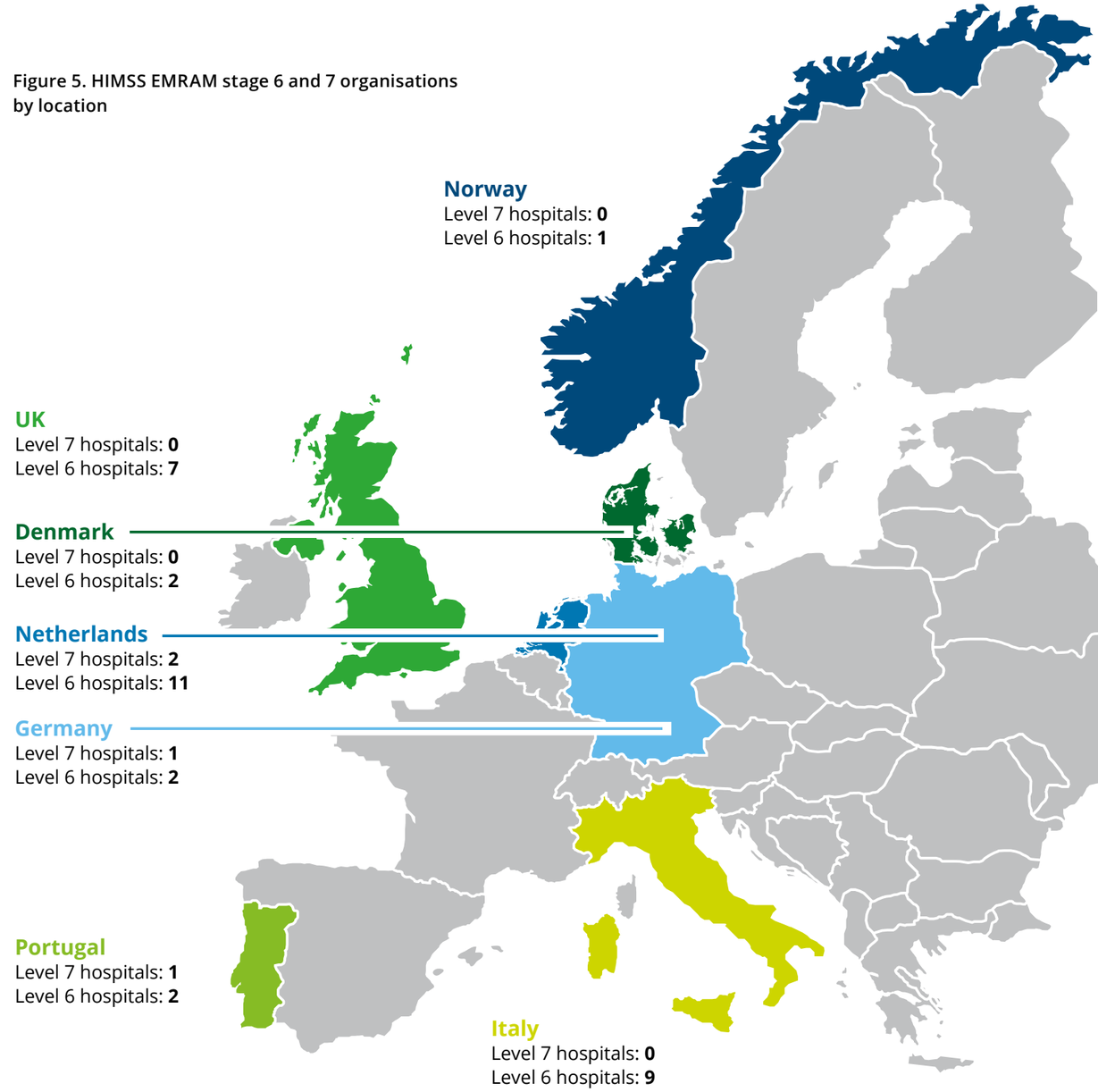
Figure 5. HIMSS EMRAM stage 6 and 7 organisations by location



Source: adapted from HIMSS Analytics, 2020

For example, our 2019 report *Closing the digital gap: Shaping the future of UK healthcare* highlighted the requirement for all NHS hospitals in England to undertake a digital maturity self-assessment (DMA) in 2016 and in 2018 across three themes: readiness, capabilities and infrastructure.[30] The aim was to understand the strengths and weaknesses of hospitals in utilising technologies to drive the digitalisation of the health service. Our analysis found that overall the digital maturity of hospitals had improved (readiness from 73 to 76, capabilities from 40 to 48, and enabling infrastructure from 68 to 75). However, there was also clear evidence of a growing digital maturity gap between hospitals, which in 2018 ranged from a high of 93 to a low of 18. Similar variations exist in other countries, such as Germany and Italy, but in others such as Denmark and the Netherlands the digital maturity of providers has evolved more evenly (see Country profiles, Appendix 2). Nevertheless, existing variations create a challenge to ensure equity of service provision.

Independent assessments of digital maturity of hospitals across Europe

The Healthcare Information and Management System Society (HIMSS) is an example of a digital maturity model. Since 2005 HIMSS has conducted an independent assessment of the digital maturity of hospitals using the Electronic Medical Record Adoption Model (EMRAM).[31] HIMSS standards are developed from international processes and practices. The assessment ratings range from Stage 0 (very limited digitalisation) to Stage 7. EMRAM Stage 7 signifies the achievement of a paperless environment, but its ultimate value is in measuring EMR capabilities and impact on systems, and patients.

The HIMSS EMRAM score is an independent assessment that relies on a request from each healthcare provider and consequently the number of assessment carried out can vary substantially from country to country. In our Closing the digital gap report, we noted that HIMSS had assessed the digital maturity of around 1,449 hospitals in Europe. Since then, HIMSS has assessed a further 2,800 hospitals. As at April 2020, there were six Stage 7 hospitals and 34 Stage 6 hospitals in the seven countries included in our survey (see Figure 5).[32]

Acceleration of adoption of telehealth solutions across Europe

The majority of stakeholders now acknowledge there are benefits in virtual healthcare delivery, or 'telehealth', especially as a solution to help manage the immense problems of aging, rising healthcare costs, and the burden of non-communicable diseases. However, healthcare providers cite the lack of incentives to promote widespread adoption, including funding, interoperability, regulatory and cultural issues.

According to a survey of 800 US clinicians (62.5 per cent primary care clinicians and 37.5 per cent hospital specialists), conducted by M3 Global Research in late 2018, telehealth adoption had increased more than three-fold over the previous four years (from five per cent of physicians reporting using video visits in 2015 to 22 per cent in 2018).[33] Among those who had used the technology, 93 per cent said they believed that telehealth improved patients' access to care and 77 per cent said that it allowed both parties to use their time more efficiently. The highest rates of telehealth interest was among specialists whose disciplines often face burnout, including 91 per cent of urologists, 89 per cent rate emergency medicine practitioners, 83 per cent of infectious disease specialists and a 75 percent rate among neurologists.

However, a more recent HIMSS eHealth Trendbarometer survey on the state on telehealth adoption among 27 countries across Europe, conducted between January and February 2020, found that despite the broad availability of existing telehealth facilities, their use has largely been limited to administrative purposes, such as meetings, training and staff education, rather than clinical care. Its application for clinical purposes is increasing, but from a low base.[34] For example Tele-ICUs have been used increasingly to provide remote access to critical care in locations where specialists are not available and also to monitor patients with chronic conditions, particularly elderly patients, in their own homes.

Since March 2020, the COVID-19 pandemic has led to an acceleration in the adoption of digital technologies, especially the use of telehealth. Telehealth has become an important way of providing primary care and outpatient consultations, as it allows for both social distancing and also rapid diagnosis of infection and other health problems. The unprecedented adoption of technology has been driven by targeted financial incentives and emergency regulatory changes.

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The COVID-19 pandemic has led to an acceleration in the adoption of digital technologies.

Part 2

Current state of digitalisation and actions to close the digital gap

The policies, legislation and funding programmes described in Part 1 demonstrate the ambition of governments and leaders across Europe to drive digital transformation to improve the sustainability of healthcare. However, our primary research, including our survey of clinicians and interviews with stakeholders, shows that the benefits from digital transformation adoption vary widely. Clinicians also need to adapt to the fact that patients are becoming better informed and more demanding than in the past.

Perspectives of our survey of clinicians on digital transformation

The pace of technological change and the numbers and types of digital health technologies available in the market have made it challenging for organisations and clinicians to understand which technologies to invest in. From late March to early April 2020, we launched a survey to assess the use of digital technologies across seven European countries. Its aim was to understand the views of frontline clinicians (nurses and doctors) working across primary and secondary care about the challenges they face and the benefits they are seeing from technology adoption. Given that the COVID-19 pandemic was spreading across Europe we included two questions to assess the pandemic's impact on the adoption of technology.

Responses to the survey (1,781) identified the top three challenges they faced as: bureaucracy in healthcare (57.4 per cent), the cost of technologies (50.3 per cent) and finding the right technologies (49.0 per cent) (see Figure 6). While the responses were broadly similar across the seven countries, the top three challenges among clinicians in Italy and Portugal included training staff to use technology, and in the Netherlands, sharing patient data.

Asked about the current state of digitalisation in their country, the most frequently mentioned negative words were 'Slow, Complex and Bureaucracy'; the three most frequently mentioned positive words were 'Fast, Innovative and Efficient' (see Figure 7). The responses in 2020 were generally more positive that the responses to our UK survey in 2019.[35]

Figure 6. The top three challenges facing organisations in implementing digital technologies?

Europe

1. **Bureaucracy in healthcare (57.4%)**
2. **Cost of technology (50.3%)**
3. **Finding the right technologies (49.0%)**
4. Training staff to adequately use technology (35.8%)
5. Complexity of technology (28.9%)
6. Challenges in sharing patient data (27.7%)
7. Convincing staff of the benefits of technology (20.5%)
8. Scaling up the use cases of technologies (16.1%)
9. Existence of evidence of outcomes (12.5%)

Note: Multiple choice question; percentage represent proportion respondents selecting particular option

By country

Denmark :
1. Finding the right technologies (61.4%)
2. Bureaucracy in healthcare (50.7%)
3. Cost of technology (47.1%)

Germany :
1. Bureaucracy in healthcare (61.3%)
2. Cost of technology (56.8%)
3. Finding the right technologies (41.8%)

Italy :
1. Bureaucracy in healthcare (63.6%)
2. **Training staff to use technology (46.6%)**
3. Cost of technology (41.9%)

Norway:
1. Finding the right technologies (61.4%)
2. Bureaucracy in healthcare (51.4%)
3. Cost of technology (42.1%)

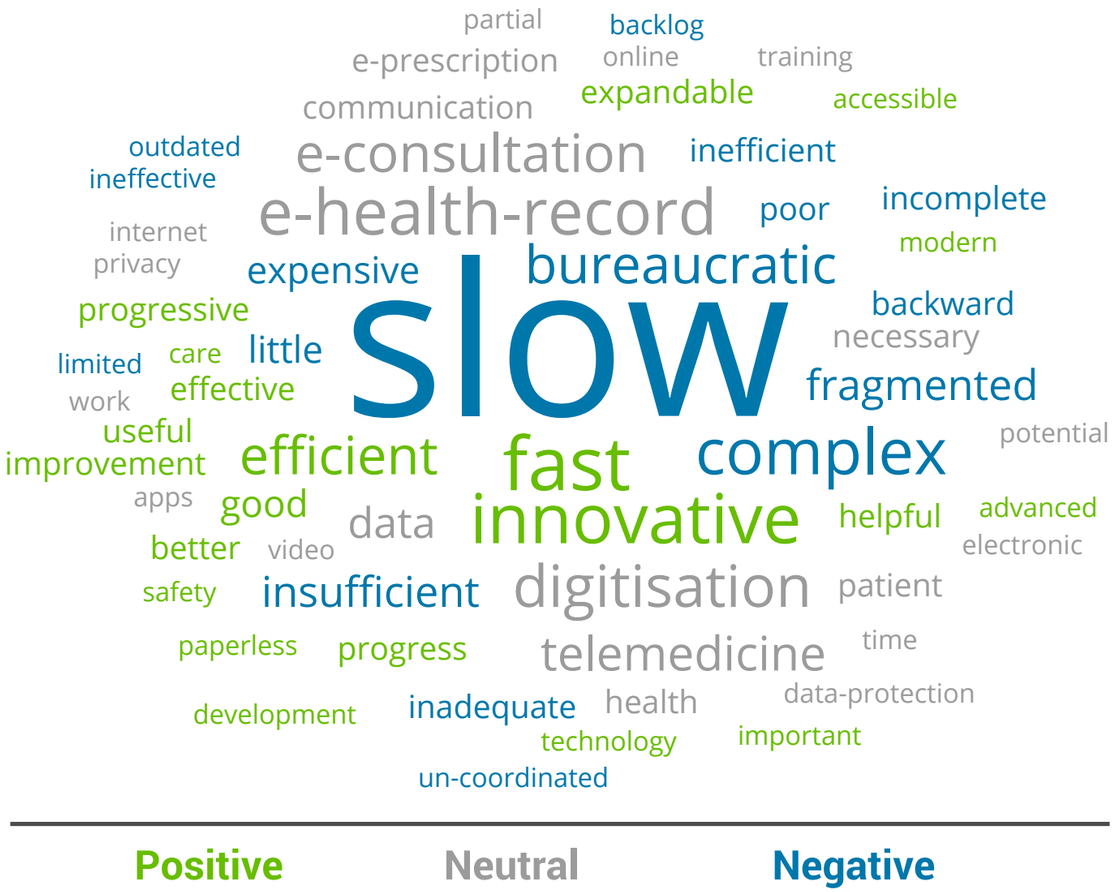
Portugal:
1. Bureaucracy in healthcare (66.7%)
2. Finding the right technologies (62.0%)
3. **Training staff to use technology (44.0%)**

Netherlands :
1. Finding the right technologies (56.7%)
2. Bureaucracy in health care (44.7%)
   Cost of technology (44.7%)
3. **Challenges in sharing patient data (44.0%)**

UK:
1. Cost of technology (61.0%)
2. Bureaucracy in healthcare (53.3%)
3. Finding the right technologies (48.3%)

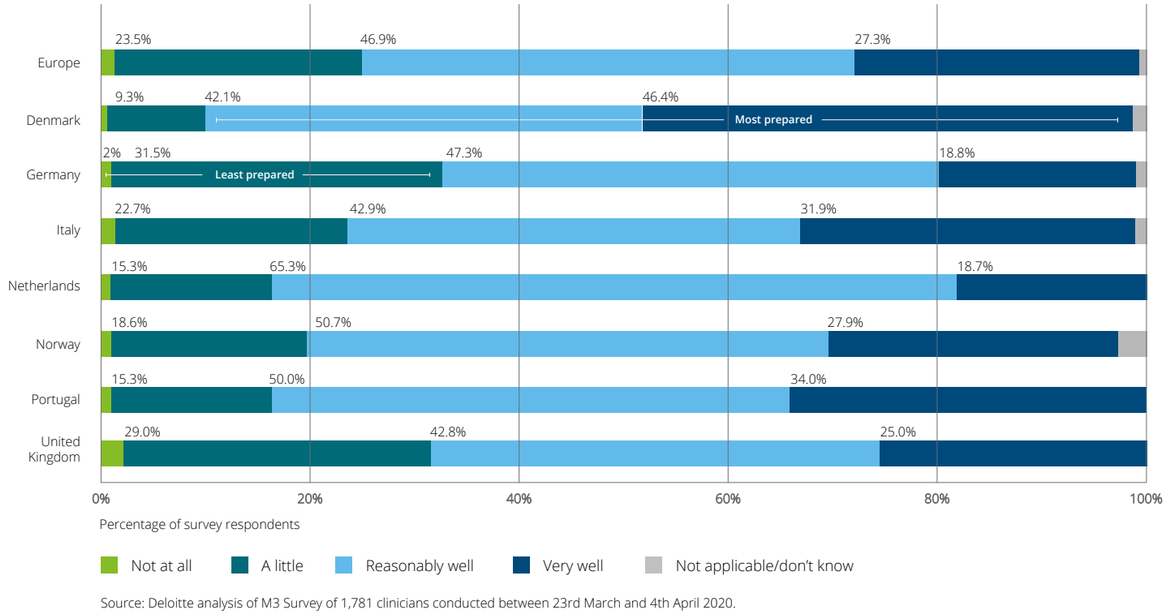
Source: Deloitte analysis of M3 Survey of 1,781 clinicians conducted between 23rd March and 4th April 2020
Survey question: What are the top 3 challenges your organisation is currently facing in implementing digital technology?

Figure 7. The top three words that come to mind when thinking of the countries progress towards digital transformation



Source: Deloitte analysis of M3 Survey of 1,781 clinicians conducted between 23rd March and 4th April 202
Survey question: Thinking about your country's healthcare system, what three words come to mind when you think of the progress in digital transformation that has been made to date?

Figure 8. How well prepared is your organisation for the adoption of digital technologies?



Source: Deloitte analysis of M3 Survey of 1,781 clinicians conducted between 23rd March and 4th April 2020.

Furthermore, a majority of clinicians across Europe said that their organisation is 'very well' or 'reasonably well prepared' to adopt digital technologies, with Denmark being the most prepared and Germany the least (see Figure 8). When analysing responses by profession, nurses and GPs were largely positive about their organisation, but 29.8 per cent of secondary care doctors stated that their organisations are 'not at all' or 'only a little' prepared for the adoption of digital technologies. Similarly, when analysing responses by age groups, clinicians under 35 were less positive about progress. This mirrors the findings in Philips' Future Health Index 2020, a global survey that explores the expectations of younger healthcare professionals around the use of technology, training and job satisfaction and the reality of their experience as clinicians.

Respondents to the Phillips survey reported serious concerns about the administrative demands that deflect them from their core duties, and frustration about what they perceived as the slow pace of technological change. [36]

There is wide variation between countries in the adoption of the different types of digital technologies

Our survey presented clinicians with a list of digital health technologies, to understand which they used the most and the extent to which the technology helped them improve their efficiency and the quality of care. In line with our 2019 research in the UK, the most frequently used technologies across the EU were EHRs used by 81 per cent of respondents and e-prescribing, used by 62 per cent (see Figure 9).[37] However, there were some notable variations both between and within countries. In the Netherlands 97 per cent of clinicians reported using EHRs, while in Italy the percentage was only 69 per cent; and Germany stands out as having the lowest levels of e-prescribing with low use of on-line booking arrangements in Norway. Overall clinicians in the Netherlands, Denmark, Norway and the UK reported higher adoption of digital technologies.

Figure 9. Variations in the percentage of clinicians using the different types of digital technologies

	Europe	Denmark	Germany	Italy	Netherlands	Norway	Portugal	UK
Electronic health record	81%	95%	77%	69%	97%	89%	74%	87%
Prescribing	62%	73%	13%	67%	97%	86%	96%	69%
Online appointment booking	54%	61%	38%	53%	67%	41%	66%	62%
Apps for Clinicians	51%	54%	44%	53%	70%	40%	55%	52%
Online access platforms/tools (for primary or hospital care)	46%	50%	23%	47%	49%	51%	68%	57%
Telemedicine	43%	61%	30%	38%	59%	40%	45%	47%
Rostering	37%	29%	52%	14%	46%	39%	23%	49%
Automation of pharmacies/ drug dispensing	30%	38%	23%	25%	62%	34%	13%	35%
Point of care diagnostics	26%	24%	31%	10%	43%	35%	9%	37%
Patients Apps/Wearables	22%	26%	21%	18%	35%	15%	17%	26%
Remote vital sign monitoring	22%	24%	22%	21%	24%	20%	13%	25%
Automation of other clinical tasks	19%	26%	25%	9%	28%	15%	12%	22%
Voice recognition tools	16%	16%	26%	8%	10%	26%	1%	20%
Robotics	8%	8%	13%	8%	5%	6%	3%	8%
Genomics data (storing or using)	8%	14%	11%	6%	1%	5%	3%	10%
Radio Frequency Identification tags (RFID)	6%	3%	8%	3%	3%	2%	5%	9%
Artificial Intelligence technologies	5%	7%	7%	5%	5%	6%	2%	5%
Virtual reality	5%	4%	4%	5%	5%	5%	0%	7%

Percentage of survey respondents

Note: Data arranged by Europe values from largest to smallest. Question: Which of the following digital technologies do you use to support care delivery?
Source: Deloitte analysis of M3 Survey of 1,781 clinicians conducted between 23rd March and 4th April 2020Survey question: Which of the following digital technologies do you use to support care delivery?

Adoption of telemedicine solutions is highest in Denmark and the Netherlands (see Case study 1), and although the use of innovative digital tools such as robotics, genomics, AI and virtual reality is much less common, there are some notable exceptions. For example, genomics data is used by 14 per cent of Danish clinicians (followed by Germany and the UK), reflecting national innovation policies and priorities. The Netherlands has the lowest use of genomics, reflecting legal restrictions on use of data, but had the highest use of patient apps and wearables and automation of clinical tasks (35 per cent and 28 per cent respectively).

Automation such as care robots and medical robotics were also used by a higher percentage of clinicians in Germany where robotically assisted surgery is the next step in traditional keyhole laparoscopic surgery (in use for the past 25 years or so). In robotic surgery a camera with light source and miniaturised instruments are inserted into the abdominal cavity through small skin incisions (as in traditional laparoscopy), but the tools are electronically controlled by the surgeon, improving the accuracy of the operation and the speed of patient recovery.[38,39,40] At the time of the survey the least used tools were virtual reality and AI but this is changing (see Part 5).

Case Study 1

Remote telemonitoring using the Luscii app - The Netherlands

Luscii was founded in 2018, and uses a mobile app to help prevent unnecessary hospital visits and admissions for vulnerable patients by increasing access to clinical support and the improving the patient experience.[41] Luscii is now active in seven countries and has secured worldwide partnerships with Apple and Omron. Fifty per cent of Dutch hospitals are using Luscii and it has extended its services internationally (Ireland, Sweden, UK, Netherlands as well as some African countries). The platform handled up to 15 million virtual care interactions between June and January 2020.[42]

Patients use the smartphone app to input their vital signs data (blood pressure, heart rate, ECG, emotion, pain, weight, blood glucose levels and also input to clinical questionnaires). These data are input directly into Luscii's eHealth platform, an in-house developed Clinical Engine which applies AI algorithms to inform clinicians when patient's conditions are deteriorating and need attention. Doctors and nurses access the data from the Luscii app directly from their EMRs.

Patients use the Luscii app to:

- track their health condition from home
- access information on how to cope with their diseases (using in-app multimedia e-learning modules)
- communicate 24/7 with their care professionals via integrated video chat and/or messaging.

Luscii is used for a variety of conditions including COPD, heart failure, hypertension, pain, complicated pregnancy, oncology and glaucoma. Luscii provides 'Luscii Specials' to hospitals to help establish digital care pathways to transform the patient experience and prevent hospitalisation. Prescribed by doctors or nurses, Luscii is fully reimbursed by most insurers and health services.[43]

Quantified outcomes include:

- 65 per cent reduction in hospital admissions for chronic heart failure[44]
- 51 per cent reduction in hospital costs for COPD[45]
- 78 per cent reduction in hospital admissions for gestational hypertension[46]
- a Net Promotor Score of 60 and 4.6 out of 5 star rating by patients.[47]

In early 2020, in response to the COVID-19 pandemic, Luscii provided medical guidance on corona symptoms with up to 190,000 daily users in the Netherlands alone (becoming the country's number one downloaded app).[48]

Clinicians' use of health apps and online access platforms is also fairly extensive (averaging 51 and 46 per cent respectively), although in Germany there is a relatively low use of online access platforms (23 per cent), due largely to strict application of GDPR. In Portugal, which has the highest use of on-line platforms and tools in hospitals, Deloitte has developed a real-time clinical management information system, known as 'ePatient', which allows hospital doctors, nurses, social assistants and administrators to access patient information quickly across multiple systems (see Case study 2).

Overall, our survey respondents reported that the technologies they use the most are also the ones that they rate highest in improving efficiency and patient care, with uncertainty about the benefits of a technology correlating with the extent and familiarity of use. Importantly, more than 80 per cent of clinicians reported they trust technologies and the data they produce to improve clinical care 'reasonably well' or 'very well'. Positive scores were higher by about eight per cent among younger clinicians.

Case Study 2

The ePatient system for centralised and real-time patient data management – Portugal

The ePatient is an advanced patient management system, supporting real-time in-patient monitoring and communication between clinicians, as well as supporting hospital-at-home case management (telehealth). It comprises a digital platform and interactive monitor which displays centralised and real-time patient data collected automatically from different hospital systems, an app for clinicians, and an app for patients.

Clinicians can input information into the app which interacts with the monitor, adding crucial features to improve the services provided. In addition, an app integrated into the hospital bed enables patients to communicate remotely with their care team and request assistance. ePatient can also connect to different peripheral smart devices, enabling integrated vital sign monitoring. Patient data is centralised and analysed using AI to help improve the quality of services provided. The system can be customised and is available in multiple languages.

Using ePatient, clinicians can:

- access over 300 indicators of real-time patient data such as heart rate and temperature
- customise the relevant indicators displayed on the monitor
- create patient notes
- signal patients for discussion at shift handover
- capture photos and descriptions (e.g. to document burn healing) and share with care team
- access imaging scans and patient test results.

With ePatient, patients can:

- request different types of assistance (e.g. request food and drinks, assistance going to the bathroom), create alerts on the monitoring screen, and communicate with clinicians
- self-report symptoms such as pain using a pain scale

Benefits for the system

- More than 20 per cent reduction in the average hospitalisation time

Benefits for clinicians

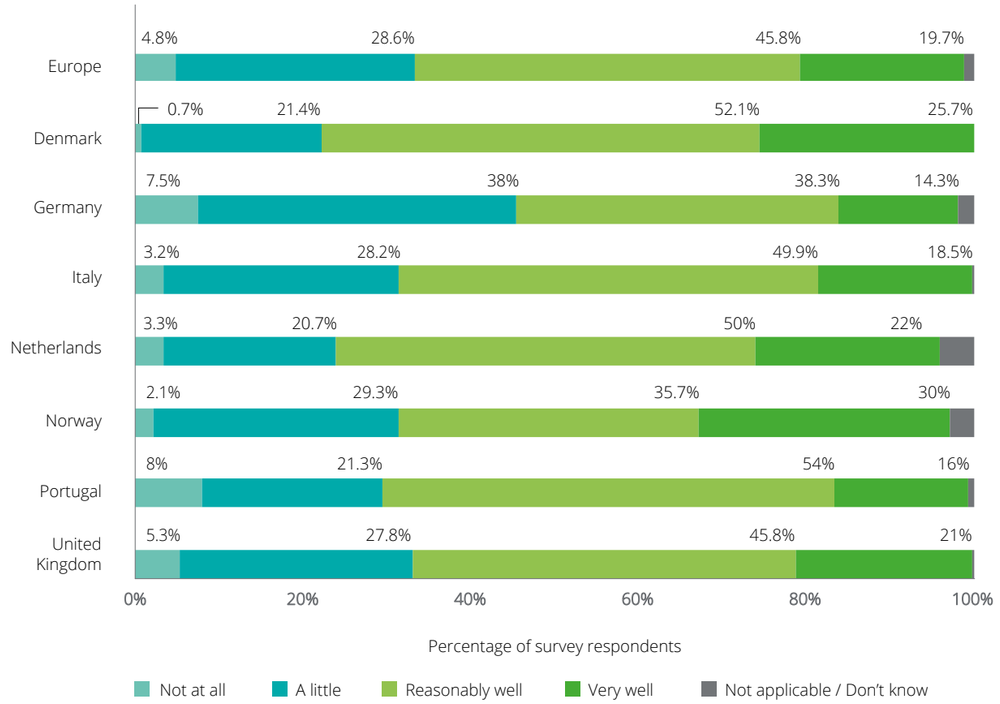
- More than 75 per cent reduction in the average shift handover time.[49]

There is a need for more digital health training, education and support

Generally European clinicians reported feeling reasonably or well supported by their organisations in using digital technologies (see Figure 10). Those in Denmark felt the most supported (76.8 per cent) followed by the Netherlands. Clinicians in Germany felt the least supported (45.5 per cent). Our survey results and interviews with stakeholders show that a lack of staff training in using digital technologies is a barrier to progress in digital transformation.

A higher percentage of Dutch clinicians felt the most satisfied with the training provided (63.3 per cent) with clinicians in Italy and Portugal were the least satisfied (41.4 and 39.4 per cent respectively). In Portugal 47.3 per cent of clinicians said they do not receive any formal training in digital technologies (see Figure 11).

Figure 10. How well supported do you feel by your organisation in using digital technologies?



Source: Deloitte analysis of M3 Survey of 1,781 clinicians conducted between 23rd March and 4th April 2020.

Figure 11. What training, if any, does your organisation provide to enable you to use technology?

By country	Europe	Denmark	Germany	Italy	Netherlands	Norway	Portugal	UK
Online training manuals and courses	44.8%	48.6%	29.5%	37.9%	55.3%	54.3%	30.7%	63.5%
Continuous support to use technology	37.3%	35.0%	36.0%	36.9%	36.7%	37.9%	22.0%	45.5%
One off training workshops	37.4%	25.7%	48.5%	27.9%	37.3%	42.1%	22.7%	43.8%
No formal training	25.5%	33.6%	22.5%	27.7%	20.0%	22.9%	47.3%	18.5%
Other	1.1%	2.1%	1.0%	0.7%	1.3%	1.4%	1.3%	0.8%
Don't know / cannot say	5.0%	2.1%	11.3%	5.2%	4.0%	2.9%	3.3%	1.3%

By role	General practic doctor	Specialist or secondary care doctor or surgeon	Nurses
Online training manuals and courses	34.5%	49.5%	54.4%
Continuous support to use technology	33.7%	36.1%	47.5%
One off training workshops	26.4%	41.4%	50.3%
No formal training	35.2%	21.4%	15.6%
Other	1.2%	0.8%	1.6%
Don't know / cannot say	7.8%	3.9%	1.9%

Percentage of survey respondents

The methods used to deliver training differed between countries. Online training manuals and courses were more likely to be used they received sufficient training and were satisfied with the level of training, such as in the Netherlands and Denmark (see Case study 3).

Source: Deloitte research and analysis based on survey commissioned from M3, 2020.

Case Study 3

Area9, tackling clinician skills shortages using tailored learning platform - Denmark

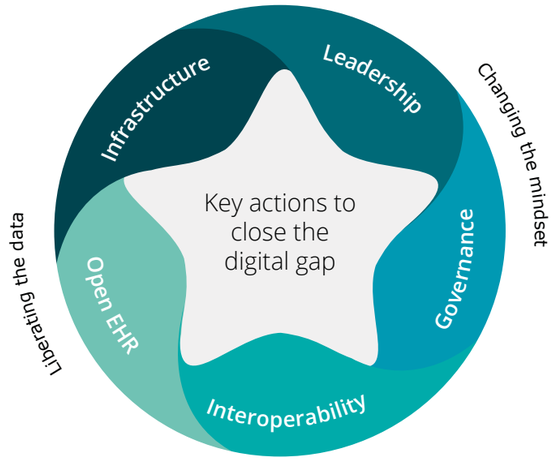
Area9 is a group of Danish companies that, based on research into human factors, learning and product development that have developed an AI-based adaptive learning platform. To address the gap in clinician skills, Area9 partnered with the New England Journal of Medicine (NJEM) Group to create the first-of-its-kind medical education platform with smart technology that adapts to clinicians' learning goals, pace and knowledge gaps to deliver customised information and training. This solution was aimed at making the learning progressive and engaging. The platform uses research-proven methods to accelerate proficiency, continuously sharpen skills and promote true life-long learning. NEJM Knowledge+, built on Area9's adaptive learning platform, provides a customised experience for physicians and residents while providing important insights for programme directors. It assists physicians with their board preparation and continuing medical education experience.
A preliminary evaluation study found an association between use of NEJM Knowledge+ and passing the ABIM initial certification exam.

In recognition of the shortages of experienced, skilled nurses in Denmark, Area9 Lyceum and its partner, Thieme, a global supplier of high-quality content and information for nurses, are developing NURSEED, a four-year program to implement 21st century nursing education to improve skills and knowledge, to help improve nurse retention. The NURSEED project began in March 2020 and will run to February 2024. The first major objective is to integrate the Area9 Rhapsode™ adaptive learning platform into the Absalon University College and nursing education programme in partnership with Danish Technical University. In the next phase, the nursing curriculum will be revamped with a blended learning approach combining personalised computer-based adaptive learning to improve each student's knowledge and skills, followed by in-classroom teaching and skills workshops. Instead of assuming or predicting where learners will struggle or where they will need reinforcement, Area9 Rhapsode™ adapts to the learner, providing additional resources and support where needed. NURSEED's goal is to improve overall competency among nursing graduates using customised content to build their skills and reduce drop-out rates.[50]

Key steps to close the digital gap

Based on our research for our UK Closing the digital gap: *Shaping the future of UK healthcare* report, and developed further during our research for the European study, we identified two overarching themes (changing the mind-set and liberating the data) and five actions needed to help deliver digital transformation at scale (see Figure 12).

Figure 12. Key actions to close the digital gap



Source: Deloitte research and analysis, 2020

Our findings show that these actions are crucial to accelerate digital transformation. Moreover that these actions are the same, for all countries:

- **Infrastructure:** create a robust health IT infrastructure that includes connectivity (Wi-Fi, fibre optic, broadband, etc), safe data storage and consented access to health data and data sharing. 5G technology with its low latency, low power and low costs could provide a strong foundation for innovations that enable interplay between sensors, algorithms and smart devices and support telehealth more effectively.
- **Open EHRs:** implement accessible and integrated EHR systems and invest in the basic digital technologies that accelerate digitalisation.
- **Interoperability:** Address the challenge of interoperability through development of shared local or national records with a single patient identifier and transparent consent processes, and embrace secure, cloud technology, placing critical IT infrastructure in virtual off-site data centres underpinned by agreed interoperability standards, for example, Health Level-7 (HL7), Fast Healthcare Interoperability Resources (FHIR).
- **Governance:** Establish a robust governance framework to support change management and a culture of digital transformation, including clarity over data ownership, cyber security, patient consent and patient education; establishing the security, safety and ethical use of digital solutions and a code of conduct for data-driven healthcare.
- **Leadership:** Develop digital leadership skills and improve the digital literacy of staff and patients.[51]

While the EC identified similar steps as priorities for action with specific commitments in its 2018 communication on 'enabling the digital transformation of health and care in the Digital Single Market; empowering citizens and building a healthier society' (see Part 1), our findings suggest that progress is still too slow and fragmented and much more needs to be done to realise the EC's ambitions.[52] In particular, a modern IT infrastructure needs to provide shared access to real-time patient health data and efficient deployment of digital technologies across primary and secondary care, at the right time, in the right place and by the right people. Moreover, interoperability between and across health care systems is needed if an integrated approach to disease prevention, care and cure, tailored to people's needs, is to become a reality. Improving interoperability can also address shortages of clinicians in radiology and pathology services, helping improve critical diagnostic services (see Case study 4).

The implementation of accessible and open EHRs is a crucial step for all countries. While most hospitals have largely digitised their patient records, health and care data is still stored in various locations; and in secondary care there are big differences in the electronic records used within and between hospitals, and these are rarely interoperable with primary care records. In the UK the 'Summary Care Records' initiative has enabled a minimum level of information from GP medical records to be seen by authorised staff in other areas of the health and care system. Importantly, emphasis needs to continue to be applied to the fact that digital transformation is not simply about having the right technology and infrastructure but requires a total change management approach to enable clinicians to work differently.

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Case study 4

How Dedalus is improving clinical care and saving money by streamlining anatomical pathology and integrating services across five hospitals - Italy

Founded in Florence in 1982, Dedalus Group is the leading healthcare and diagnostic software provider in Europe and one of the largest in the world. DIAP, a functionality offered by the Dedalus Group, is a pathology consortium between the University of Bologna and the St. Orsola University Hospital, the largest hospital in Italy and five other local hospitals in the province of Bologna. This pathology consortium replaced ten disparate laboratories (lab), by one central technician-preparation lab with remote clinicians delivering specialist diagnoses. The Bologna DIAP network of labs is quickly becoming a fully digital interoperable anatomical pathology service.

Like many surgical pathology services, Bologna was faced with disparate specialty expertise and different operating standards leading to duplication of efforts across their multiple hospitals, and declining number of pathologists nationally. Therefore to improve patient outcomes and operational efficiency, Dedalus commenced the rationalisation of anatomical pathology processes and locations in 2016. The process review resulted in an agreement to standardise to one single 'Laboratory Information System' across all sites and to amalgamate all the technician-led, slide production procedures onto a single site in a large purpose-built lab which opened in 2020.

Key benefits include:

- consolidation of the equipment supply chain for all labs
- cost savings due to single supply chain sourcing of equipment
- reduction in clinical errors and improved patient safety
- more accurate specimen, procedure and results tracking
- optimised workload planning
- effective use of specialist clinicians with remote collaboration minimising impact of increasing skills shortage.[53]

Digital transformation | Shaping the future of European healthcare

Part 3

Improving citizens' experience of digital health

Increasing numbers of citizens across Europe are no longer prepared to be passive recipients of care: instead they expect to have choices based on trusted advice and reliable information. They also wish to own their own healthcare data and decide who to share it with and for what purposes. Individuals also expect transparency, as well as consistent and convenient access to reliable services; and are willing to embrace technologies that track their health and help them understand and manage their treatment plans. Improving people's digital health literacy is crucial in ensuring that digital transformation improves equity of access and helps reduce health inequalities.

Easy access to personal health information has long been on the 'wish list' of patients and their advocates. However, patients have access to their health data in only a few countries in Europe (Denmark, Estonia, Finland, France, Iceland, Norway, Scotland and Sweden, and recently England).[54,55] For example Finland's Kanta Services is widely regarded as paving the way in patients being able to access their records including agreements for use of e-prescriptions in several countries (see Case study 5).

Case Study 5

Kanta Services, Finland's internationally, interoperable national health data – Finland

Finland's Kanta Services was launched in 2010, as the national health infrastructure and archive. It includes electronic patient records, e-prescriptions, imaging and other test data, electronic social care documents and personal health and well-being records. The records are always up-to-date and available to clinicians nationwide to add real-time information. Patients have control over the flow of their data, can view their full health records and can request repeat prescriptions via an online service. A 'Patient Data Repository' allows centralised archiving of electronic patient data, as well as active use and storage of the data, and plays a key role in sharing information between healthcare service providers.[56]

Kanta Services permit reliable and secure processing of information held. The data security and protection of Kanta Services ensure data protection is observed and data processing complies with relevant legislation. This is made possible by operators monitoring logs on the use with full disclosure of information.

Kanta Services are underpinned by robust interoperability standards (HL7 interfaces and IHE XDS interfaces for imaging data and for cross-border data exchange) enabling sharing of data both nationally and internationally. It is currently possible to purchase medicines with a Finnish prescription in Estonia and Croatia showing cross country interoperable services. More countries are joining the scheme. In the future, the service will incorporate a European patient summary so doctors in participating countries can access the patient's basic details.[57]

Meanwhile, Denmark, who launched its national e-health portal Sundhed.dk in 2003, has been providing patients with access to their own data for more than 15 years. Its portal provides updated functionalities for citizens such as quality assured health information, access to medical records and medication. It uses a secure infrastructure, search optimisation and user interfaces to create linkages between existing data sources, open up data sets to new user groups, and facilitates communication between healthcare providers and citizens. It was recently supplemented by the MinSundhed (MyHealth) app, which gives mobile access, including support of video consultations with GPs during the COVID-19 pandemic.[58]

The use of digital technologies is increasing

Increasing numbers of European citizens are using digital technologies to access health information and manage their health. This includes using the internet to search for health information, book appointments, have virtual health consultations, and use digital technologies to manage their health remotely (see Case study 6).

Case Study 6

Portugal telehealth developments and the newly introduced National Strategic Telehealth Plan – Portugal

In 2019, the Portuguese National Center of Telehealth (CNTS) was launched by the Portuguese Ministry of Health, with the aim of advancing their telehealth approach to healthcare. Currently the Portuguese NHS has a Contact Centre which provides an array of clinical and administrative services to the population. This includes teletriage, telecare for the elderly, health care information, referrals, point of care tests for hepatitis C virus and hepatitis B virus in pharmacies or at home.[59]

Citizens across Portugal have access to a whole range of digital tools to help them manage their own health, with high usage rates. The online Citizen Area allows people to access their EHRs book an appointment with a GP and check their vaccination card. There are now over 2,250,000 users, a number which on average increases by 300 users a day. Furthermore e-prescriptions sent over text or email, are compulsory within the Portuguese National Health Service. Over 80 per cent of healthcare patients use this service to get their medication highlighting its popularity.

Many e-prescription services are also available online with over 1.87 million users using the website. Additionally, the MySNS Carteira app, allows users to access and share important personal information about their healthcare such as vaccine cards, access data to the NHS service, allergy registration and e-prescriptions. The app can also create medication reminders on smartphone calendars. Since the app launched in 2016, it has been downloaded 460,000 times and proving useful to many citizens.[60]

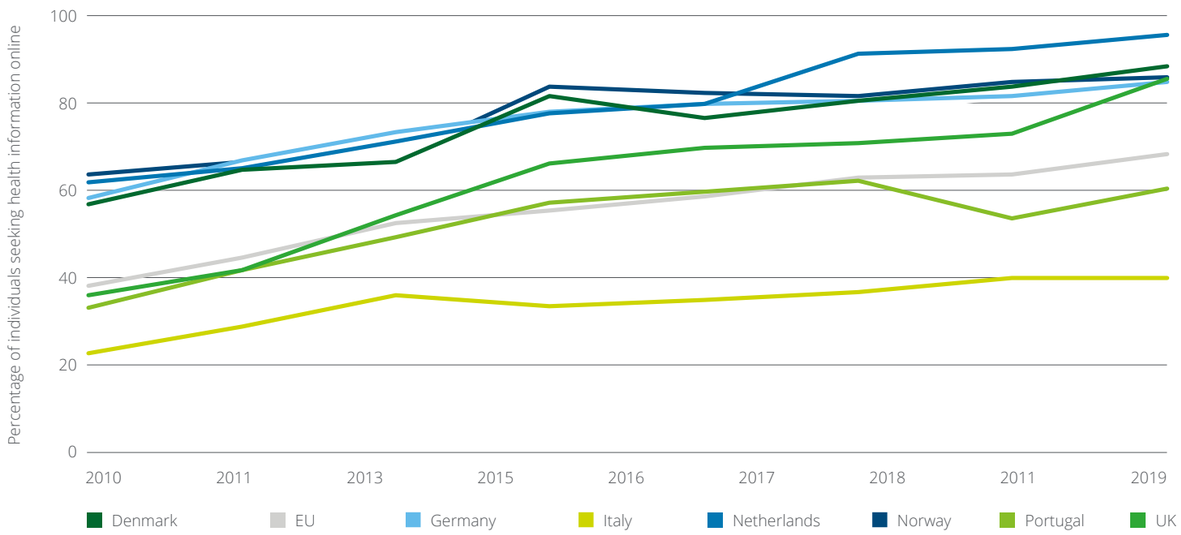
European citizens are increasingly using the internet to obtain healthcare information and book appointments on-line

According to longitudinal research from the EC, European citizens are increasingly seeking health information online. In 2019, 54.9 per cent of survey respondents sought health information online compared to 46 per cent in 2015. There are wide inter-country differences (see Figure 13), with Dutch respondents most likely to search for health information online (74 per cent in 2019). Respondents from Norway, Denmark, the UK and Germany also reported higher levels of performance, whereas Portugal and Italy were below the EU average.[61]

EC research shows that citizens are increasingly using the internet to book healthcare appointments. In 2018, 17.3 per cent of Europeans used the internet to book a healthcare appointment compared to 10.1 per cent in 2014. In 2020, the use of the internet to book appointments is highest in Denmark and lowest in Italy (see Figure 14).[62] A number of digital technology companies are helping countries improve access to online appointment bookings (see Case study 7).[63,64]

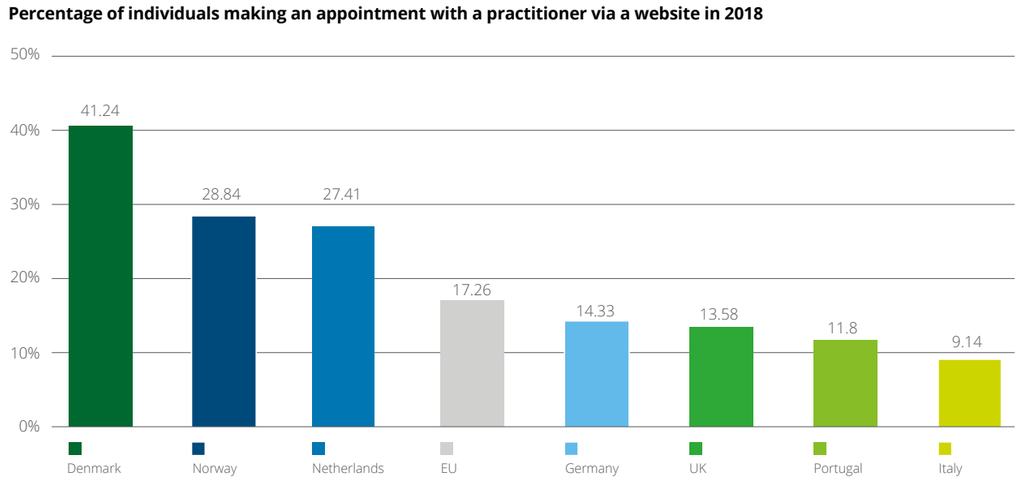
Although the EC sees digital inclusion as a crucial priority and is sponsoring a number of initiatives, a significant number of people are deterred from adopting technologies because they lack sufficient digital skills and /or have accessibility and connectivity problems (see Figure 15).[65]

Figure 13. European citizens are increasingly seeking health information online



Source: adapted from Eurostat, 2019

Figure 14. Variation in percentage of people using the internet to book appointments



Source: adapted from Eurostat, 2018

Case Study 7

Examples of patient online booking portals for medical appointments – Germany

Doctolib was founded in France in 2013, started in Germany in 2016 and is now one of the leading e-health companies in Europe.[66] Since its foundation the company is pursuing the goal of improving the healthcare system through technology and providing easier, faster and better access to healthcare for patients.[67] Doctolib supports doctors and hospitals with an intelligent cloud-based software solution that helps them be more efficient to free up more medical time, improve their patients' reach and experience to provide better care, and better collaborate with peers.[68] 135,000 practitioners and 35 million patients use Doctolib products. This year has seen a large adoption of Doctolib's video consultation, with more than 5 million video consultations held so far.[69]

Doctolib outcomes include:

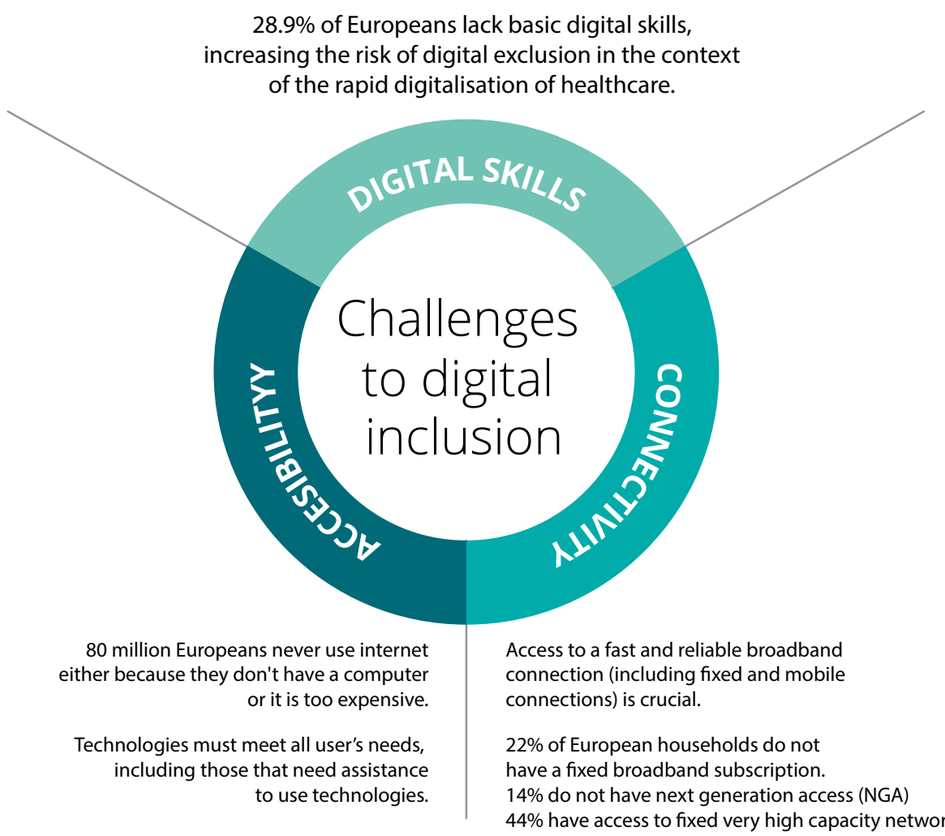
- 96 per cent of patients are satisfied and recommend Doctolib
- the reminder functionality has reduced cancellations by up to 58 per cent
- up to 30 per cent of administrative time has been saved.[70]

'Samedi', is a leading German medical booking platform founded in 2008, enabling patients to manage doctor's appointments online, receive treatment information and reminders of appointments directly via smartphone and exchange information with doctors.[71] Samedi is widely used in Germany, Austria and Switzerland, but also internationally, with the software is available for clinicians in seven languages and for patients in 13 languages. The functionality also enables patients to book a specialist appointment, dental appointment or a video consultation. Currently over 17 million patients can use this functionality which is embedded within 8000 practices and 900 clinics.[72]

Samedi outcomes include;

- 75 per cent reduction in doctor to doctor calls and 36 per cent reduction in patient calls
- 95 per cent less faxes from doctors
- 320 hours saved by eliminating typing (average hospital) and up to 23 per cent labour savings in patient administration
- 70 per cent fewer no-shows due to SMS reminders
- 30 per cent less waiting time due to exact process planning
- 96 per cent positive response from referring clinicians and 92 per cent positive response from patients.[73]

Figure 15. A lack of digital skills, accessibility and connectivity problems, undermine digital inclusion



Source: adapted from NHS Digital, Eurostat

In 2019, the percentage of people with at least basic digital skills reached 58 per cent (up from 55 per cent in 2015).[74] However, the overall level of digital skills across the EU was lowest among adults living in rural areas (48 per cent had basic or above basic digital skills), rising to 55 per cent for adults living in towns and suburbs, and 62 per cent for adults in cities.[75] Moreover, 82 per cent of young people (aged 16-24), 85 per cent of those with high formal education, and 68 per cent of employed or self-employed individuals have at least basic digital skills. By contrast, only 35 per cent of those aged 55-74 and 30 per cent of the retired and the inactive possess basic skills. Older age, low levels of formal education, low income levels, and certain disabilities can all influence the extent of digital exclusion and the ability to access health information, make health care appointments online and use digital health technologies (see Figure 16).[76]

Figure 16. The sections of society more at risk of digital exclusion

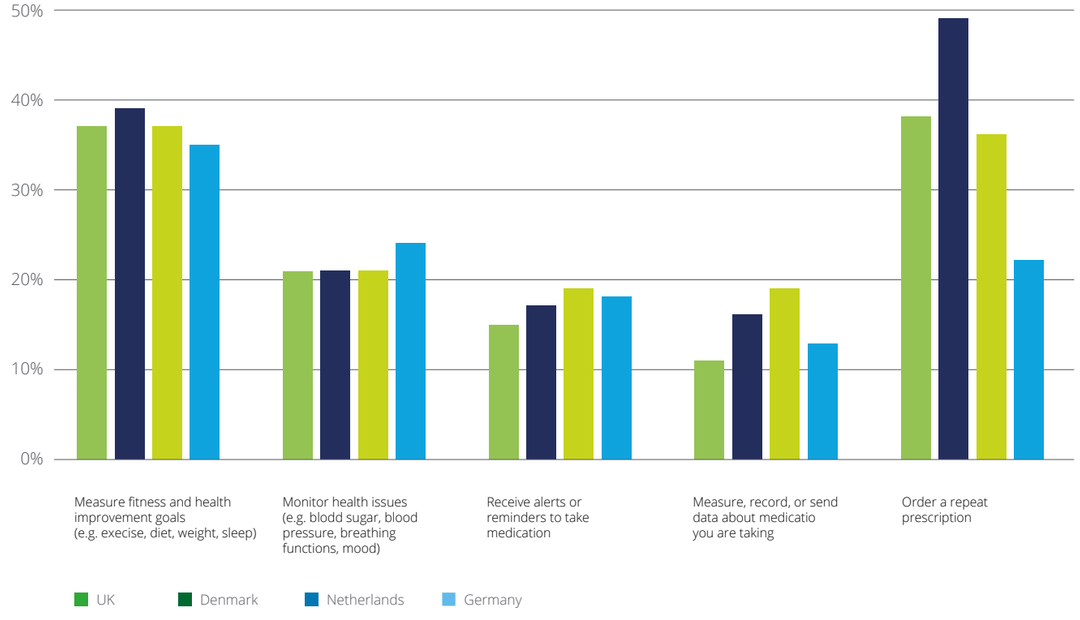
Source: adapted from NHS Digital and Eurostat, 2020

Consumers are increasingly willing to use digital technologies to engage in new ways

From May to June 2019, the Deloitte US Center for Health Solutions conducted a global survey of healthcare consumers to understand their experiences and attitudes to health and healthcare, and their appetite for digital innovation.

Its survey of some 12,000 consumers in eight countries including four European countries[77] found that the most frequent use of technology across Europe was for measuring fitness. The widest variation was in the use of technology to refill prescription drugs (see Figure 17).[78] Figure 18 details some of the key takeaways from this global survey.

Figure 17. Citizens' willingness to use digital technologies to engage with the health system in new ways



Source: US Center for Health Solutions, Global survey of health care consumers, 2019.

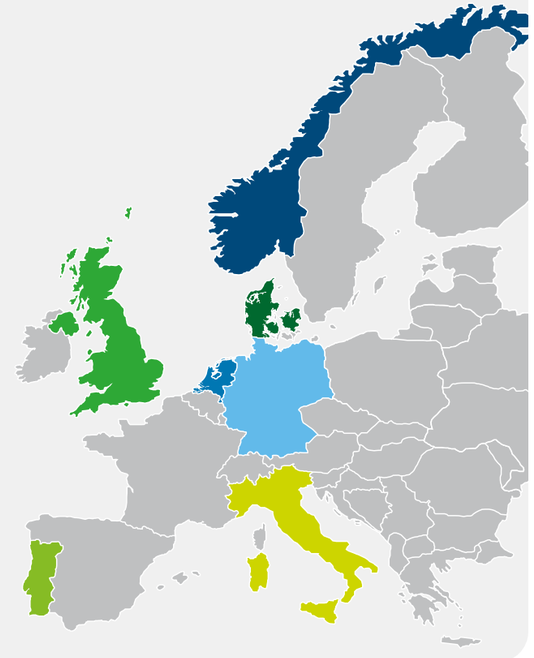
Willingness to share data is crucial for developing interoperable platforms and providing joined-up healthcare services for patients, and crucially to develop new therapies and technologies. Patients are usually willing to share their data as long as appropriate safeguards are in place.[79]
It is clear that healthcare providers need to build trust to improve people's confidence in sharing their data to benefit from better care.

Figure 18. Overview of the Deloitte Global healthcare consumer survey 2019

Despite some differences, consumers are more alike than different and many consumers across the eight countries are interested in engaging with the health systems in new ways.

- Consumers are on different levels of 'consumerism' maturity, they are no longer passive and demand transparency, convenience and access.
- Around two fifths of consumers in the four European countries in the global survey that are the focus of our report are using digital technologies and tools to help keep them healthy.
- Many consumers who track their health data are mostly willing to share it with their doctors: UK (45%), Denmark (39%), the Netherlands (39%) and Germany (36%).
- Among those who didn't share their tracked health data, most said they didn't think their doctor would be interested (52% in the UK, and 51% in the Netherlands, 34% Denmark and 41% in Germany).
- Many consumers believe they should own their personal health record (48% in UK and 50% in Denmark). However, consumers in the Netherlands (59%) and Germany (55%) believe their doctor or hospital should own their data.

- Consumers in Denmark (27%) and Netherlands (22%) have more virtual visits than those in the UK (17%) and Germany (13%).
- The majority of consumers who have had a virtual care visit would choose to have another Denmark 74%, Germany 73%, the Netherlands 73% ,the UK 69%.



Source: US Center for Health Solutions, Global survey of health care consumers, 2019 Australia (4,079); Canada (4,039); Denmark (2,023); Germany (3,625); Netherlands (2,014); Singapore (2,014); UK (4,165); US (2018 survey – 4,530)* May-June 2019

Tackling digital inclusion and use of health technologies

Improving digital inclusion

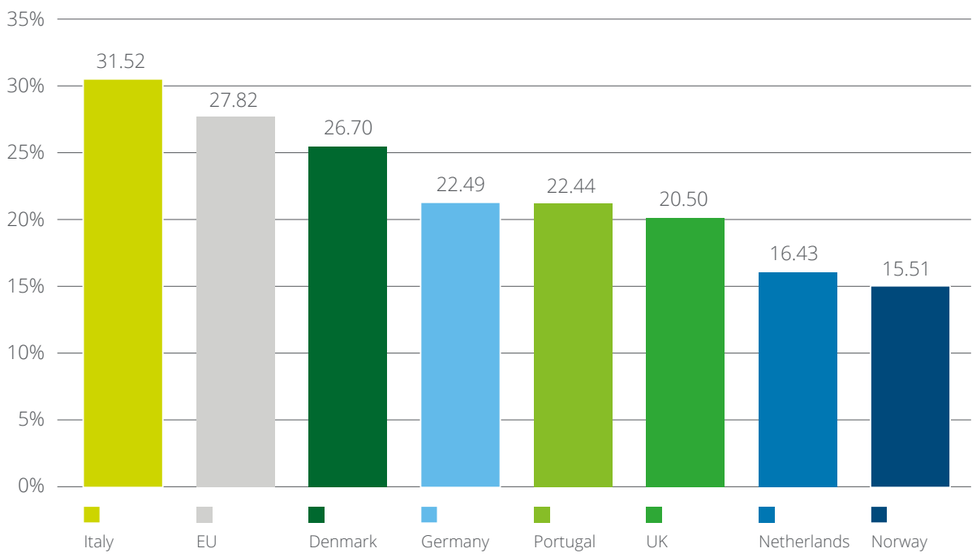
Organisations such as the WHO, the EC and UNICEF are attempting to improve the digital skills of citizens aimed at supporting the wider deployment of digital health technologies.[80 81 82] However, according to figures from the EC's 2019 DESI report, nearly a third of Europeans aged 16-74 (28.9 per cent) still lack basic digital skills. Indeed, 31.5 per cent of Italians and 27.8 per cent of Portuguese citizens say they lack even 'basic digital skills'. This compares with only 15 per cent in the Netherlands and Norway (see Figure 19). Many Europeans also lack awareness of how digital technologies could help them manage their own health. Likewise there is low awareness of being able to access EHR systems.[83]

For example:

- A 2018 German ePatient survey, designed to evaluate the target groups of medical digital technologies, identified a low level of awareness of and interest in online patient record systems among its respondents.
- In the UK, awareness and use of digital GP services remains relatively low. A 2019 GP patient survey found that only about 40 per cent of patients are aware that they could book GP appointments or request repeat prescriptions online, and just 14 per cent of patients said they had used these services.[84]
- In Italy, the Deloitte Italia Outlook Salute 2021 Report revealed that 41 per cent of Italians do not know about EHR availability, and that only 37 per cent have received patient data via emails, 35 per cent have booked appointment online, 23 per cent have used apps to communicate with their doctors, and eight per cent have used telehealth. Overall, however, 41 per cent of Italians think that the digitalisation of the healthcare system is is equal (32 per cent), a little better (seven per cent) or much better (two per cent) than that of other services.[85]

Lack of awareness of the benefits of digital technologies and how data is used risks increasing mistrust. One way to increase trust is to allow people to own their personal health data and decide who to share it with.[86] Case study 8, illustrates how the Patients Know Best (PKB) Platform puts patients fully in charge of their own health data. Moreover initiatives like the 'Widening Digital Participation programmes', run at EC level and by individual countries like the UK, are crucial, as are regular targeted communications about the benefits of technology in supporting patients to manage their own health more effectively.[87,88]

Figure 19. The percentage of European citizens lacking digital skills in 2019



Source: adapted from Eurostat, 2019

Case Study 8

How Patients Know Best (PKB) is empowering patients to manage their own health data – UK

PKB, a social enterprise and technology platform launched in 2008, brings together patient data from health and social care providers and patients into one secure personal health record (PHR). Patients can access everything from appointment letters and test results, to their care plans. To empower patients to play an active role in their health they can also use specially designed tools to monitor and track their health condition.[89] PKB has been designed to give all patients, whatever their health literacy, control over their own health data, while making access simple, so that even the most disadvantaged patients and those with the most complex healthcare needs can use it.[90] In 2020, PKB became the first to integrate with the national NHS App to enable patients to directly access their combined data and is contracted for more than 12 million people to use the service across the UK.[91]

PKB locks every PHR with a unique key that the patient controls providing a high level of security and privacy. PKB automatically provides the key to regulated clinicians so they can access the record where they can prove implied consent, for example a clinic appointment or an emergency admission where the patient is unconscious. PKB divides the record into levels of sensitivity - general, mental, sexual, social care – with patients choosing what data the provider can access.

The privacy settings are automated defaults, and while the underlying technology is complex, it is simple for patients to manage and operate.

The functionality supports parents, partners, and those with power-of-attorney carers to legally see relevant data to support the patient, working directly with the patient's clinical team. The system works on any mobile device, providing access even when a user has no fixed address and works in 20 languages, reaching patients who are hard to reach. Interoperability is achieved through:

- a contract that says the data in PKB is owned by the patient, so the patient can share with anyone
- a public 2-way Application Programming Interface (API) that allows any third party to read and write in the patient's record with the patient's authorisation
- OAuth 2.0 international standard to allow the patient to grant authorisation by entering their PKB username and password
- international standards for the 2-way API (FHIR) so that third party developers can learn quickly and easily how to use the PKB APIs.[92]

Improving equity of access

As we noted in our 2019, *Closing the digital gap: Shaping the future of UK healthcare* report, while new technologies have the potential to promote equity and fairness by reaching a larger number of people at a lower cost, digital solutions must avoid creating or exacerbating inequalities in access to healthcare. Studies show that individuals from a higher socio-economic status are typically the first to adopt innovative health technologies, creating a 'digital divide'. The divide tends to disadvantage the same groups of people who are at risk of social and health inequalities (people from older age groups, low income, low education, low literacy, ethnic minority groups, and socially marginalised and underserved groups).[93]

According to Deloitte's 2019 global mobile consumer survey, smartphones are now the world's most ubiquitous digital device. In most developed economies, about 90 per cent of adults own a smartphone, with around 95 per cent of them smartphones used daily.[94] However, access to other types of digital technology is not ubiquitous. For example:

- about 11 per cent of Europeans do not have access to the internet at home and individuals in cities and towns have comparatively higher access rates compared to those in rural areas[95]
- in Europe, adoption and ownership of smartwatches and fitness trackers is biased towards affluent millennials[96]
- in rural areas, mobile phone and broadband signals are 'temperamental'.

Concerns about the cost of digital technologies constrain the potential to use them for healthcare. If online services and personal technologies such as wearables are to become part of mainstream healthcare, providers must address the issue of who pays to improve the technology infrastructure and provide the technology to support citizen's to use it effectively. To address inequities, healthcare providers should screening patients to access their digital skills and their willingness to use digital technologies, support them to access training to use technologies, and to obtain the technologies and understand the benefits of using them, including changing mind-sets and using social prescribing.[97]

For example in the UK, the *Topol Review: Preparing the healthcare workforce to deliver the digital future'*, commissioned by the Secretary of State for Health and Social Care to deliver the digital future, recognised that digital medicine (digital technologies and products that directly impact the diagnosis, prevention, monitoring and treatment of a disease, condition or syndrome) is already having a positive, albeit uneven, impact on healthcare.[97] It highlighted the potential of telemedicine, telephone triage, video consultations, and smart phone apps and wearables, but emphasised that the patient-clinician relationship is important for encouraging equity in adoption and that technologies need to be intuitive to use. Furthermore, clinicians will need to understand, and be able to convey to patients the benefits of digital technologies while being confident that the technology meets the requisite regulatory and data protection standards.[98]

Part 4

COVID-19 and the acceleration in adoption of SMART technologies

The COVID-19 pandemic has affected billions of citizens and millions of healthcare staff across the world. Health systems had little time to prepare and in the shortest of time frames had to reorganise services, train staff to work in new ways and in unfamiliar teams, and protect staff well-being. This was done in the absence of any known treatments and a need to reduce the risks of infection to staff and patients. The response has been an unprecedented change management programme implemented in weeks that would otherwise have taken years. Stakeholders across the health system have rapidly formed collaborations to develop much needed medical technology, personal protective equipment and treatments. Moreover, the pandemic has accelerated the digital transformation of healthcare.

"The pace of change and mobilisation throughout the COVID-19 pandemic raises the question why digital technologies were so slow to be adopted before that…"

(UK interviewee)

The rapid response from healthcare systems

In April 2020, the WHO issued guidance to European countries to help decision makers, policy makers and national or regional health authorities to reorganise their healthcare services during the COVID-19 pandemic. The focus of the guidance is on maintaining continuity of essential health care services across the continuum of care while managing the COVID-19 response, including the supports and measures required to ensure that health workforce is mobilised and enabled to deliver the care required.[99]

As the varied effects of the virus on patients who required hospitalisation began to emerge, hospitals had to double or even triple their intensive care unit (ICU) capacity, and determine how best to monitor patients and patient-flows more closely and over a long period of time. They also recognised the need to work more effectively with other parts of the system, including monitoring people discharged early and those with long-term conditions, in their own homes. A crucial enabler has been the growing use of connected care solutions, such as telehealth and remote patient monitoring. Where providers had previously been slow to adopt new technologies and new models of care, the compelling need to change behaviours and adopt new ways of working has expedited the adoption of technology-enabled ways of diagnosing, monitoring and treating patients.

"The COVID-19 situation has forced us all to leverage digital technologies"

(Dutch interviewee)

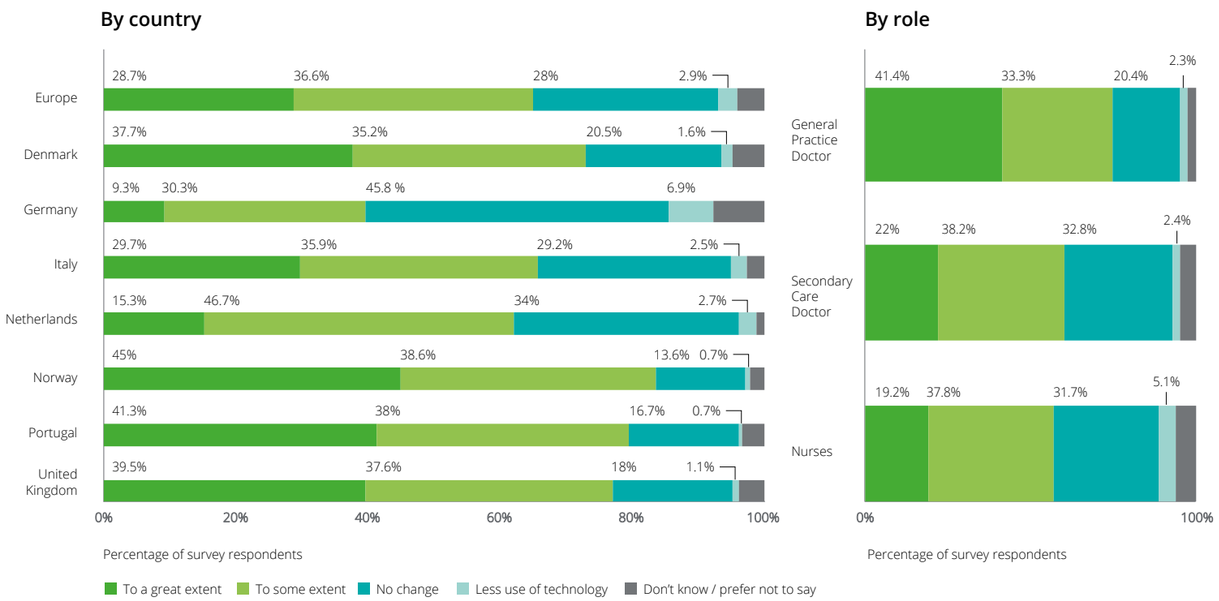
Increased adoption of technologies in response to the COVID-19 pandemic

The primary research for this report was conducted within a few weeks of the start of the COVID-19 pandemic, consequently, we included questions in our survey of front-line clinicians on how COVID-19 was influencing the adoptions of digital technologies. Specifically, we asked our survey respondents how far their organisation had increased its adoption of digital technologies to a) support clinicians' ways of working (see Figure 20) and b) support patient care (see Figure 21).

Overall, nearly 65 per cent of survey respondents said their organisation had increased its adoption of digital technologies to support clinician's ways of working and 64.3 per cent said their organisation had increased its adoption of digital technologies to provide virtual support and ways of engaging with patients in response to the COVID-19 pandemic. The change in adoption to support clinician's ways of working was highest in Norway (83.6 per cent), and to support patients was highest in Portugal (81.4 per cent). Meanwhile 45.8 per cent of German respondents said their organisation had made no changes and seven percent saw a reduction in their adoption of digital technologies to support clinician's ways of working and 48.3 per cent reported no change in use to support patients.

Discussions with interviewees indicate that Germany's high number of hospital beds, including intensive care beds,[100] and high ratio of hospital doctors and nurses to the population meant they were less reliant on new ways of working to be able to cope with increased demand. Indeed, a broad network of GPs, was able to treat six out of seven coronavirus patients in the community, reducing demand on hospitals. As elsewhere, Germany also postponed all elective procedures for several weeks. Consequently, Germany has been able to keep first-wave COVID-19 deaths to relatively low numbers and confirmatory testing at high rates.[101] German authorities provided financial incentives to keep ICU beds free for potential COVID-19 patients, and Germany also utilised mass testing early on in the pandemic, encouraging early self-isolation of those infected with the virus.[102]

Figure 20. COVID-19 is increasing the adoption of digital technologies to transform ways of working



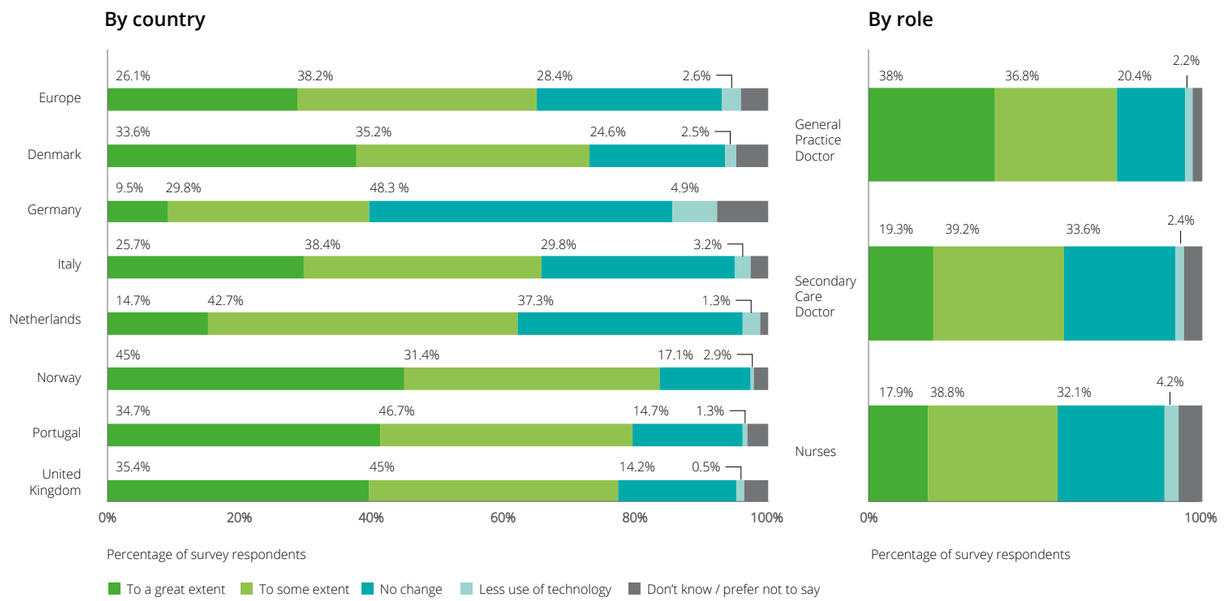
Source: Deloitte research and analysis based on survey commissioned from M3, 2020.
Survey question: To what extent has your organisation increased its adoption of digital technologies that support clinicians' ways of working in response to the Covid-19 situation so far?

How digital technologies are helping primary care to respond

Across the seven countries in our survey, primary care doctors reported the greatest adoption of digital technologies in response to the pandemic (74.7 per cent). For example, this increased adoption of digital technologies was evident in the UK were NHS leaders had signalled their expectation to move to a digital-first primary care model in the January 2019 NHS Long Term Plan. Deloitte's February 2020 report, *Realising digital-first primary care,* examined the progress towards this ambition and found that while innovative technologies were only evident in pockets of the NHS, there were an increasing number of online GP services with evidence of improved outcomes for clinicians and patients. These services, shared as case examples in the report, deploy different virtual care models:

- some connect patients to GPs directly, through video or online messaging (in real time or asynchronously)
- others allow patients to send web-form request to a practice's central system and be contacted by telephone or video
- a number employ GPs directly while others connect patients to their own GP.

Figure 21. COVID-19 is increasing adoption of digital technologies to manage and improve patient access



Source: Deloitte research and analysis based on survey commissioned from M3, 2020.
Survey question: To what extent has your organisation increased its adoption of digital technologies to provide virtual support and ways of engaging with patients in response to the Covid-19 situation so far?

Case Study 9

eConsult's online consultation platform providing patients access to their own GP practice – UK

eConsult provides patients with access to a suite of online services through their own practice's website or the NHS App, connecting patients to their own GP. The patient completes a symptom-specific web-form, which responds in real time, and allows the patient to send photos and documents. The practice reviews the patient's 'story' and triages patients based on urgency and need. The GP or practice can support patients remotely by messaging the patient to collect a Fit Note or prescription, or by arranging a phone or video consultation. A range of self-management tools are also available on the website, allowing patients to manage their symptoms.

Using eConsult, over 90 per cent of patients do not need to come in to the surgery, leading to a better patient experience, improved health outcomes, better use of resources, higher staff satisfaction and fewer patient journeys. In January 2020, pre-COVID-19, eConsult was working with around 1,182 practices covering over 11 million patients providing some 10,000 remote consultations a month. By July 2020, the eConsult platform was available to some 28 million patients across 3,100 practices and 116 Ministry of Defence sites (across 14 international locations) with over 800,000 eConsults being conducted each month (on average, one eConsult is submitted every 3 seconds).[103]

In April 2020, in response to the pandemic, NHS England and NHS Improvement instigated a 'total triage model' where all patients had to be assessed by phone or online before being offered a face-to-face appointment where clinically indicated. [104] In a matter of weeks practices moved from carrying out around 90 per cent of consultations face-to-face, to managing more than 85 per cent of consultations remotely.[105] By the end of May, 99 per cent of GP practices in England had activated remote consultation platforms, with NHS leaders now examining how to sustain this approach.[106] Our follow-up with case studies in our Realising digital-first primary care report, to understand how the COVID-19 pandemic had impacted their business, found all reported double, if not triple digit growth in activity (see Case Study 9). For example, Doctorlink, reported acceleration in use of digital triage, video and phone consultation services by 148 per cent between January and June, and a 278 per cent increase in the number of NHS GP surgeries using the platform; with the service available to over 12.5 million NHS patients through 1,500 GP surgeries.[107].

As shown by our survey and interviews, most countries across Europe are seeing a huge shift to remote consultations (see Case study 10).

Case Study 10

KRY's Care Connect empowering clinicians to use free video consultations during the COVID-19 pandemic across Europe – Europe

KRY (which operates as LIVI in the UK and France), was founded in 2015. KRY work in partnership with national and local healthcare authorities to provide a digital extension to primary care services, making it easy for clinicians to work remotely and for patients to access vital healthcare services. Patients consult a clinician within minutes, via a smartphone or tablet app. Its seven-day a week video consultation service provides equitable access to clinicians at the patient's own convenience.[109]

KRY has delivered over 2.3 million video consultations, making it the largest digital provider in Europe. Headquartered in Stockholm, Sweden, KRY operates in a number of European countries, with plans for further international expansion.

In 2020, KRY launched a new web-based platform, known as Care Connect in the Nordics (LIVI Connect elsewhere) that allows clinicians to hold secure video consultations with their patients during the COVID-19 pandemic.[110] Once a clinician is verified by Care Connect, they can text a patient directly, sending a link that opens a video chat. The platform is free for any healthcare professional in Europe and so far is available in ten languages: English, French, German, Italian, Spanish, Swedish, Norwegian, Danish, Dutch and Polish. Thousands of clinicians across multiple countries have delivered tens of thousands of consultations through the service.[111]

The Care Connect platform helps connect people who are in the at-risk groups or those who are self-isolating should still be able to contact clinicians and get the care they need. In addition, the platform is also aimed at providing convenient access to care and support for patients with long-term medical conditions.[112]

How digital technologies are helping hospitals respond to the COVID-19 pandemic

The COVID-19 pandemic has had a significant impact on most European hospitals, particularly in five crucial aspects:

- the hospital workforce – against a trend of increasing staff shortages,[113] hospitals had to respond quickly, flexibly and pragmatically to manage the surge in patients
- emergency departments and outpatient visits had to be reorganised to reduce the risk of cross-infection and respect the fact that 'lockdown' and social distancing rules impacted patients' willingness and ability to attend
- planned services – difficult decisions had to be made around normal elective hospital activity and ongoing treatments
- supply chain – sourcing, selecting, procuring and distributing the massive amounts of equipment required to deal with the pandemic, in the face of intense international competition, while balancing supply chain compliance and equipment shortages
- governance – understanding and managing the risks of new ways of working and adaptive models of care, the establishment of new delegated authorities and revised board governance arrangements, as well as deploying products and technologies that have been fast tracked through temporary and more flexible regulatory processes.

Across Europe, many industry stakeholders, both traditional and non-traditional, rallied to assist the health economy, especially hospitals (see Case study 11).

Case Study 11

Collaboration between Vimercate Hospital and Fujifilm on an AI-enabled platform, REiLI, supporting radiologists in assessing the impact of COVID-19 on patients' lungs – Italy

During the novel coronavirus emergency, the healthcare system of the Italian Lombardy region faced enormous pressures. The Azienda Socio-Sanitaria Territoriale (ASST) Vimercate hospital, a HIMSS EMRAM Stage 6 hospital leading in digital transformation, collaborated with Fujifilm to implement an AI platform, REiLI to help reduce the impact caused by the rapid spread of COVID-19 and to deliver a timely response to the evolving pandemic.[114]

REiLI's processing of CT scans and chest X-rays provides important support for radiologists, offering them an extremely rapid, quantitative and objective assessment of the various zones of the lungs for evaluating the presence of the pulmonary parenchymal consolidation caused by the virus. The AI data supports reporting on daily examinations aimed at monitoring the development of the disease, and supports clinical analysis and decisions operators. REiLI, Fujifilm's AI platform, is integrated with the Lunit Insight CXR module for the analysis and detection of the main types of pulmonary disease including differentiating disease due to the virus.

REiLI was installed at ASST Vimercate in just two weeks as the first site in Europe to use Fujifilm Artificial Intelligence; REiLI was installed alongside the existing PACS system to avoid interrupting the daily workflow and to speed up the AI algorithms availability to the radiologists. The hospital employs 17 radiologists and 19 technicians processes around 160,000 radiology examinations each year using Fujifilm PACS system. By March 30th, REiLI was operational and processed more than 600 images during its first five days. From February 23th to May 15th more than 900 cases of COVID-19 lung disease were identified, from an average of 80 chest X-rays per day, allowing for precise and punctual data collection.

REiLI was also used to automatically process over than 8.000 chest X-rays executed from January 1st to March 31st (1.200 for outpatients, 2.500 for inpatients and 4.500 at Emergency Department) to analyze the evolution of the pandemic and to start a retrospective study of the lung disease.[114]

During the pandemic, REiLI AI Platform has been helpful to optimize the radiologist workflow and to safe time in the positive study detection process.

By now, REiLI AI Platform is usefully applied to automatically analyse specific clinical cases and is giving a strategic contribution in increasing the trust of the hospital specialists with the concrete and practical support of AI technologies.[115]

Digitalising hospital emergency departments and outpatients services

In response to the pandemic, hospitals have had to make radical changes to their emergency department (ED) 'front doors', to reduce overcrowding in order to comply with social distancing rules and deliver care safely. Digital technologies have been used to manage ED demand, for example eTriage systems which allow patients on entering an ED to enter their symptoms into a web-form which reacts in real time to ask relevant questions, ensuring the most critical patients are seen first.[116] Another example, co-created by Deloitte with clinical and operational experts, is a simulation model, 'ECO', which provides a digital model of the emergency department and uses simulations based on real-time ED data to experiment with alternative processes and pathways.[117]

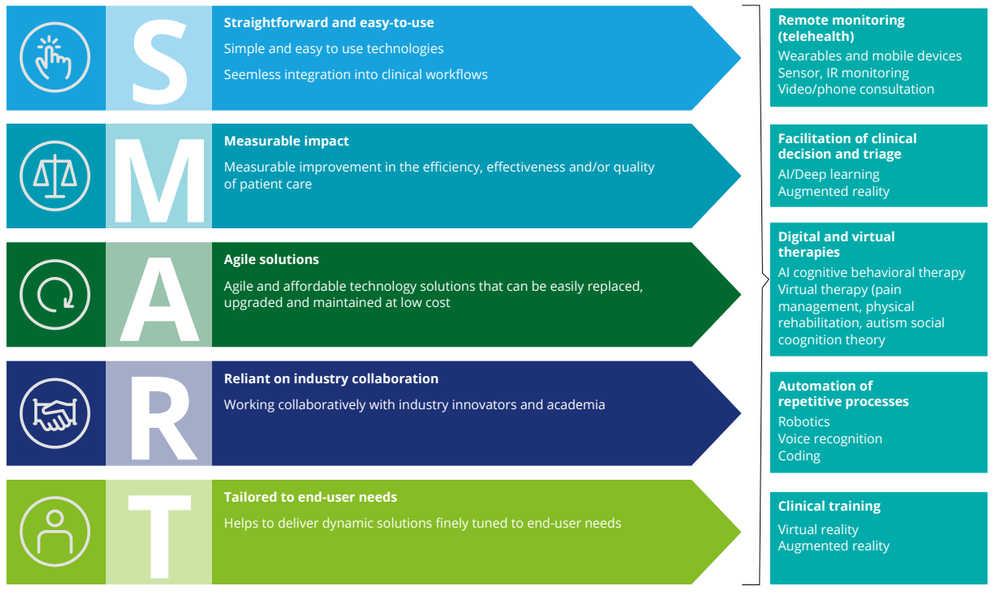
Likewise, outpatient consultation systems have pivoted to become telehealth services. Before the pandemic, outpatient departments were largely based on the traditional and relatively unchanged face-to-face consultation model. However, due to the necessity of reducing the risks to patients and staff, over the course of a few days many transformed themselves to offer remote consultations wherever possible.[118]

The SMART characteristics needed to encourage adoption at scale

As already discussed as digital technologies collect and analyse patient level data, data privacy and security are paramount. Moreover, if digital technologies are to help healthcare systems thrive in the post-COVID era they should ideally meet the following SMART characteristics (see Figure 22).

The ongoing development of healthcare technologies that meet the SMART characteristics are will be crucial for the sustainability of healthcare systems including ensuring that they are better prepared to cope with future infectious disease outbreaks. Case studies 12 and 13 illustrate examples of SMART digital solutions that have the potential to be scaled across any country.

Figure 22. The SMART characteristics that can help improve technology adoption at scale



Source: Deloitte LLP 2019.

Case Study 12

Healthy.io launches 'stay-at-home' smartphone urine test for women – UK

Urine analysis is the second most common diagnostic test in the UK with 42 million tests undertaken annually. It is used in all sectors of healthcare, including key clinical pathways such as chronic kidney disease (CKD), diabetes screening, antenatal care, urinary tract infections (UTIs), and paediatrics as well as in outpatient management.[119] Around 10– 20 per cent of women will experience a symptomatic urinary tract infection at some time and 20 per cent of women over the age of 65 years have asymptomatic bacteriuria.[120]

Traditional urine analysis involves a dipstick with different chemical pads that react by changing colour. This is then compared to a reference chart. This manual and subjective test, makes it prone to diagnostic errors which can exacerbate the patient's condition and may require patients to return to the clinic, which is inconvenient for patients and costly for the healthcare provider.[121]

Healthy.io is a healthcare start-up, based in Israel with a global presence that has developed technology combining smartphone cameras, a mobile app and a home-based urinalysis test kit, to enable patients to self-test at home and share the results with their care provider through the mobile app. Healthy.io developed self-testing for UTI can shift uncomplicated UTI management from the GP to the community pharmacy setting and can reduce unplanned hospital admissions among people with chronic conditions.[122] Healthy.io launched its pharmacy first test-and-treat service in January 2019, which is available at 1,600 retail pharmacies across the UK.

In light of the growing demand to shift medical care closer to home, which has been accelerated during the COVID-19 pandemic, Healthy.io launched the first direct-to-consumer UTI test and treat service on May 5, 2020, called 'Velieve'. With Velieve, women can have a urinalysis kit delivered to their homes, use their smartphone to complete the test, have results assessed by an online doctor, and, where indicated, have antibiotics delivered to their homes within hours. During the first few weeks of its operation the service has been used by more than a 1,000 women in London alone and has received overwhelmingly positive feedback, with a Net Promoter Score of 79.[123]

Digital technologies to support mental health problems during the COVID-19 pandemic

Common mental health problem such as depression or anxiety affect around 25 per cent of the European population, with some 50 per cent of chronic sick leave is due to depression and anxiety.[125] Poor mental health is estimated to cost over EUR 600 billion, or more than 4 per cent of GDP.[126] There is a growing body of research evidence that shows that the COVID-19 pandemic has had a significant and sustained impact on the mental health of healthcare staff and with demand on mental health services growing.[127,128] The use of digital interventions such as video conferencing tools, online courses or apps, synchronous and asynchronous messaging services have expanded to serve patients with pre-existing disorders, healthcare workers and the general population (see Case study 14).[129] Scientists have issued a call for action to monitor and report on the efficacy of digital interventions for mental health.[130]

Case Study 13

Dignio is a digital platform for SMART medication dispensing - Norway

Dignio is a digital platform that connects to a set of at-home monitoring devices which can monitor a number of vital signs (including blood pressure and glucose, spirometry, weight, temperature, sleep and activity levels), and transmit results via Bluetooth to the patient's tablet or smartphone. Both the patient's and the clinician's platforms are updated instantly. The software has standardised APIs making it possible to integrate with other systems and devices. All communication through the software is encrypted and in compliance with current legislation. The platform also integrates with a range of at-home testing equipment, such as tests for white blood cell count, C-Reactive Protein, GFR-Renal filtration rate, and long-time blood glucose.

Through the Dignio platform, patients have access to their own data and a direct line of written communication (encrypted) with healthcare professionals. The system is mobile and cloud-based giving the patients a large degree of independence in their everyday life.

Dignio offers two smart medication dispensers. Pilly SMS is a manually loaded, automatic dosette that contains 28 chambers for medication. It sounds an alert and releases medication at programmed times. If the medicine is not collected from the device, notifications are sent via SMS. Pilly SMS is small, easy to carry, and approved for flights.

Medicio is a smart dispenser that delivers individualised bags of multidose medication. It provides a sound alert when programmed for medication time, and if the medication is not collected, this is registered in the Dignio Prevent app, and a notification is sent to the health personnel, relatives or the patient themselves via SMS.

Dignio Connected Care has been adapted for use in home care and hospitals as well as in research and clinical trials in both the public and private health sector. The technology has been used in around 40-50 Norwegian counties, and one county in Denmark, and is being trialled in China. The following outcomes have been observed:

Outcomes for patients

66 per cent of patients feel they have more control over own health
39 per cent fewer bed-days at hospital
34 per cent fewer home visits from nursing staff
Outcomes for clinicians
47 per cent cost reduction per patient per month
42 per cent fewer doctors' appointments
32 per cent fewer hospitalisations.[124]

Case Study 14

SilverCloud's online platform provides digital interventions for mental health conditions - Europe

SilverCloud is a secure and safe online platform that provides evidence-based, cognitive behavioural therapy based courses that can be accessed 24 hours a day, seven days a week. More than 30 mental health programmes are available, covering the full spectrum of care from preventative interventions for wellness promotion to the self-management of chronic issues. SilverCloud's services are used by more than 300 organisations throughout the UK, Europe and North America. SilverCloud has delivered more than two million hours of digital support and has been used by over 500,000 users to date, and around 30,000 new users sign up each month. In the UK, SilverCloud's programmes are used by over 75 per cent of the NHS's mental health services. Throughout the Covid-19 pandemic, the service was made free to all NHS staff and their families.

A recent randomised controlled study in an NHS service found statistically significant reductions on depression and anxiety symptoms compared to controls. Furthermore, clinician-administered interviews showed that a significant number of patients (60 per cent with depression, 50 per cent with anxiety, and 46 per cent with comorbid depression and anxiety diagnoses) no longer met the diagnostic criteria after three months. Overall, 56.4 per cent of participants did not meet diagnostic criteria for any disorder at three months. Results also showed significant improvements of symptoms over the 12 months follow up.

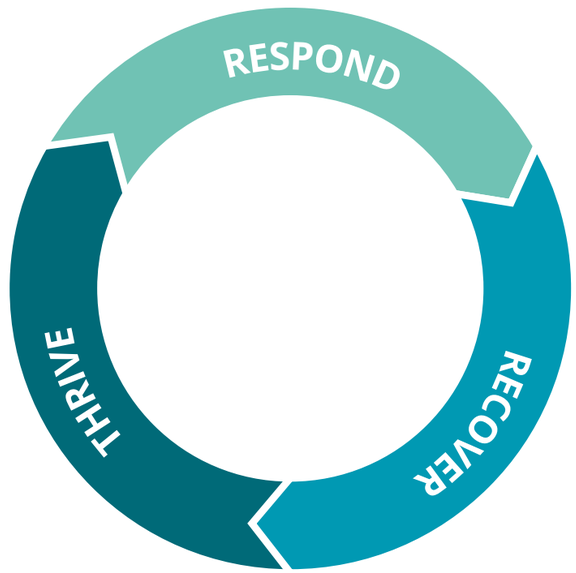
COVID-19 presents a unique opportunity to shape the future of European healthcare

Healthcare's response to the COVID-19 pandemic illustrates clearly how preconceived views about delivery systems have been transformed. Attitudes to care have changed and traditional boundaries have been removed creating the opportunity for new health care behaviours. Staff across healthcare systems bought quickly into the need to work differently, including working outside their normal scope of practice with new teams created around people's experience and capabilities rather than traditional roles. Successes in teams were made possible by good communication, high levels of trust, distributed leadership, and rapid decision-making, as bureaucracy reduced and people were empowered to make decisions. Sector boundaries have blurred, with greater collaboration across all stakeholders, demonstrating how coordinated and determined efforts, focused on a common cause, can expedite transformation.

All countries are now considering how to recover 'normal' services as quickly as possible, while continuing to contain and mitigate the on-going spread of the virus. The response to the COVID-19 pandemic has created an opportunity to accelerate positive changes and flexible ways of working that have long thwarted the modernisation of healthcare systems. Indeed, the pandemic has created the momentum to move the evolution of technology adoption to a revolution. Clinicians and patients have adapted seamlessly to the use of digital channels for delivering and receiving care. Deloitte has identified three phases – respond, recover and thrive (see Figure 23).

During most of the past five months healthcare across Europe have largely been in the respond phase, but is now moving into recovery requiring healthcare systems to build resilience. Healthcare providers now have an opportunity to evaluate what has worked well and what hasn't and decide which of the technologies that have been scaled up rapidly, are the most robust and cost-effective platforms and need to be retained going forward.

Figure 23. The three phases of organisation and system recovery



Source: DeloitteLLP, 2020

Part 5

Shaping a predictive, preventative, personalised and participatory future

The COVID-19 pandemic has accelerated the digitalisation of healthcare by at least a decade. Indeed, the legacy of the pandemic is likely to be new relationship paradigms based on collaboration, 'good will' and heightened levels of trust. Attitudes to care have changed and boundaries that have been in place for a long time have been removed, creating the opportunity for new healthcare behaviours. Moreover, through digital transformation and the adoption of technologies at scale, key stakeholders will increasingly collaborate to realise a future for healthcare that is truly predictive, preventive, personalised and participatory.

Just as experience in other industries has driven consumer demand for digital on-demand accessible, personalised services, the COVID-19 pandemic has driven European citizens' expectations for care anywhere, anytime and an acceptance that care can now take place outside traditional healthcare settings. The pandemic has also increased citizens' understanding of their own health status, particularly the importance of mental as well as physical health and the link between having a healthy immune system and prevention. Moreover patients want personalised interventions based on their own data. This is part of a major shift towards a digital health system approach that will connect and empower people and populations to manage their own health and wellness.

At the same time, however, the pandemic has highlighted serious disparities and inequalities in health systems across Europe that need to be addressed urgently.[133] While there is clear evidence of the role of poverty and deprivation in driving health and social inequalities, there is also an increased understanding of the role of epigenetics and that social and genetic causes of disease are not mutually exclusive.[134] In reducing health inequalities, governments will also need to identify and tackle any and all systemic racism and ageism in the health care system, and ensure that technology is available to all to enable equity of access and engagement in virtual care.

The Future of Health

Deloitte's 'Future of Health 2040' campaign, identified a wide range of companies from inside and outside of the healthcare sector that are making strategic investments to drive a future of health defined by radically interoperable data, open and secure platforms, and consumer-driven care.[135] It identified six primary forces of change that will drive this vision of the future (see Figure 24).

On a number of fronts, the pandemic has caused the health sector to leap one or two innovation cycles ahead in a remarkably short amount of time but in other areas action is still needed to embed and sustain technology adoption.[136] Specifically, the COVID-19 pandemic has improved access to and sharing of data, including open data platforms, but these are largely focused on helping to monitor the extent and scale of the pandemic and accelerate the search for a vaccine and new treatments. As shown by our survey, interoperability in European health systems remains a key challenge for all countries.

In the future our complete health history will exist in one place and be accessed by computer or phone as easily as we access our bank account details. Interoperable, always on data will promote closer collaboration among industry stakeholders, with new combinations of services offered by incumbents and new entrants (disruptors). Interventions and treatments are likely to be more precise, less complex, less invasive, and cheaper, with digital transformation driving most of the change.[137]

Digital transformation | Shaping the future of European healthcare

Figure 24. What you have to believe in to achieve the Future of Health

Data Sharing

Consumers own their own data and consent to share it as part of a value exchange. Transparency in data use increases consumer trust.

All companies have Ethics & Health Data Protection Officers.

Regulations guarantee privacy and data-blinding.

Interoperable Data

Large aggregated data sets provide real-time and holistic view of the consumer and their environment. These data enable advanced analytics to generate novel insights. Data is standardised, aggregated, stored and continuously updated.

Shared data is automatically de-identified and complies with international interoperability standards.

Empowered Consumer

Consumers are no longer passive participants and drive the pace of change. They expect transparency, convenience and consistent access. In response the health system has adopted a fundamentally patient-centric approach that benefits all consumers, ensuring access across all socio-economic groups.

Behaviour Change

Consumers have more awareness of how to modify diseases by behavior, and co-produce their own care plans. The use of AI, VR, AR, remote care and sensors that are tailored to consumer interests and health status will empower people to take control of their physical and mental wellbeing.

Ethical algorithms govern the nature of interventions.

Access

Traditional barriers to health care access, like geography, lack of resources, and poor digital literacy are overcome due to a radically transformed health system. The cost of wellness and care has reduced thanks to interoperable data and data sharing. All patients have universal access to the tools to achieve wellness and health.

Scientific Breakthrough

Scientific breakthroughs, like stem cells, nanobots, biome sensors, are occurring at an exponential pace, using insights derived from radically interoperable data, orthogonal players that disrupt the market, transformed clinical trials and increased citizen participation with outcomes data drive reimbursements.

Population health management is key to a sustainable future

The future of health also requires a PHM approach which emphasises prevention, reducing health inequalities and improving the health and wellbeing of the entire population. This requires robust interoperable data, analytics and insights about defined populations, across multiple care settings, to identify healthcare needs and align services accordingly. Enablers include the adoption of digital and remote monitoring technologies and improving the health literacy and deploying patient activation measures.[138]

PHM also requires new approaches to funding to replace the existing 'fee for service' payment model with funding models based on value-based healthcare outcomes. These new funding models will, in turn, drive new business models to incentivise traditional and new stakeholders to collaborate across the health system. PHM is crucial to the future of fully integrated where technology will be a key enabler (see Case study 15).

Case Study 15

Royal Wolverhampton partners with Babylon for digital-first integrated care – UK

In January 2020, The Royal Wolverhampton NHS Trust entered into a ten year partnership with digital healthcare service provider Babylon Health to develop a Digital-First Integrated Care' solution Wolverhampton's population of 300,000 patients. The partnership will involve creating a free app that enables patients to take greater control over their own health, access treatment remotely and more easily, enable fewer trips to hospital, and greater access to their own healthcare data. The first new services are expected to go live before the end of 2020.

Through the app, patients will be able to attend clinical consultations with healthcare professionals from The Royal Wolverhampton or Babylon's national network of clinicians, while controlling their own appointment bookings and prescriptions. The aim of incorporating Babylon's national network of clinicians is to increase the staff available to support patients and free up the Trust's clinicians time to spend with more complex patients.

The app provides patients with 24/7 digital access to:

- their own health records and a record of their video or chat consultations
- a `Health Assessment', which generates a health report based on the patients' medical history and lifestyle displayed as a `digital twin'
- an `AI chat-bot', which provides symptom advice and access to medical information
- personalised care plans to provide proactive support to patients with chronic diseases
- a platform, `Monitor', that tracks health information from connected devices in real-time
- `Rehab', a remote monitoring system that can monitor patient's symptoms.[139]

The 4P future of European healthcare systems

The adoption of digital technologies, and the use of datasets from multiple sources is already enabling more precise targeted treatments and will shift health systems toward a future where medicine is personalised, predictive, preventative and participatory (the '4Ps'). Over the next decade, these shifts will have a significant impact on treatments and on patient outcomes, particularly in those areas of medicine with unmet need.

Personalised - treatments will largely be enabled by new ground breaking developments in 'omics' (genomics, proteomics etc). The availability of full genome sequences will allow more precise clinical therapies and speed up drug development. Importantly, susceptibility to diseases will be detected in advance allowing prevention and early intervention. Genomics applications coupled with AI technologies and digital devices for life style and vital sign monitoring, will be at the core of new self-management and prevention tools. In our survey, Denmark is leading the way in the adoption of genomics data, with 14 per cent of clinicians stating that they are already using genomic information in their daily work.

We predict the practicable application of genomics will increase substantially across Europe over the next decade.

Predictive – medicine will be enabled by AI tools and algorithms. AI-enabled early warning systems that alert clinicians to patients at risk of deterioration in the hospital already perform better than existing clinical risk scores. Deep-learning technologies designed for automated image interpretation have shown expert-level performance in medical image analysis.[143] Denmark has successfully applied predictive models by using machine learning to predict patients at risk from infection in chronic lymphocytic leukaemia (CLL) and has designed a prospective study in patients undergoing organ transplants (see Case study 16). The disciplines of radiology, pathology and ophthalmology are also already being improved by AI tools, largely due to the availability of large amounts of digitised data from a number of sources. For example the following predictive studies based on EMR clinical data have been undertaken at Vimercate Hospital in Italy:

- predicting diabetes prognosis through the implementation and application of specific machine learning algorithms
- forecasting the risk of renal failure for patients affected by chronic kidney disease with machine learning techniques
- using a machine learning approach to predict hospital readmission in heart failure of elderly patients.

Preventative – approaches will dominate the management of care with information from wearables (implantables and ingestibles) integrated with EHR data for a tailored detection of any changes to an individual's condition. The ability to detect and monitor conditions outside the clinical space using point-of-care (POC) diagnostics, available 24/7, will be an important feature of the next generation diagnostic tool-kit. Prevention and wellness will focus increasingly on mental health and in delaying age related diseases by improving the immune system. European employers will take a much more active role in monitoring the health and wellbeing of their employees. Cross industry stakeholders will come together to deliver a prevention and consumer focused experience, shifting in the duty of care away from health care institutions, towards more of an employer/consumers responsibility.

Participatory – patient engagement and involvement will drive patient centric models of care and shape the future of European healthcare systems. European governments are already strongly encouraging initiatives to improve citizen's digital health literacy and are equipping patients with digital tools.

The future of work in healthcare

As shown by our survey, clinicians are increasingly positive about the adoption of digital technologies and feel empowered when adequately trained in using them or involved in their development and implementation. Indeed, the majority of European clinicians feel that it will take less than five years from now to achieve a fully digital healthcare system (see Figure 25). Their expectations, based on the top three words they hope to use to describe the system in five years are also largely positive (see Figure 26).

Case Study 16

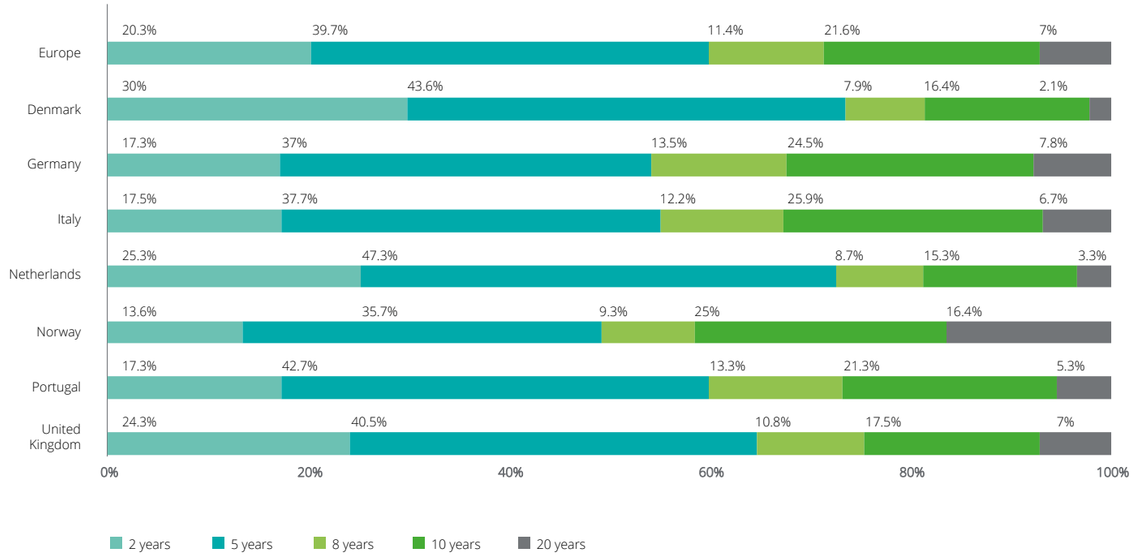
Machine learning-based model to identify patients at risk of infection – Denmark

In Denmark, University Hospital - Rigshospitalet, is using machine learning (ML) to identify patients at risk of infection with chronic lymphocytic leukemia (CLL) due to immune dysfunction. This is based on an ensemble algorithm called CLL-TIM, encompassing 28 algorithms trained on data from 1,800 variables in 4,149 patients with CLL and externally validated. The model is capable of dealing with heterogeneous data, including the high rates of missing data seen in the real-world setting, with a precision of 72 per cent and a recall of 75 per cent in an independent validation cohort. The use of the complex CLL-TIM algorithm provides explainable predictions with uncertainty estimates and personalized risk factors and is prospectively being tested in the PreVent-ACaLL trial.

The model is capable of dealing with heterogeneous data, including the high rates of missing data seen in the real-world setting, with a precision of 72 per cent and a recall of 75 per cent in an independent validation cohort. The use of the complex CLL-TIM algorithm provides explainable predictions with uncertainty estimates and personalized risk factors and is prospectively being tested in the PreVent-ACaLL trial.

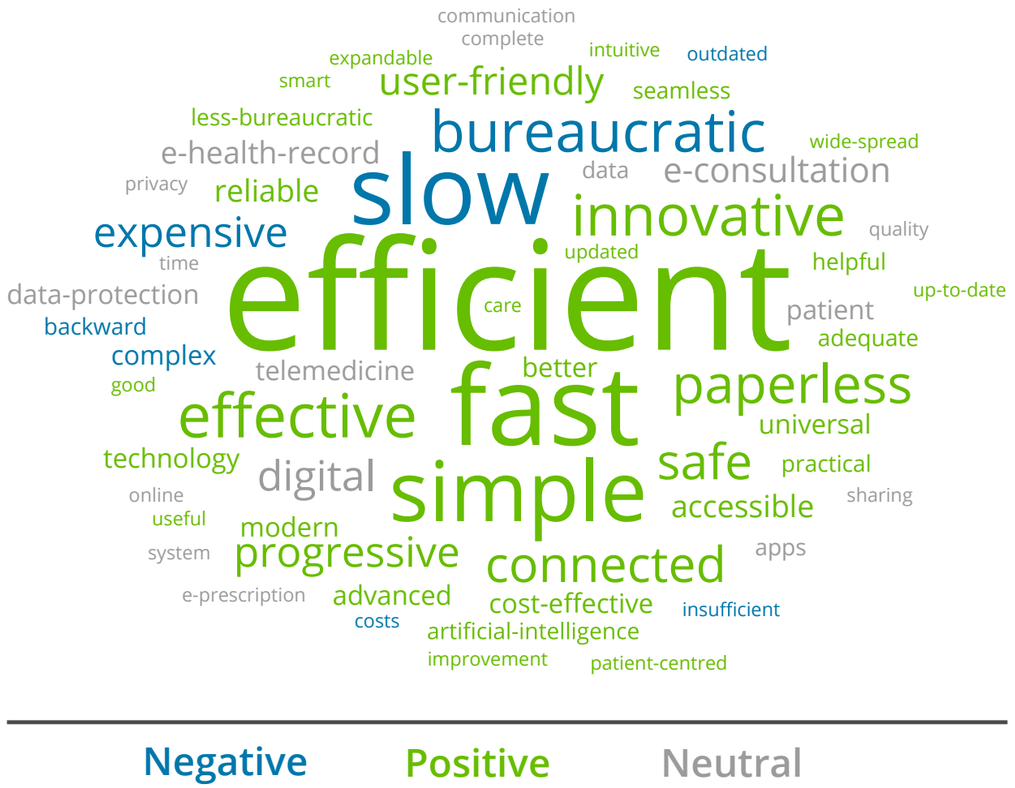
University Hospital - Rigshospitalet in collaboration with PERSIMUNE, are currently conducting a prospective observational study through enrolment of around 170 adult patients undergoing solid organ transplantation. They plan to perform a complete immunological profile on the recipients. It is expected that this will generate prediction models identifying patients at increased risk of infection and/or rejection. If the study is successful, they will use these prediction models to propose personalized immunosuppressive regimens for randomised controlled trials.[140,141,142]

Figure 25. How long will it take for your organisation to become a fully digital organisation?



Source: Deloitte 2020 survey of 1,781 clinicians conducted by M3Survey question: How long do you think it will take your organisation to become a fully digital organisation (paperless)?

Figure 26. Thinking about your country's healthcare system in five years from now, what three words would you hope to use to describe the progress of digital transformation?



Source: Deloitte survey of 1.781 clinicians conducted by M3 Global in 2020.
Survey question: Thinking about your country's healthcare system in five years from now, what three words would you hope to use to describe the progress of digital transformation?

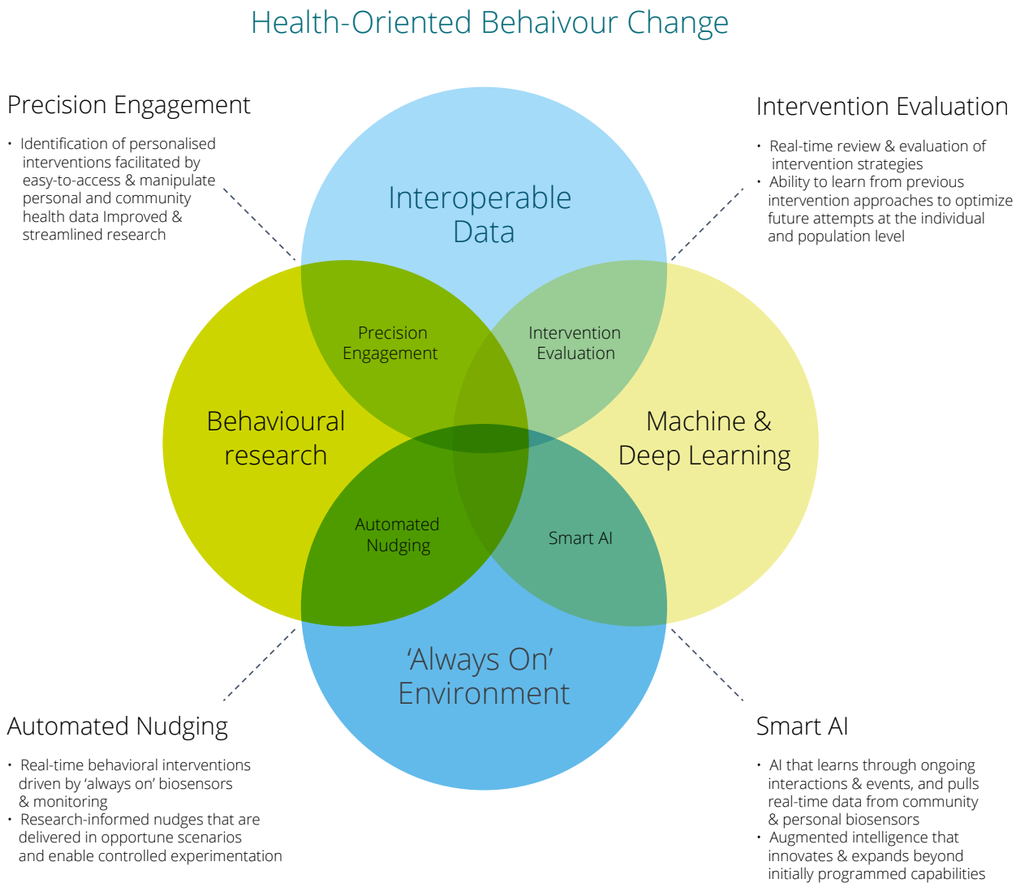
The future of work will require systems that support lifelong learning with flexible education and training systems that can anticipate the skills demanded by the labour market. The transformations in work driven by new technologies means that education and training will have to prepare clinicians more effectively for their new tasks and roles. Investment in continuous skills development will be critical to ensure that effective adoption of AI, telehealth, digital medicine and genomics are met. Clinicians will need to develop additional skills such as interpersonal communication, emotional, social and team building skills. The increase in global opportunities and clinician mobility will increase the need for soft skills still further.[144]

With the rising use of virtual consultations, clinicians will be able to engage remotely and, as long as they meet the countries medical registration requirements, this could potentially enable clinicians to consult from other locations, addressing the current problem of GP shortages for example.

We will see wearables integrating routinely with virtual consultations, providing clinicians with real time vital signs data to help improve the diagnosis and treatment decisions. We will also see more patients diagnosed, reviewed and treated in their home as illustrated by Case study 12 on UTI test at home with antibiotics delivered later that day.

Moreover, the role of clinicians will change dramatically in terms of the kind of work they do, where they do it and how they do it, due largely to a fundamental change in the way clinicians will be supported by robotics, cognitive automation and AI. Clinicians will be able to spend considerably less time on data collection and administrative processes, freeing them up for a more personal approach, to quality and safety and helping patients navigate their own care plans. They will be more agile and flexible less constrained by working for a specific institution. Permanent contracts will be less common, with health professionals working more in networks or district teams, perhaps under their local municipal authority. Meanwhile citizens will become true partners in the 'future of work' empowered by new consumer engagement tactics and true contributors in the future of their own health (see Figure 27).

Figure 27. New consumer engagement tactics will be required to realise the future of health



Alliances and partnerships driving new models of care

New entrants will disrupt the healthcare ecosystem, mainly focused on value creation derived from personalised health data. This will generate insights to improve wellness, immune health, vitality and prevention and facilitate innovative healthcare solutions. New alliances will emerge between these new and existing stakeholders, with health data being a crucial binding factor.

Leading companies in the food industry, retail, financial services and telecommunications will likely redouble their efforts to carve out a role in the new health system, with alliances and partnerships a key success factor. Besides the established technology giants we expect strong growth in start-ups and scale-ups in the health data value chain, particularly in areas like AI.

Meanwhile the digital hospital of the future will be fully automated and digitalised focused on delivering specialised acute and emergency care. Primary care providers will provide the bulk of PHM prevention and chronic care management services, largely through virtual channels. These changes will have a major impact on the education and training of clinicians and decisions around infrastructure, funding and business models.

With ageing posing the greatest challenge to healthcare provision, residential care, nursing homes and home care providers will have an increasingly important role within the health system working in partnership with hospitals and primary care. There will therefore be more emphasis on their digital transformations, generating greater demand for more extensive digital capabilities to keep pace with technological changes, both now and in the future.

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Appendix. Methodology

This report builds on our June 2019 report, 'Shaping the future of UK healthcare, Closing the digital gap' in which we examined the current state of and future potential for digital technologies in healthcare, including the infrastructure and other challenges affecting implementation, and the existing and future solutions that could transform care across Europe. For this report, we focused on seven European countries with a representative number of respondents: Denmark 140, Germany 400, Italy 401, the Netherlands 150, Norway 150, Portugal 140 and the UK 400.

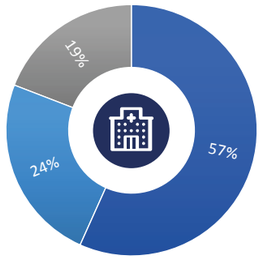
These are diverse in terms of their size (population and geography), and have different healthcare models, thus enabling our research to be representative of digital transformation of healthcare across Europe more widely.

Our methodology comprised: extensive literature reviews; a survey of approximately 1,781 doctors and nurses working across primary and secondary care, conducted on our behalf by M3 Global Research; together with insights from colleagues in the selected countries to obtain evidence based assessments of each countries policies and practices in driving the digital transformation of their healthcare system.

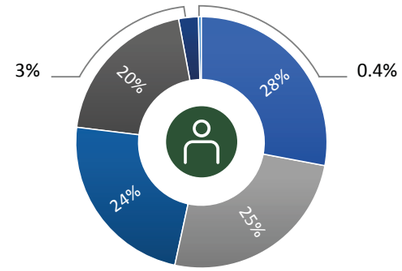
Together, we interviewed key stakeholders in each country, from both the public and private sectors, including: healthcare policy makers, providers, payers, IT and digital technology professionals. We conducted a series of semi-structured interviews with 40 stakeholders to help understand the challenges they faced and identify examples of good practice.

Survey respondent demographics:

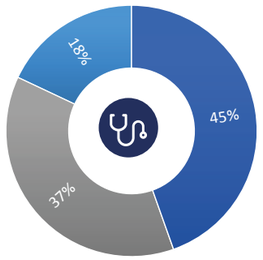
Care Sector



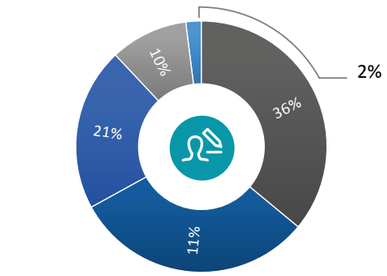
Age



Role



Experience



1 M3 Global Research, part of M3 Inc., provides market research recruitment, data collection, and support services reaching respondents in 248 markets across 70 countries worldwide with a strong emphasis on the healthcare space. Working in highly regulated industries, M3 maintains ISO 26362 and 27001 certifications, providing data collection and project management capabilities covering a broad spectrum of quantitative and qualitative techniques.

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Glossary of abbreviations

Application Programming Interface (API) – is a set of definitions, communication protocols, and tools for building software. In general terms, it is a set of clearly defined methods of communication among various components. A good API makes it easier to develop a computer programme by providing all the building blocks, which are then put together by the programmer. An API may be for a web-based system, operating system, database system, computer hardware, or software library.

Artificial intelligence (AI) – refers to any advanced technologies that enable computer programmable machines and portable devices to complete tasks that normally require human intelligence. It describes machines that mimic 'cognitive' functions that humans associate with other human minds, such as 'learning' 'sensing' and 'problem solving'.

Cross-enterprise Document Sharing (XDS) – an IHE profile dedicated to simplifying the document sharing across healthcare enterprises by providing a standards based interoperability framework focused on the use of a document registry and repository.

Electronic Health Records (EHRs)/ Electronic Patient Record (EPR) – systematically collects patient and population health information and stores them digitally and is at the core of healthcare digital transformation. They can be used for: recording of longitudinal data produced by different clinical visits and by any other related health sources. EHRs can include a range of data, including demographics, medical history, medication and allergies, immunisation status, laboratory test results, radiology images, vital signs, and personal statistics like age and weight. At present the EHRs landscape is fragmented with a wide variety of capabilities.

Electronic Medical Record Adoption Model (EMRAM) – was created by HIMSS Analytics®. It is an eight-stage model that allows organisations to track their digital progress against others around the world. This eight-stage (0 – 7) maturity model measures the adoption and utilisation of functions required for digitisation to support patient care including security, electronic documentation, data analytics and clinical decision support.

Fast Healthcare Interoperability Resources (FHIR) – is an industry standard open API which is being adapted to create APIs suitable for sharing data in health and social care – known as Care Connect FHIR APIs. FHIR builds on the HL7 standards.

Healthcare Information Management Systems Society (HIMSS) – is an international not-for-profit organisation, originating in the United States, which works to improve healthcare through the use of information technology and management systems.

Health Level-7 or HL7 – refers to a set of international standards for transfer of clinical and administrative data between software applications used by various healthcare providers. The HL7 standards are produced by the Health Level Seven International, an international standards organisation, and have been adopted by other standards issuing bodies across the world. Healthcare provider organisations typically have many different computer systems which need to communicate with each other (or "interface") when they receive new information, or when they wish to retrieve information, HL7 specifies a number of flexible standards, guidelines, and methodologies to assist this communication.

Integrating the Healthcare Enterprise (IHE) – a not-for-profit initiative set up to promote the interoperability of healthcare systems by promoting the coordinated use of existing standards by developing frameworks to ease their implementation.

OAuth 2.0 – OAuth is an open standard for authorisation used as a way for Internet users to grant websites or applications access to their information on other websites without giving out a password. OAuth 2.0 provides specific authorization flows for web and desktop applications, mobile phones, and smart devices.

Population health management (PHM) – is a patient-centric, data-driven approach to optimise the physical and mental health of populations over individual life spans and across generations. PHM brings together an understanding of the health needs of a given population using big-data analytics, patient engagement, and health and care insights. PHM requires clinicians to address existing acute and chronic conditions, and to extend their focus beyond the care and treatment of patients with known problems, identifying all the individuals in their patient population who may have potential conditions. A proactive approach is needed to enable healthy patients to remain healthy and to monitor continually the status of at-risk patients.

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