BRIEFING

European Parliament

The rise of digital health technologies during the pandemic

SUMMARY

Coronavirus has accelerated the rise of digital health, a broad concept that includes solutions for telemedicine and teleconsultation, remote monitoring, connected devices, digital health platforms and health apps. The concept also covers the related health data analysis and application in systems based on big data, for instance for epidemiological research and AI-enabled diagnosis support.

Digital technologies are becoming critical in the fight against the ongoing pandemic. They have been used, among other things, for online medical consultations from home and for increasing efficiency in diagnosis and treatment of patients through telemedicine, which, like teleworking and online education, has been a novel experience for many.

Likewise health workers have been using digital technology to diagnose the virus. For instance, China has developed new e-health apps allowing patients to assess their Covid-19 symptoms remotely. Patients with existing critical illnesses, reluctant to go to hospital because of the risk of contracting the virus, have been able to get online consultations from home and have in some cases been monitored remotely. Moreover, thanks to the availability of digital health records and e-prescriptions in many EU countries, it has been possible to issue repeat prescriptions remotely, limiting unnecessary contact between doctors and patients and reducing the chances of exposure to the virus.

Nevertheless, there are many challenges to overcome as advances in digitalisation of healthcare come with drawbacks. They highlight a widening 'digital divide' that risks leaving behind the elderly and socially disadvantaged, who are less able to master or afford the technology. In addition, liability, reimbursement and cybersecurity issues are among the other key challenges that need to be considered, as cyber-attacks on hospitals are on the rise. Meanwhile, the transfer of personal health data is fuelling a debate over who owns and controls that data, raising questions over individuals' rights to privacy. What is clear is that digital health is here to stay.

IN THIS BRIEFING

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How the pandemic has boosted digital health

The digital transformation is rapidly changing our economy and society and touches upon many sectors, including the health sector. According to the World Health Organization (WHO), digital health is an umbrella term encompassing e-health,[1] and also developing areas, such as the use of advanced computer sciences (for example, in the fields of 'big data', genomics and artificial intelligence – AI). For many, while ehealth remains linked to national and regional health programmes, digital health is broader and knows no borders at global level, as it works independently of national health infrastructure. This makes it easier to scale its solutions up, as what works for one patient group will work across country borders.

Digital health and ehealth policies are not new. They have been a strategic EU health priority for years. Even prior to the Covid-19 pandemic, the potential of digital health technologies to make health systems and services more effective was widely recognised. At global level, countries have also indicated the importance of digital health, committing to the WHO's 13th General Programme of Work, for 2019-2023, which recognises digital health as key to realising the vision of transforming the future of public health.

Digitalisation presents benefits for improving healthcare, such as time savings and improved monitoring, but it also brings many challenges to the regulatory and policy framework. While digitalisation has been happening for years, progress has been uneven across the EU. Nevertheless, the pace of change picked up in all countries during 2020 owing to the pandemic, which is accelerating the use of digital technology in many sectors, including the health sector. The pandemic is redefining how and what care is delivered. Digital tools can provide effective support for institutions during a pandemic, allowing the deployment of novel digital healthcare models at different stakeholder levels – from healthcare and research, to government and general population. For instance, since early 2020 countries have rushed to introduce remote health consultations and other telemedicine services at an unprecedented deployment rate. Thus the global telehealth market is expected to reach US$80.53 billion in 2021, as demand grew exponentially during 2020. The market is expected to grow to US$218.5 billion by 2025.

According to investment figures, healthtech start-ups are attracting new users and investment. It is estimated that there are 626 funded digital health companies active across Europe today, and 63 % of them were founded in the past five years. The area receiving the most investment is digital technologies for health providers, including software that helps with daily workflows. However with the ongoing pandemic the situation is also shifting towards investment in companies in the on-demand healthcare services space, which includes telemedicine services, prescription delivery and at-home urgent care.

Telemedicine

In the Covid-19 era, the digital delivery of healthcare has been more important than ever. Digital technologies have been used, among other things, for telemedicine,[2] which like teleworking and online education has been a novel experience for many. According to recent research, about 84 % of patients using virtual care in March 2020 were doing so for the first time. Health workers have also been using telemedicine to diagnose patients remotely. Since the pandemic began, 58 % of countries have been using telemedicine to replace face-to-face consultations, as family doctors' surgeries and hospitals restrict face-to-face contact to essential visits. According to one survey, the majority of European doctors believe that telemedicine is here to stay and will play a significantly greater role in the future.

According to the Organisation for Economic Co-operation and Development (OECD), telemedicine is being used to deliver healthcare in a wide range of specialties, for numerous conditions and through varied means. There is a growing body of evidence that it can improve health outcomes across a range of therapeutic areas such as diabetes,[3] asthma,[4] cardiovascular disease[5] and

ophthalmology.[6] For instance in Germany it has been shown there have been fewer hospital admissions, and a reduction in all-cause mortality for heart-failure patients, along with improved quality of life due to telemedicine interventions. A variety of telemedicine solutions, such as mobile applications, websites, robots and chatbots are providing virtual medical visits and primary care, e-prescriptions, remote patient monitoring and screening in real time, risk assessment and triage prior to hospital admission, as well as the immediate widespread dissemination of information.

In addition telemedicine has allowed medical professionals to collect new data from their patients and to provide new services. Teleconsultations can improve the quality of certain tests and treatments, and give doctors an opportunity to identify potential lifestyle factors in illness, including poor nutrition from the existing food in a fridge, checking thermostats in the household and monitoring background for tripping hazards. Videoconferencing has been helping to diagnose Covid-19 patients in their homes, and has allowed patients to stay in touch with their families when hospitalised, including in intensive care. Patients with pre-existing critical illnesses, reluctant to go to hospital in case they were exposed to Covid-19, have been able to have online consultations from home and have in some cases been monitored remotely by means of digital technology.

With the advancement of 5G and the internet of things (IoT) there will be further developments in interventions, such as the possibility for remote or robot-led surgeries. It is expected that 5G will transport a huge amount of data much faster, reliably connect an extremely large number of devices and process very high volumes of data with minimal delay. For example, certain types of real-time applications, such as remote surgery, would not work with the current 4G technology because of time lag and control delay. The first 5G-enabled human remote brain surgery took place in China in November 2019, with doctor and patient over 2 400 km apart. In 2020, surgeons in Italy tested remote 5G vocal chord surgery on a cadaver.

Teleconsultations

According to industry analysis, the financial market volume of the European teleconsultation market is doubling or tripling every year. This trend is expected to continue as there has been a sharp uptick in teleconsultations as a result of the Covid-19 pandemic. It began with the confinements and restrictions on free movement following the WHO recommendations to stay at home, and the restriction of medical services to emergency situations to avoid the spread of Covid-19 infection. This was particularly important for vulnerable and at-risk health groups with serious or chronic conditions who were more likely to die or suffer serious complications from the virus.

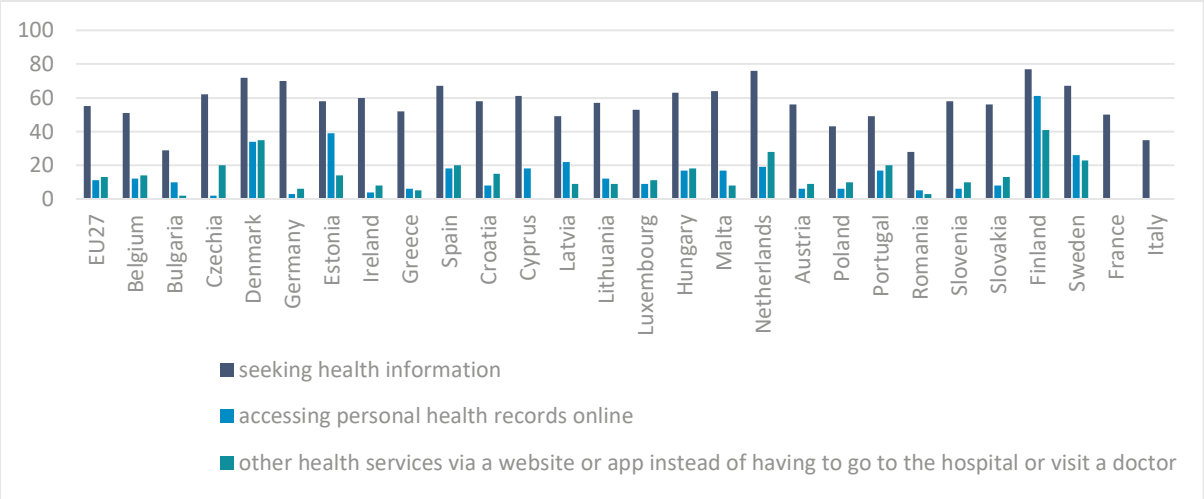
The pandemic has disrupted health systems, causing overloads in demand and pressure on resources. Traditional face-to-face patient–doctor meetings have been replaced in many countries with teleconsultations, although in most cases these have been telephone-based rather than videoconferences. According to the European Patient Forum (EPF), there is still a clear expectations versus reality gap when it comes to telephone consultations and email exchanges.

Teleconsultations have therefore skyrocketed during the pandemic. It is estimated that telehealth examinations comprised 69 % of total ambulatory visits in the US in April 2020. According to media sources, KRY a Swedish digital health provider allowing users to consult with a qualified health professional, has seen demand for teleconsultations double. Demand for Top Doctors in Italy, Spain and the UK has multiplied by 30. AccuRx, another UK provider, built a video chat tool over one weekend in March 2020 and within a couple of months, the software had been used to conduct over one million video consultations and was in use in 6 700 doctors' practices.

Similarly, France has seen an explosion of teleconsultations. In pre-coronavirus times, the national insurance fund recorded and reimbursed about 40 000 teleconsultations per month, a figure that increased more than 10-fold in one week during the pandemic. The requirement to know the patient before the teleconsultation has been waived for suspected Covid-19 patients.

The availability of digital health records and e-prescriptions in many EU countries, has meanwhile made it possible to repeat a prescription remotely, limiting unnecessary contact between doctors and patients and reducing the chances of exposure to the coronavirus. Yet EU statistics show that few patients today access their medical records online or use websites or apps. They use the internet mainly to seek online health information.

Figure1 – Percentage of people (aged 16 to 74) using the internet for health-related activities



Source: EPRS, based on data from the Eurostat ICT household survey 2020; except for Italy and France where data were only available for 2019.

According to the Eurostat ICT household survey, in the EU, 55 % of people aged 16 to 74 searched for health-related information over the internet in the first quarter of 2020, with wide differences across countries. Of all health-related activities, accessing personal health records online and replacing visits to doctors with apps and health websites recorded lower rates, except in Finland and Estonia, which are more advanced in digital health. Online health searches have been increasing during the pandemic and this trend is expected to increase even further in 2021. The European Commission Joint Research Centre (JRC) has been analysing the evolution of EU citizens' Google searches, looking at users' concerns during the pandemic. Over time, searches using the word 'symptom' show a significant increase, particularly in those countries where the Covid-19 outbreak has been more pronounced. There have been also increases in searches for medical equipment (e.g. searches for face-masks and hand sanitiser) and self-care advice (e.g. on physical exercise and nutrition).

Big data and AI

Before the pandemic began, artificial intelligence (AI) solutions were already being used to help healthcare systems handle increasing demand with limited resources, and in advanced data analytics to support scientific research, personalised medicine, early diagnosis of diseases and more effective treatments. It is estimated that the market for AI in healthcare will reach around US$6.6 billion by 2021 and US$8 billion by 2022. There is real AI and machine-learning going on in health, especially in fields such as radiology and cancer screening.

AI is widely deployed to help radiologists with the triage, quantification and trend analysis of patient data. AI can help cancer patients with early diagnosis and personalisation of treatment, using new software developments. For instance, the company Kheiron Medical uses AI to assess mammograms and screen for cancer in a more cost-effective way, in most cases eliminating the need for a second

doctor to analyse the X-ray. Similarly, the company Methinks cuts down assessment time for stroke patients by using AI to analyse preliminary CT scans.

Some European health start-ups using AI include France-based Cardiologs, which helps healthcare professionals screen patients for heart disorders, and the UK's Healthily (formerly Your.MD), which uses AI to help users check their symptoms before deciding to see a doctor.

The transfer of personal health data is meanwhile fuelling a debate over who owns and controls that data: the patient, the healthcare provider, the state or the companies that collect it. Sharing sensitive data raises questions over individuals' rights to privacy. Yet according to the EPF, patients are comfortable and willing to share their health data. Patients understand its vital importance for advancing health research, helping other patients, and ultimately benefiting society.

In parallel to AI, the range of connected devices enabled by the IoT continues growing rapidly. The number is forecast to almost triple, from 8.74 billion in 2020 to more than 25.4 billion IoT devices in 2030, generating even more big data for analysis and smart applications. These devices are used in all types of industry verticals and consumer markets, with the consumer segment accounting for around 60 % of all IoT connected devices in 2020. The country with the most IoT devices is China, with 3.17 billion devices in 2020.

Among the verticals, healthcare is the fastest-growing IoT market in Europe. Applications for active and healthy ageing in particular are quickly gaining in popularity. Healthcare is increasingly linked to big databases and medical advice is provided by doctors supported by artificial intelligence and big data analysis, IoT, machine learning and robotics. Examples of better aging applications include health-specific personal wellness, such as wearable heart-rate, glucose level and blood pressure monitors, and telehealth systems that exchange medical information between sites, medical professionals and patients. Monitoring technology such as wearables to track body temperature and heart rate can help people do more at home, reduce the need for doctors' visits, and save costs. Moreover with the help of connected sensors, regional hospitals can track hospital beds, ventilators, lifesaving machines and decrease time spent locating equipment.

In addition to the IoT, there is a rapid proliferation of mobile health solutions (i.e. mobile apps, mobile sensors, mobile data collection forms, etc.) as an increasing number of patients own a smartphone. According to the Commission there are more than 3 000 mobile health (m-health) apps on the EU market. This number is double what was in 2015. The US m-health app market is expected to grow to US$50 billion by 2025. According to industry estimates there are over 100 000 health and wellness apps available, but only a few of a significant size and funding, as most still lack a sustainable business model. The wearable electronics market is expected to grow to €53 billion by 2025, but is dominated by smartwatches.

Monitoring Covid-19 using digital technologies

Health information and digital health solutions are playing a key role in helping cope with the ongoing pandemic. Epidemiological surveillance, based on real-world data and AI, together with telemedicine and mobile health applications, are all contributing positively to the resilience of the health service delivery system.

AI analytics tools are helping health professionals to cope better with the pandemic. These technologies have been a key part of most of the global response to the health threat. AI and high-performance computing help public health sectors to monitor the spread of the coronavirus and quickly devise effective response strategies. In the healthcare industry, AI also plays a part in powering the robots and other tools used when coming into contact with patients, as human interaction must currently be kept to a minimum.

Asian countries such as China and South Korea have used digital technology to impose restrictions on movement. According to media sources, this has led to ambivalence towards their application in the West on account of concerns that data could be passed from public health officials to the police,

or sold to companies such as insurers. China, for instance, established a quick response (QR) code system, in which individuals are required to fill out a symptom survey and record their temperature, allowing authorities to monitor health and control movement. The QR code serves as a Covid-19 health status certificate and travel pass, with colour codes representing low, medium, and high risk; individuals with green codes are permitted to travel unrestricted, whereas individuals with red codes are required to self-isolate for 14 days. Apps have also been developed to allow patients to assess their Covid-19 symptoms remotely. In addition China uses AI-powered surveillance cameras, drone-borne cameras, and portable digital recorders to monitor and restrict the gathering of people in public. In fact AI is one of seven[7] strategic areas on which Beijing is planning to focus over the next five years, aiming to become the world leader in AI by 2030.

Likewise South Korea has integrated digital technology into government-coordinated containment measures, including surveillance, testing, contact-tracing, and strict quarantine, which some associate with the flattening of South Korea's Covid-19 incidence curves.

Most EU Member States (except for six) have launched a national contact-tracing and warning app that can be used on a voluntary basis. Some of them are working jointly with the EU's Covid tracing app project, that allows national apps to talk to each other and exchange information (see below). Some EU countries have also launched other digital measures. Germany has launched a smartwatch application that collects pulse, temperature, and sleep pattern data to screen for signs of viral illness. Data from the application are presented in an online, interactive map from which authorities can assess the likelihood of Covid-19 incidence across the nation.

AI-powered medical imaging is also playing a significant role in the fight against Covid-19, easing the pressure on healthcare systems. Although AI imaging as a diagnostic tool is still associated with various challenges and uncertainties, its use in the context of Covid-19 has assisted clinicians with its faster image-processing times – as little as 10 seconds compared with up to 15 minutes for a manual reading of a computerised tomography (CT) scan.

AI medical imaging models have been deployed in a number of hospitals around the world. The US Food and Drug Administration (FDA) has authorised the use of AI algorithms that detect Covid-19 in partially imaged lungs as an incidental finding, whereas the EU is funding the 'imaging Covid-19 AI initiative', a multi-centre European project, to enhance the use of CT in the diagnosis of Covid-19 by using AI. Three powerful European supercomputing centres are meanwhile engaged in studying and developing vaccines, treatments and diagnoses for the coronavirus.

Many countries worldwide are also collaborating in Covid-19 epidemiological research in an unprecedented way. Epidemiologists and researchers are running multiple models to predict the spread and burden of the pandemic and inform governments about appropriate measures to adopt. An example is the European Covid-19 Data Platform, set up in April 2020 to enable the rapid collection and sharing of research data, and part of the Commission's ERAvsCorona action plan.

Digital technology has allowed discoveries about the virus to be quickly shared around the world. There has been a willingness to cut through the international red tape that normally restricts data-sharing between countries. This has enabled scientists to exchange genetic sequences from the virus to track how it has spread, allowed doctors to learn how to spot the symptoms of Covid-19 infection quickly, and given hospitals the ability to share the best ways of treating the disease. Pharmaceutical companies and researchers are also using the information about the virus and patient immune responses to be able to develop potential vaccines and drug treatments rapidly.

Electronic cross-border health services

The EU has been aiming to deploy some digital health services across the EU for over a decade. The April 2018 Commission communication on enabling the digital transformation of health and care in the digital single market set out a plan of action to accelerate 'citizens' secure, cross-border access to their electronic health records and the possibility of sharing their records across borders'. This approach will provide the basis for EU cross-border digital health services, such as support for the

exchange of e-prescriptions and electronic patient summaries, and eventually enabling the cross-border exchange of full electronic health records. To this end, the Commission has established the eHealth Digital Service Infrastructure (eHDSI), a secure infrastructure ensuring continuity of care for European citizens while they are travelling abroad in the EU. One of its priorities for the 2019-2025 period is the creation of a European health data space to promote better exchange of digital health data such as electronic health records (EHRs) or e-prescriptions. The aim is that by 2025 all patients from all Member States will be able to share their data with the healthcare professionals of their choice when traveling abroad. The following two electronic cross-border health services are currently being introduced in all EU countries (but have so far been implemented in only a few).

e-Prescription

ePrescription (and eDispensation) allows EU citizens to obtain their medication in a pharmacy located in another EU country, thanks to the online transfer of their electronic prescription from their country of residence to their country of travel. At present, cross-border e-prescriptions only work in four Member States (Croatia, Finland, Portugal and Estonia).

Patient summaries

A patient summary provides information on important health-related aspects such as allergies, current medication, previous illness and surgery. It is part of a larger collection of health data referred to as an electronic health record (EHR). The digital patient summary can provide doctors with essential information in their own language concerning the patient, when the patient comes from another EU country and there may be a linguistic barrier. In the long term, medical images, lab results and hospital discharge reports will also be available across the EU, with the full health record to follow later on. According to the EPF, much more effort is needed to ensure that all patients who so wish can access their EHRs easily and freely, that the availability and interoperability of such systems is improved across Europe and within countries, and that EHR contents are co-created with patients to ensure they are understandable and contribute to greater patient empowerment.

Covid-19 tracing apps digital gateway

In April 2020 the Commission adopted a recommendation to support the gradual lifting of coronavirus-containment measures by means of mobile data and apps. As mentioned earlier, most Member States have launched a national Covid-19 contact tracing and warning app. The EU digital gateway was launched to ensure the communication of information between national apps across borders so that users could be warned when abroad if they had been in contact with someone who had indicated that they had tested positive for Covid-19. Three national apps (Germany, Ireland, and Italy) were linked on 19 October 2020 when the system came online. In total, 20 apps based on decentralised systems could become interoperable. Progress to date has been limited however, as less than half the Member States have registered with the service. Contact-tracing and warning apps are only used voluntarily and respect users' privacy as per the agreed specifications. The information exchanged is kept to a minimum and it is fully pseudonymised, encrypted and only stored in the gateway for a maximum period of 14 days.

Digital green pass

In March 2021, the European Commission presented a proposal for a digital green certificate to act as an EU-wide vaccine passport to prove that a person has been vaccinated against Covid-19. It would also carry the results of tests for those who have not been able to get a vaccine yet or do not want to get one and/or other information on Covid-19 recovery, the aim being to gradually enable citizens to move safely in the EU for work or tourism. The proposal is not free of controversy according to media sources however. Most countries whose economies are based on tourism have welcomed it, while others are more reluctant to divide and potentially restrict EU citizens' right to free movement. This is the view of the World Health Organization, along with countries including France and Belgium, which consider that the solution could be discriminatory.

Challenges

Despite good progress there are many challenges to overcome as advances in the digitalisation of healthcare come with drawbacks.

Increased investment needed

Digital health solutions such as telemedicine based on 5G will require substantial and robust new infrastructure. Compared with other industries, however, healthcare was lagging behind in digitalisation prior to the pandemic. Countries were not therefore prepared for the high demand and there have been challenges relating to the limited digital health infrastructure and technical resources available. According to one survey, the average European healthcare provider organisation spends only between 2.9 % and 3.9 % of their total annual expenditure on digital products and services. Yet several big tech firms are trying to get involved in digital health, especially in the US, as evidenced by Google's 2019 acquisition of Fitbit for US$2.1 billion. Google for instance has launched Google Health and Google Fit investing massively in healthcare-centric AI. Likewise Apple in the US has expanded the functionality of its products, such as the iPhone and Apple Watch, to increase its offering on the provider side with ResearchKit and Health Records. The company is currently working on its own health benefits platform. Amazon meanwhile has acquired Health Navigator, a start-up offering symptom searches and digital triage tools and is planning to revolutionise healthcare.

The global pandemic may cause digital health investment trends to shift, however, due to the economic crisis that it is causing together with the increased public debt.

Digital divide

The coronavirus crisis is showing that the digital divide is a reality for 3.5 billion people who cannot access the internet at all. Only just over half of the global population is connected, with people in poorer regions far less likely to be online, along with women, elderly people and those living in remote and rural areas. Moreover of those who are connected, over 90 % access the internet via mobile devices that might not be appropriate for digital health services delivery. Therefore many countries on the losing end of the digital divide cannot benefit from the advantages offered by digital health treatments. In the EU, despite basic broadband being available for all since 2015, there is a geographical urban-rural digital divide in terms of the quality and affordability of broadband networks. There is also a digital divide in terms of usage for those who are digitally illiterate or have low skills, which risks leaving behind the poorest, the elderly and others less able to use technology. Inequalities in health, purchasing power and digital literacy mean that the patients that stand to benefit most, such as the elderly, disabled and retired, are also often those that are least able to access and make use of telemedicine. Some research has shown that those using digital health tools, especially wearables, tend to be wealthier and are more likely to belong to the 20 to 40 age group. That means that the current data collected by digital health tools is concentrated on a small part of the population, and affordability and usability issues might hinder their take up. Broadly speaking, reimbursement is one of the key barriers to the adoption and wide dissemination of digital health.

The EPF has strongly advised the Commission to develop a patient empowerment strategy encompassing (digital) health literacy as part of its strategy on data, and further address the issues around user-awareness and acceptance of digital health services. Patients aside, there is also an e-skills gap among health professionals that needs to be addressed.

Cybersecurity

Cybersecurity incidents have been on the rise since the start of the pandemic. Now more than ever, healthcare is a target for malicious actors who have been introducing more advanced phishing campaigns and ransomware attacks. As 5G is deployed and there are more connected devices, the situation may become even more complex and critical.

ENISA, the EU Agency for Cybersecurity is currently working on several studies and with a number of working groups to improve the situation. Given that healthcare services have been recognised as a critical sector, their protection from cyber-attacks will also be considered under the ongoing review of the NIS Directive.

Mobile digital health apps store sensitive and personal data, as well as medical prescriptions and other certificates. They connect users to appropriate services and act as communication hubs. Their security is another area under close watch that requires protection.

Privacy, liability and data protection

Concern is also growing over the convergence between confidential medical data and consumer health applications. Questions raised include whether patients should benefit from any profit when their data is sold and whether citizens have a societal obligation to share their data with researchers. Some caution against undermining quality of care with teleconsultations and the possible erosion of people's privacy with applications such as fitness trackers. There are also important concerns relating to the use of digital technology to fight the pandemic. The European consumer association, BEUC, has raised legal and ethical issues triggered by the digitalisation of healthcare that need to be tackled. Not least among these is data protection and privacy in relation to digital tracing apps. For instance, Google's 'Project Nightingale' was found to be amassing health data on millions of US citizens without their permission. There is also the issue of not creating lock-in effects in cloud computing services and protecting the data privacy of health data. In this area, the EU is working on the GAIA-X project. Its goal is to create a secure system to bring together existing cloud providers and their services and ensure data and applications can be handled in such a way as to enable users to retain full control.

In terms of liability, many questions remain regarding who is to be blamed for faulty digital systems. Many of these issues have still to be considered in the context of new or updated legislative proposals on product liability responsibility regarding AI for instance.

What the EU is doing

For many years the EU has been supporting ehealth strategies and action plans, the most recent covering the 2012-2020 period. Based on the existing Cross–border Healthcare Directive, Member States collaborate through a voluntary network connecting national authorities responsible for eHealth (the 'ehealth network'). 'A Europe fit for the digital age' is one of the six political priorities of the Commission for the 2019-2024 period, and the EU's digital transformation has been identified as a priority for unlocking future growth. The 2018 communication on the digital transformation of health and care in the digital single market includes measures to enable people to access and share their EHRs, to pool data across Europe to boost research and spur the development of personalised medicine, and to scale up digitally enabled person-centred care models.

More recently the EU put forward EU4Health 2021-2027, investing €5.1 billion in response to the pandemic, which has had a major impact on medical and healthcare staff, patients and health systems in Europe. The areas for action again include the digital transformation of health systems.

The Commission's digital decade targets include the digitalisation of public services by 2030, with all citizens having access to their EHR and 80 % of citizens using some form of e-ID. The Commission is working to improve cross-border EHR interoperability to this end.

The Commission has also presented Europe's Beating Cancer plan, a very comprehensive strategy to prevent and fight the spread of cancer, with a focus on using digital technologies such as AI and high-performance computing.

When it comes to funding instruments, in addition to the structural funds there is an increasing level of funding dedicated to digital health, for instance under Horizon2020, the digital Europe programme, EU4Health, and the Recovery and Resilience Facility.

In its resolution of 18 December 2019 on enabling the digital transformation of health and care in the digital single market, the European Parliament underlined the need to take full account of data privacy, security and accuracy and to integrate patients' needs when implementing digital health components. It also emphasised the importance of compliance with EU data protection legislation as a precondition for the digital transformation of health and care in the digital single market.

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ENDNOTES

1 According to the WHO, the term digital health covers a range of activities, including: (1) electronic health records (EHR) and standards underpinning the exchange of data; (2) mobile health apps for monitoring and prevention;(3) public health portals that provide transparent access to an individual's personal health records and contacts with the health system; (4) telemedicine; (5) integrated care delivery; (6) clinical decision-making support tools in primary care; (7) robotics; (8) personalised medicine; (9) nanotechnologies; and (10) artificial intelligence (AI).

2 Telemedicine refers to healthcare service provision from a distance – teleconsultation, teleradiology, telesurgery, etc.

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7 The others are quantum computing, integrated circuits, genetic and biotechnology research, neuroscience and aerospace.

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