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Digital Healthcare in the Context of Challenges and Opportunities of Technological Progress in the Countries of the European Union

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ABSTRACT

The objective of the article is to investigate the theoretical and practical aspects of digital medical care in the context of the challenges and opportunities of technological progress, and to outline the main guidelines for the development of digital technologies in the field of Medicine. The methodology consists in the use of a systematic method, which offers the achievement of sustainable development of digital technologies of medical institutions; the proposal is based on the adaptability and flexibility of the management structures of medical institutions, capable of using the available data and digital technologies to provide assistance to the population; a synergistic method based on self-organization and the search for the bases of self-organization, which can help medical institutions to overcome the crisis and instability. The study shows that the digital change is increasingly visible in Medicine. Thanks to digital technologies and tools in Medicine, particularly through eHealth technologies, prevention, diagnosis, treatment, monitoring and administration have been improved. The problems of digitization are discussed not for themselves, but for the improvement of medical care, digital health in the context of the challenges and opportunities of technological progress, the formation of a new concept of digital technologies in the field of health.

KEY WORDS: Digital technologies, medical field, digital healthcare, artificial intelligence, data management, innovations.

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La salud digital en el contexto de los retos y oportunidades del progreso tecnológico en los países de la Unión Europea

RESUMEN

El objetivo del artículo es investigar los aspectos teóricos y prácticos de la atención médica digital en el contexto de los desafíos y oportunidades del progreso tecnológico, y esbozar los principales lineamientos de desarrollo de las tecnologías digitales en el campo de la Medicina. La metodología consiste en el uso de un método sistemático, que ofrece el logro del desarrollo sostenible de las tecnologías digitales de las instituciones médicas; la propuesta se basa en la adaptabilidad y flexibilidad de las estructuras de gestión de las instituciones médicas, capaz de utilizar los datos disponibles y las tecnologías digitales para brindar asistencia a la población; un método sinérgico fundamentado en la autoorganización y la búsqueda de las bases de la autoorganización, que puedan ayudar a las instituciones médicas a superar la crisis y la inestabilidad. El estudio demuestra que el cambio digital es cada vez más visible en la Medicina. Gracias a las tecnologías y herramientas digitales en Medicina, en particular a través de las tecnologías eHealth, se ha mejorado la prevención, el diagnóstico, el tratamiento, el seguimiento y la administración. Los problemas de la digitalización se analizan no por sí mismos, sino por la mejora de la atención médica, la salud digital en el contexto de los desafíos y oportunidades del progreso tecnológico, la formación de un nuevo concepto de tecnologías digitales en el campo de la salud.

PALABRAS CLAVE: Tecnologías digitales, campo de la Medicina, sanidad digital, inteligencia artificial, gestión de datos, innovaciones.

Introduction

Digital health, including artificial intelligence, health data management, the growing use of telemedicine and much more, is an important and relevant topic for Member States of the WHO European Region in the field of digital skills of health personnel. Therefore, the main task is to develop a health workforce capable of using digital technologies. The COVID-19 pandemic has highlighted the importance of developing a health workforce that is able to adapt to a rapidly changing environment and use available data and digital technologies to provide care to the population. However, while the need for standardised approaches to developing the digital skills of health professionals in the European Region has long been recognised, best practices in this regard have not yet been established. Assistance to countries in using digital technologies to improve health service delivery is needed. The WHO/Europe Data and Digital Health Programme coordinates a leading initiative on digital health. It provides technical advice, guidance and expertise on the safety and effectiveness of

digital health solutions, while upholding equity, gender equality and human rights as fundamental human values. The program's activities support countries in using digital technologies to improve the interaction between people and health services, which aims to improve the performance of health systems, contribute to strengthening the basic functions of public health, such as disease monitoring, early warning and risk assessment, develop the skills of health workers in the field of digital technologies in terms of policy, research, education and clinical practice. The main challenge is to integrate digital skills into current health workforce training practices (initial and continuing) to prepare them to use digital health technologies today in their roles as well as in the digital future of health and care.

New technologies are finding their way and starting to change the hospital in the long term. Starting with the automation of previously analogue processes to "true digitisation" and the use of artificial intelligence, we are now experiencing numerous innovations. The hospital is becoming more and more networked, both internally and externally. A good example of this is the transfer of ECG data from ambulances to emergency departments, digital platforms for discharge management or, for example, networked communication with laboratory suppliers. The arrival of robotics will be particularly prominent. Whether it is an autonomous medical trolley or a humanoid robot: healthcare professionals are getting new tools for everyday life. It is important to take patients and employees with them. For example, a well-designed digitalisation strategy can help to identify and act on challenges. We should not forget one thing: digitisation is not an end in itself; instead, we want to make our processes and structures more efficient with digital technologies, data and solutions and create added value for the people we work for".

Many questions are raised: What technologies are currently being used and how do big health data sets help in diagnosis? What brings real help to patients? What are the chances to assess the state of human health? How much data is protected? The new digital strategy of the United Nations Development Programme (UNDP), a United Nations agency established by the General Assembly resolution of 22 November 1965 through the consolidation of the United Nations Expanded Programme of Technical Assistance and the Special Fund, supports efforts to help countries to build inclusive, ethical and sustainable digital societies. UNDP also recognizes that digitalization will continue to change the way the organization responds to the monumental challenges our world now faces. This includes

harnessing its power to combat climate change and restore the natural world. It will also complement the United Nations' many global efforts to increase the digital capacity of vulnerable and marginalized groups, including women and people with disabilities. In many ways, this strategy will make the organization ready for current and future technological change, including finding ways to enhance the digital experience of our staff. This digital strategy demonstrates that UNDP is refusing to stand still and, guided by the Sustainable Development Goals, continues to provide cutting-edge development assistance at a critical time for people and planet.

According to the study, there are five innovations in particular that will shape the future of healthcare: 1) Artificial Intelligence (AI): examines digital health data and can recognize patterns with a high level of accuracy. This technology can provide valuable services in diagnosis and decision making and we see great potential in applications that support doctors in their work rather than replace them. Artificial intelligence can help, for example, to adapt treatment pathways to the current state of science and individual patient symptoms. In addition, there are areas of indications such as dermatology or ophthalmology where AI can support the doctor in making a diagnosis." 2) Big data: provides an opportunity to determine the risk of disease earlier and personalize treatment. 3) Telemedicine: allows for monitoring, diagnosis and therapy at different geographical distances, facilitating, for example, the use of services of well-known specialists and the provision of medical care in rural areas. Such digital consultation hours are particularly recommended for introductory appointments, check-ups and follow-up examinations. 4) eHealth: This is a collective term for all programs that rely on new information and communication technologies to deliver health care. 5) Robotics: currently used mainly in the form of assistance systems, but in the future it will be increasingly integrated into operating rooms and care. According to Bitkom, there is another trend: 6) 3D printing: This is an umbrella term for all manufacturing processes in which material is applied layer by layer to create three-dimensional objects. The majority of doctors expect that organs such as gastric implants, skin slices or cartilage will be created using a 3D printer in the future. More than half also expect that animal experiments will be replaced by experiments on 3D printed cell structures. Medicine 4.0 has already become a reality in other countries. Many of the developments described here may still sound like science fiction, but their breakthrough and widespread use will develop at an

astonishing rate in the coming years. After the emergence of modern medicine in the 19th century, its mechanization in the early 20th century, the introduction of IT and the increasing automation of certain tasks in the 1980s, many countries are now in the fourth stage of the development to the so-called medicalization. 4.0 has arrived. They have successfully integrated health care with the help of information and communication technologies so that important information can be shared between providers. Furthermore, in many places (semi-autonomous systems) are taking over more and more tasks in everyday medical life. Of course, it would be wrong to categorically reject any progress in the field of digital technologies. But it is also wrong to just uncontrollably and uncritically agree to every step of modernization. For example, we need medical fields that have been further digitally developed, we can support mobility in old age with semi-autonomous driving, but we should not give others access to our driving profile. Ultimately, it is about the human image in the digital world: about preserving dignity, freedom and self-determination.

Health requires a good user experience and a high level of security. In eHealth in particular, many successful use cases show what is already possible today, from prevention and diagnosis to treatment, monitoring and administration. The digitalization of medicine makes it easier for patients, saves doctors' time that can be invested in treatment, and significantly advances medical research through the analysis of collected data. One of the biggest implementation obstacles that the healthcare system in this country has to contend with is the numerous siloed solutions that make cross-sectoral networking difficult. Digitization also carries risks, as the use of sensitive data makes patients potential victims of cybercriminals. There is also concern that the personal connection between doctors and their patients may suffer, and as a result older people in particular may become increasingly isolated. To address the challenges of secure electronic exchange of patient information, the federal government is creating a framework based on the highest security standards: the telematics infrastructure. In addition, when choosing an IT service provider, stakeholders in the healthcare sector should make sure that they guarantee secure applications and that data is stored in certified data centers.

Regarding the relationship between doctors and patients, it should be emphasized that apps and wearable devices should not - or cannot - completely replace visits and personal conversations. They serve as supplements that allow for better and more

comprehensive treatment. In order to accomplish this task, they must not only simplify and speed up processes, but also be easy to use. Ultimately, in healthcare it is no different from all other areas of life: to be successful, a digital product must be accepted by users and used with pleasure. Numerous studies have shown that an excellent user experience is crucial here. Digitalisation offers a wide range of opportunities for social work: digital technologies can strengthen the self-determination of those in need of care, facilitate the participation of people with disabilities, relieve the workload of care staff and caring relatives and make work processes more efficient. Many things are only at the testing stage, and already clear simplifications in care can be felt through "mobile data collection" in outpatient services. In addition, the Diakonisches Werk Württemberg is working on the social services platform "live with us", which is an easily accessible offer of advice, mediation and information for the elderly and caring relatives. Part of our strategic orientation is to promote the digitization of society for the benefit of people. The vulnerable life situation of the people supported by Diakonie requires special efforts in the areas of data security, information self-determination and training in new technologies. The heart of the Diakonia's social work will continue to be the meeting between people. Only specialists can be responsible for the quality of social work. Digitalization should create space for human commitment. Aspects of rationalization are legal, but decisions on the use of digital technologies should be based on the human need of the people in need of support.

According to the digital association Bitkom, digital technologies such as implantable microchips, custom-made medicines and surgical robots will definitively change medicine and the healthcare industry over the next ten years. The study surveyed 102 health experts. Most respondents believe that digital technologies can bring great benefits to health and healthcare. Of those surveyed, 80 percent believe that digital technologies can help defeat diseases such as cancer. In addition, almost 70 percent believe that digital technologies extend people's life expectancy. Almost as many believe that digital technologies will improve medical prevention in case of diseases. The consequence of this will be that we will live longer and healthcare costs will decrease. Today, it is already common to measure vital signs with a fitness tracker, which motivates people to do sports more and more. In addition, many people now check their cardiac output with an app that can even give warnings in case of bad values. And there are other possibilities when it comes to digitalization when it comes

to healthcare. Thus, one of the main tasks of ethics is to keep in mind the dignity and well-being of the human being, as well as the importance of trust, which is fundamental to health, i.e. the physical, mental and social well-being of the individual. Formalized data protection, for example, is no substitute for trust based on intrinsic values that people's data are handled with care and respect. Thus, ethics must also ensure that the "smart" patient is not overwhelmed in a jungle of options, decisions and largely anonymous co-determinants. This becomes all the more important the more we are talking about sick people whose power is limited. The digital revolution also creates values and expectations about the perfection of the human body and life. The challenge for ethics is to ensure that the enormous opportunities that are opening up do not become a "tower of Babel", but are realized with modesty and care. Not everything you can do makes sense from an ethical point of view. Thus, ethics helps to prevent the destruction of borders. Therefore, ethics should be increasingly introduced in all healthcare training courses. Coaching and other ethical support close to people should come to the fore in everyday health care".

1. Objectives

The object of research is digital health care as a complex social phenomenon and a dynamically changing development process.

2. Materials and Methods

The methodology consists of using: 1) systematic method that offers the achievement of sustainable development of medical institutions' digital technologies; 2) Agile methodology, based on the adaptability and flexibility of the medical institutions' management structures, which are able to use available data and digital technologies to provide assistance to the population; 3) synergetic method, based on self-organization and the search for self-organizing principles, which can help medical institutions to overcome the crisis and instability.

The study proves that digital changes are becoming more and more noticeable in medicine. Thanks to digital technologies and tools in medicine, in particular eHealth technologies, prevention, diagnosis, treatment, monitoring and administration have been improved. To make sure that the benefits of digital technologies for people are as great as possible and the risks are low, it is important to use the digitalization of medicine to better

care for patients and gain significant competitive advantages for healthcare institutions and organizations. The methodology of the study helps to understand the future medical trends such as personalized medicine, telemedicine and diagnostic procedures with the help of IT, shows that there are many other medical procedures that can be developed or optimized. The study used a statistical method to show 40 percent believe that robotic surgeons could be used in everyday life in the future. Digital surgeons are already being used for urological interventions to reduce incisions and thus improve wound healing. Almost 50 percent of respondents suggest that therapeutic systems consisting of medicines and digital products such as apps will help patients take them in the future. And the same number expect that the production of prostheses and implants on a 3D printer will become commonplace. Also in ten years, implanted microchips for taking medications will become part of doctors' daily lives. But doctors will remain important in the future when it comes to uninterrupted treatment. Digital technologies will not be able to replace doctors anytime soon. Almost 30 percent of respondents believe that digital technologies will be able to replace doctors. The experience and intuition of many doctors cannot be replaced by microchips, algorithms or robots, according to 93 percent of respondents. Nevertheless, they can be a useful support in the future. Another consequence of digitalization will be a change in business models in the healthcare industry. In the future, pharmaceutical companies will no longer act exclusively as drug manufacturers, but will offer other products and services. Almost 98 percent of respondents now believe that so-called lifestyle products, such as dietary supplements, will account for a significant share of pharmaceutical companies' sales in the future. Even digital products, such as apps that support medication intake, will not soon be unusual for pharmaceutical companies (93 percent). In addition, 82 percent said they anticipate that services such as the evaluation of health data to develop medical dosage forms or to monitor therapy will be offered more frequently. Over 50 percent of respondents believe that evaluating data from social media or apps about the impact and side effects of medications will become a common model in the near future. The study used general philosophical methods - analysis and synthesis, abstraction, generalization, historical and logical analysis, cross-cultural method, in the context of which the comparison was made.

3. Literature Analysis and Problem Statement

In the study we focus on the works of such authors as Voronkova Valentyna; Andriukaitiene Regina "Trends in the development of the philosophy of medicine of the XXI century in the context of foreign experience" (2022); Buhaychuk, Oksana; Nikitenko Vitalina; VoronkovA Valentyna; Andriukaitiene Regina; Malysh Myroslava. "Interaction of the digital person and society in the context of the philosophy of politics" (2022); Nikitenko Vitalina; Voronkova Valentyna; Oleksenko, Roman "Medicine of the future in the context of philosophical reflection" (2022); Nikitenko, Vitalina; Voronkova, Valentyna; Andriukaitiene, Regina; Oleksenko, Roman "The crisis of the metaphysical foundations of human existence as a global problem of post-modernity and the ways of managerial solutions" (2021).

The articles note that the philosophy of medicine of the XXI century is based on the exponential growth and convergence of technologies, based on genomes, stem cells, 3D printers, electric transport, etc. When it comes to medicine, it turns out that the system is more unhealthy than the patients, even the terminology is confusing. At the same time, as a result of this technological convergence, two paradigms are changing. The first is the strengthening of the emphasis from disease to health, the transition from a system that reacts to the consequences to a system that acts proactively and seeks a personal approach to each patient. The next one is to change the management system, use the potential of augmented reality, namely artificial intelligence and exponential growth of information (use of BIG DATA: 10-11). In 2018, the National Institutes of Health at Harvard and similar organizations launched the All of Us project, giving out \$27 million in grants to decode millions of genomes. If they succeed in this, they will be able to grow organs for transplantation, obtain weapons to fight viruses and cancer, cheap medicines and vaccines (pp.10-11). A great importance for our work was provided by Diamandis Peter, Cotler Stevens "The future is closer than it seems. How technology is changing business, industry and our lives" (2021: 320). In the article by Nikitenko, Vitalina; Voronkova, Valentyna; Oleksenko, Roman "Medicine of the future in the context of philosophical reflection". The collection of materials of the III All-Ukrainian Scientific and Practical Conference with international participation "Socioethical and deontological problems of modern medicine (non-medical problems in medicine)" (February 24-25, 2022) is noted that the development of medicine of the future in the context of philosophical understanding is based on cellular medicine, the concept of it appeared in the 1990s after the discovery of stem cells, which were planned to be used in the fight against

diseases. Now this plan provides for the use of other types of cells, not only stem cells, but their essence remains unchanged (pp. 231-234). To determine the competitiveness and strengthening of competition as a result of digitalization of medical organizations and institutions, the works of Afanasyeva, L.; Muzya, E.; Koleva, K.; Oleksenko, R. 2017. "Intercultural dialogue in the context of Ukraine's unification". Ukrainian Studies Almanac, Vol. 21, pp. 15-20; Oleksenko, Roman "Policy of ensuring Ukraine's competitiveness in the world food market in the context of globalization: trends and prospects". Melitopol: Kolor Print (2011); Oleksenko, Roman "Philosophy of market relations. Formation and development in Ukraine in the period of globalization and information revolution: social and philosophical analysis. Kyiv: Knowledge of Ukraine (2013, 367 p.). To determine the directions of digitalization development in healthcare, we used our own research Nikitenko, Vitalina; Voronkova Valentyna; Shapurov Oleksandr; Ryzhova Iryna; Oleksenko Roman "The Influence of Digital Creative Technologies on the Development of Education and Medicine". International Journal of Health Science (2022: 699-708); Kyrychenko, Mykola; Nikitenko, Vitalina; Voronkova, Valentyna; Harbar, Halina; Fursin, Alexandr. 2021. "The search for new forms of personal expression in the era of postmodernism (2021: 248-254); Punchenko Oleg; Voronkova Valentyna; Andriukaitiene Regina. 2018. "Sociodynamics of the globalizing world in its civilization dimension" (2018: 48-60). All these developments allowed to form the concept of digital healthcare in the context of challenges and opportunities of technological progress and to outline the main directions of digital technologies development in the field of medicine.

4. Research result

4.1. Increasing competition as a result of digitalization of healthcare organizations and institutions

But the competitive situation will also change as a result of digitalization. 70 percent of startups assume that their biggest competition will be companies from the biotechnology sector. Only one percent of respondents consider international competitors from the pharmaceutical sector even more important. National competitors rank third with 58 percent, followed by online retailers (39 percent). Online pharmacies are also considered strong competitors (28 percent). In addition, 25 percent consider large companies in the digital industry to be competitors. The respondents stated that strict regulation is an

additional obstacle to innovation (61 percent). Many patients are not yet ready for this step. Many patients are also not ready to spend money on health (56 percent). In addition, many patients indicated that the lack of IT specialists in this area is another obstacle (38 percent). Other obstacles include lack of capital for research and development (27 percent) and overly strict data protection regulations (20 percent). 43 percent of the companies surveyed are positive about the future of German pharmaceutical companies. Almost 10 percent even believe that German companies will become world leaders in this field. When it comes to digital innovation, the pharmaceutical industry will be in the middle (39 percent) in the next few years. Only ten percent believe that they play only a subordinate role. Most companies see great opportunities in digitization. Only three percent consider it a risk. Pharmaceutical companies have recognized the opportunities of digital technology, only the prerequisites must be implemented by all if you want to take advantage of these opportunities. But the legal requirements should also be more rigidly enshrined, for example, in the eHealth Law. In particular, it is planned to introduce telemedicine with a doctor's prescription for teleconsultation diagnostics using X-rays. But that is not all, other areas of application such as stroke, heart failure or diabetes must be approved by the legislative bodies. Digitalization of medicine is an important component of the healthcare system. But digital transformation is comprehensive and is also changing the industry in many other areas. Electronic medical records, prescription health apps or hours of video consultations between doctors and patients: the digitisation of medicine has made progress in Germany in recent months. This was driven on the one hand by political decisions, but above all by the corona pandemic as a catalyst. Out of necessity, new concepts that had previously been discussed for years in theory but rarely, too slowly, implemented in practice were introduced almost instantly.

The benefits of digitisation are obvious: improved communication that is independent of location, patient self-monitoring through wearable devices and apps designed for this purpose, or even personalised medicine through new diagnostic and treatment options are just a few examples. "Digital technologies can help us better address the challenges faced by almost all healthcare systems in the Western world - more and more elderly and chronically ill people need to be treated, expensive medical innovations need to be paid for, and structurally weak rural areas need to be provided with healthcare. However, there is still a long way to go to digitize medicine, despite the progress made in this country recently. Only

last year, according to the digital health index, Estonia, Canada and Denmark topped the list. Germany took the penultimate place in the international comparison with 16 other countries. Thirty-four indicators were assessed on strategy, technical readiness or digital readiness, and actual networked health data exchange. Only Poland was worse. Only 15 percent of German citizens said they could also make an appointment with their family doctor online. For comparison: in the US and Spain - 55 percent each. The impression that Germany still has some catching up to do in terms of digitalization in the field of medicine is confirmed by a joint survey by the digital association Bitkom and the doctors' association Hartmannbund, which examines, among other things, the offer of video consultations of the hour. Although it increased during the corona pandemic, today communication between doctors remains predominantly traditional. Accordingly, the telephone is still the most important communication channel in the exchange with patients (77 percent), pharmacies (61 percent) and practices (53 percent). In addition, every fifth doctor (19 percent) communicates with medical practices mainly by mail, and 22 percent rely mainly on fax. Only one out of 20 doctors communicates mainly by email with other practices (5 percent), pharmacies (6 percent) or patients (5 percent).

Digital gap between clinics and practices. If files and reports are submitted in paper form, double checks, security flaws and loss of information are inevitable. It is more important that digital processes are implemented throughout the entire healthcare system.

Accordingly, 86 percent of clinic doctors see digitalization primarily as an opportunity for the healthcare system - 10 percent see digitalization as a risk. Among GPs, only 53 percent emphasize the opportunities - and 39 percent the risk perspective. At the same time, three quarters said comparable crises could be better managed with digital technology. 71 percent called for accelerating the expansion of digital offerings in healthcare, and 70 percent expressed the view that Germany is lagging behind when it comes to digitizing the healthcare system. In accordance with the report, 71 percent of Germans want prescriptions that are transmitted to pharmacies in real time, as well as electronic documents such as vaccination records, pregnancy and maternity records or organ donor cards. In addition, a digital patient dossier is high on the agenda (70 percent). While 73 percent of respondents rated the degree of digitalization in German hospitals as "average", 60 percent were also convinced that it should be "high" for optimal quality of care.

The digital revolution poses serious ethical challenges, especially for the healthcare system and all stakeholders, and contributes to the competitiveness of healthcare institutions. As global markets with giant players, tech and other non-medical players have long defined how we deal with what ultimately matters to the patient. Whether artificial intelligence becomes a curse or a blessing depends on what we do with this technology, how we design and shape it. The social responsibility in working with this technology, as well as individual responsibility, remains with us. What is artificial intelligence allowed to do and where should it be ethically limited? How should we develop principles of artificial intelligence with which we can solve medical problems between benefit and harm? Equity (access for all) and respect for individual choice can be part of this set of principles. As well as the realization that there is an unbridgeable gap between data and reality. When it comes to artificial intelligence, the biggest concern is the data power of leading corporations. In the next ten years, telemedicine procedures will take up more and more space. The exchange of a doctor with other specialists will increase in the future. X-ray images can, for example, be evaluated via video together with fellow specialists. 98 percent believe that operations supported by telemedicine will play an important role. Then, when there are problematic cases, a leading specialist can be called from abroad. According to all experts, routine telemedicine monitoring of human health will be of great importance. In the future, patients with heart disease or diabetes will be able to transmit electronically to the doctor from home such indicators as blood pressure, ECG, weight or blood sugar level. Values can thus be checked independently by the doctor without constant visits to the practice or patients staying in the hospital. 70 percent of experts believe that online consultations between doctors and patients are becoming increasingly important. It should not eliminate the need to visit a doctor, but only to replace it. Telemedicine offers far-reaching benefits, especially for the chronically patients, the elderly and people and patients in sparsely populated regions, as patients receive quality care without having to travel long distances. Of course, in the next ten years, telemedicine procedures will occupy more and more space. The exchange of a doctor with other specialists will increase in the future. X-ray images can, for example, be evaluated via video recording together with specialist colleagues. 98 percent believe that operations supported by telemedicine will play an important role. Then, when there are problematic cases, a leading specialist can be called from abroad. According to all experts,

routine telemedicine monitoring of human health will be of great importance. In the future, patients with heart disease or diabetes will be able to electronically transmit to the doctor from home such indicators as blood pressure, ECG, weight or blood sugar level. Values can thus be checked independently by the doctor without constant visits to the practice or patients staying in the hospital. 70 percent of experts believe that online consultations between doctors and patients are becoming increasingly important. This should not eliminate the need to visit a doctor, but only replace it. Telemedicine offers ambitious benefits, especially for the chronically patients, the elderly and people and patients in sparsely populated regions, as patients receive quality care without having to travel long distances. Of course, this factor also improves the patient's quality of life. Individual medicines are no longer something special. There are other options in personalized medicine. In particular, this means therapy adapted to the patient using big data technologies. This allows factors such as lifestyle, gender, age and genetic makeup to be taken into account when treating cancer. In addition, it reduces negative side effects and also increases the chances of recovery. 60% of the surveyed experts said that in a few years the production of individual medicines will cease to be something special. In particular, diagnostic procedures with IT (decision support systems) will become more important. This refers to computers connected to medical databases. In addition, these databases can be read very quickly. Thus, doctors can identify diseases faster and more accurately. Almost 80 percent believe that in ten years this process will become standard. Now medical research is developing at a rapid pace, so it is not always easy for doctors to keep up with the rapid development. High-performance computers and big data technology can be useful for doctors.

4.2. Directions of digitalization development in healthcare

The electronic health record, the measurement of health data via an app, the communication between doctors and the hospital via a platform, video consultation hours are just a few examples of the digital technologies that are currently transforming the German healthcare industry. The basis of digitization is the medical data of the insured person, which is exchanged between doctors and patients, as well as between individual service providers using modern information and communication technologies. Digitalisation creates new diagnostic and treatment possibilities, such as personalised medicine, which facilitates communication between individual players in the healthcare system and allows

individual patients to monitor their health more effectively, for example through apps and information on the Internet. Digitalisation of healthcare enables faster detection of diseases and better control of them. Digitalization opens up great opportunities: better and at the same time more accessible care. It also offers an opportunity to address the lack of digitalisation skills. Germany is lagging far behind: in other European countries, digital technologies are already part of everyday medical life, while in Germany there are still implementation barriers, such as numerous isolated solutions that make cross-sectoral networking difficult. Digitization also contains risks: citizens fear losing the sovereignty of their data. Therefore, the topic of data protection is particularly important, so it is necessary to create uniform and secure rules. Opportunities for digitization. The main challenges facing the German healthcare system include demographic changes and sharply rising costs. Digitalization can help address these challenges. Whereas previously it was only possible to improve the quality of care for the individual or to reduce costs for the general public, this conflict of goals can be resolved through digital innovation: digitalization ensures high-quality and accessible care for everyone. It also provides people in structurally weak rural regions with access to medical expertise through telemedicine solutions.

When it comes to digitalization, the German healthcare system lags far behind in international comparison. Many of the opportunities offered by digital technology are not yet used in Germany, while telemonitoring, video consultations and electronic patient files have long been standard in other European countries. Although there are innovative ideas from companies, they have not yet entered the standard health insurance (SHI) system. In order to push the development forward in Germany as well, the Federal Ministry of Health has taken various legislative measures, among other things, health insurance companies are obliged under the Recording and Supply Services Act to store electronic patient files for their insured persons from January 2021. Telematics infrastructure is to be expanded through the eHealth initiative. Citizens are less critical of the digitalisation state: according to a PwC study, 61 percent believe that Germany is already well positioned when it comes to digital technology. Technology and its capabilities are making a variety of innovations by digital companies in the healthcare sector in detail. Artificial intelligence examines digital health data and can thus recognize patterns. This can help doctors in diagnosis and decision-making. The shortage of skilled workers in the healthcare sector is getting worse: a PwC

study shows that by 2030, Germany will be short of at least 400,000 full-time employees. The insured patients are already experiencing a shortage of qualified employees - they criticize that resident doctors take too little time and patients wait too long to see a specialist. In the hospital, the insured patients are already noticing a shortage of staff. Digitalization can help to counteract the shortage of skilled workers: digital technologies such as artificial intelligence or robot-assisted care systems help doctors and nurses to make their work much easier, for example in administrative and documentation activities, as well as in diagnostics and daily activities.

4.3. How artificial intelligence is revolutionizing medicine

Artificial intelligence (AI) is a key technology of the future. It helps to overcome the current challenges of the healthcare system: improving the quality of medical care while maintaining the accessibility of the healthcare system. Artificial intelligence promises great success, especially in diagnostics - it ensures that diseases can be detected more accurately and earlier. A potential that is also seen by the leaders of the German healthcare system, as a PwC study shows: 64 percent are convinced that AI will revolutionize medicine in the next ten years. Preventive measures alone could save 90 billion euros over the next ten years in the case of childhood obesity alone, which is a serious problem for health systems around the world. 54% of people around the world are ready to use artificial intelligence (AI) in medicine. 64% of German executives are convinced that artificial intelligence will radically change the healthcare system.

90 billion US dollars can be saved worldwide in the next ten years only thanks to AI on the clinical picture of obesity in children. 61% of insured people believe that Germany is well positioned when it comes to digital technologies. Public view. Insured persons in Germany are open to the digitalization of the healthcare system: they can well imagine using telemedicine solutions, such as consultations via video or online chat, as the PwC study shows. However, they see digital technologies only as a complement to healthcare - face-to-face exchanges with doctors remain important, especially in the case of serious illnesses, as 72 percent of respondents confirm. Most are also positive about new technologies such as artificial intelligence and robotics. However, as the data security study shows, greater digitalization of the healthcare system is also accompanied by concerns: insured persons fear that their hospital may be subject to a cyberattack or that the personal data of resident

doctors is not adequately protected. Nevertheless, 52 percent of Germans are willing to share personal information with doctors and their health insurance company through an electronic health record. Admittedly, hardly anyone likes going to the dentist - especially when there is a risk of long-term treatment.

Modern technologies speed up dental treatment. CAD/CAM dental technology makes it possible. The practice has a computer system consisting of a tooth scanner and a dental milling machine, as well as two ovens. It allows to make dental bridges and crowns independently. And it works like this: after scanning the teeth on a computer, a model of dentures is created, which are then made on a dental milling machine. Depending on the material used, it is glazed or sintered in an oven, i.e. hardened. The electronic customer card, for example, helps its employees to advise customers individually and according to their needs, taking into account their purchase history. A picking machine ensures that the requested products are in stock, if possible. KfW research shows that 87 percent of medium-sized companies finance digitization projects with internal funds; only seven percent use bank loans. The picture is quite different with classic investments: 43 percent of them are financed with internal funds and 34 percent with bank loans. Digital storage allows to expand the range of goods. Investments and working capital for digitalization and innovation projects as well as full financing of the needs of innovative companies are eligible for funding.

Conclusions

The COVID-19 pandemic has highlighted the importance of building a health workforce that is able to adapt to a rapidly changing environment and use available data and digital technologies to deliver care to the population. However, while the need for standardised approaches to developing the digital skills of health professionals in the European Region has long been recognised, best practices in this regard are still unclear. Helping countries to use digital technologies to improve health service delivery. The WHO/Europe Data and Digital Health Programme coordinates a leading initiative on digital health. It provides technical advice, policy guidance and expertise on the safety and effectiveness of digital health solutions, keeping equity, gender equality and human rights as core values in their deployment. The programme's activities support countries in using digital technologies to improve the interaction between people and health services; improve the performance of health systems; and strengthen core public health functions such as

disease surveillance, early warning and risk assessment. Digital literacy now means knowing the techniques needed to succeed in a society where communication and access to information are increasingly dependent on digital technologies such as online platforms and mobile phones. The concept covers a broad understanding of a series of digital tools that enable professionals to perform their duties in the office, hybridly or remotely in any environment. These tools include real-time collaboration software, such as business chat applications, and sophisticated asynchronous work tools. Today, digital competence is no longer a functional proposition, but a state of mind. In the modern workplace, employees are increasingly expected to quickly master the technologies that accompany their work, as well as adapt to constantly changing tools and approaches. Professionals must also use technology strategically, from handling personal mobile phones to managing collaborative workflow applications. Digital knowledge has become essential for almost every job as technology has revolutionized processes and industries. Technology is no longer specific to a few sectors. Digital knowledge and employers' demand for digital skills have evolved along with the digitization of the economy and the labor market. What was once a bonus is now a core part of almost every job. And this demand for digital savvy has peaked as employers have adopted hybrid or remote working standards. Employers are now much better able to identify specific digital skills and name the software they use. Greater ability to use specific project and office management software and tools is required so that employees can work more efficiently.

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