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ABSTRACT

Rapid advances in science and technology have accelerated digital transformation in the healthcare sector leading to significant changes in the delivery, planning and financing of healthcare services. Artificial intelligence is a natural consequence of this digitalisation process. Artificial intelligence is widely used in areas such as improving healthcare services, increasing the quality of patient care, reducing costs, supporting medical decision-making, early diagnosis, facilitating drug development and contributing to policy planning. However, with the advancement of digitalisation in the field of healthcare, significant changes in employment dynamics also occur. This study examines the effects of the digital transformation taking place in the healthcare sector, focusing on the positive developments brought about by artificial intelligence technologies and the potential transformations in healthcare employment. In this context, the impacts of artificial intelligence technologies used in the healthcare sector on employment are evaluated through a comprehensive review of the existing literature. As a result of the literature review conducted in this context, the proliferation of artificial intelligence technologies may reduce health costs, but may also create imbalances and economic risks in the labour market. Therefore, it is important to develop balanced and sustainable policies to maximise the opportunities brought by technology in health services in the future.

ÖZ

Bilim ve teknolojideki hızlı ilerlemeler, sağlık sektöründe dijital dönüşümü hızlandırmış ve sağlık hizmetlerinin iyileştirilmesi, planlanması ve finansmanında önemli değişimlere yol açmıştır. Yapay zekâ, bu dijitalleşme sürecinin doğal bir sonucu olarak karşımıza çıkmaktadır. Yapay zekâ, sağlık hizmetlerinin iyileştirilmesi, hasta bakım kalitesinin arttırılması, maliyetlerin düşürülmesi, tıbbi karar verme, erken tanı, ilaç geliştirme ve politikalarının planlanması gibi alanlarda yaygın olarak kullanılmaktadır Sağlık alanında yaşanan dijital dönüşüm istihdam üzerinde de önemli etkilere sahiptir. Ancak, sağlık alanında dijitalleşmenin ilerlemesiyle birlikte, istihdam dinamiklerinde de önemli değişiklikler meydana gelmektedir. Bu çalışma, sağlık sektöründe yaşanan dijital dönüşümün etkilerini ele almakta; yapay zekâ teknolojilerinin sağlık alanında ortaya çıkardığı olumlu gelişmeleri ve sağlık istihdamında meydana gelmesi muhtemel dönüşümleri incelemektedir. Bu doğrultuda, sağlık sektöründe kullanılan yapay zekâ teknolojilerinin istihdam üzerindeki etkileri, literatür taraması yöntemi kullanılarak değerlendirilmektedir. Bu kapsamda yapılan literatür taraması sonucunda yapay zeka teknolojilerinin yaygınlaşması sağlık maliyetlerini düşürebileceği gibi, iş gücü piyasasında dengesizlikler ve ekonomik riskler de yaratabilir. Bu nedenle, gelecekte sağlık hizmetlerinde teknolojinin getirdiği fırsatlardan maksimum düzeyde yararlanmak için dengeli ve sürdürülebilir politikalar geliştirilmesi önemlidir.

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INTRODUCTION

Significant changes and transformations have occurred in information and communication technologies from past to present. Innovations brought by digitalisation are significantly shaping human-machine interaction through advanced technologies such as the Internet of Things, artificial intelligence, big data and nanotechnology. Digitalisation creates direct or indirect effects in many sectors through the integration of different technologies. In this context, the healthcare sector stands out as one of the areas where the effects of digitalisation are most clearly observed.

Digital health technologies used in the field of health play an important role in diagnosis, treatment, patient follow-up, medical decision support systems and evaluation of health services. These technological developments aim to provide health services in a more effective and quality manner and various studies are carried out in this direction. Thanks to the integration of digital health technologies, the efficiency of healthcare services is increased by providing significant improvements in areas such as patient follow-up, patient-physician interaction and data management.

One of the technologies that play an important role in the digital transformation of healthcare services is artificial intelligence. Artificial intelligence is a technology based on machines doing the work that humans would do. In recent years, artificial intelligence-supported applications have become widespread in the healthcare sector and are effectively used in many areas such as early diagnosis, management of treatment processes, control of health costs and medical imaging. While the multidimensional use of artificial intelligence in healthcare has the potential to increase the speed and efficiency of healthcare services, at the same time, its possible effects on the healthcare workforce are also an important topic of discussion. Based on this fundamental problem, this study evaluates the effects of artificial intelligence tools used in healthcare on employment.

The effects of technological developments on labour markets have been discussed historically and the consequences of technological changes on employment have been intensively discussed since the industrial revolution. The concept of technological unemployment is considered as one of the structural and long-term unemployment types and it is suggested that this situation may increase its impact in different sectors with the digitalisation process. While digitalisation makes business processes more efficient, it may lead to job losses in certain occupational groups. The healthcare sector is a field where white-collar employees are generally predominant and includes occupational groups where automation is relatively more difficult to implement. However, the use of artificial intelligence-based systems in various fields such as diagnosis, treatment and patient services may lead to changes in labour dynamics in the health sector. Since the health sector has complex regulations and multidimensional human interaction, the impact of artificial intelligence technologies on employment constitutes an important research topic for existing employees and individuals who will join the workforce.

Digital Transformation in Health Services

Today, significant progress is being made in the field of science and technology, and in line with these advances, knowledge production is changing at an extraordinary speed and gaining a new dimension (Alacadağlı, 2019). The fourth industrial revolution that emerged in the current period and the post-modern life shaped by its impact have contributed to the development of human-machine-automation interaction by revealing concepts such as digitalisation, virtual organisations, artificial intelligence, autonomous systems, internet of things, big data, robotics, cybernetics, genetics, space engineering and nanotechnology (Kılıç & Tosun, 2021). Industry 4.0 is a new disruptive evolution that affects not only the production systems of companies but also society as a whole. Industry 4.0 provides companies with many advantages such as a more flexible production system, individual production, digital value chain, new business models, resource and energy efficiency (Yılmaz & Özdağoğlu, 2020).

Digital transformation refers to changes in digital technology used to benefit society and healthcare (Stoumpos, 2023). Digital transformation and information integration enable the operational management of

information and communication processes in many industries (Kukhtevich et al., 2020). The concept of digitalisation refers to the interconnected and harmonious operation of multiple electronic devices. For this reason, digitalisation should not be understood only as the use of computers; it should be considered as the electronic communication of individuals and institutions with each other via the Internet (Yücel & Adiloğlu, 2019). Today, it is possible to see digitalisation in all areas of life. There have been significant developments in technologies such as the Internet of Things, artificial intelligence, blockchain and cloud computing, and the field of health has become one of the areas where these technologies are frequently used (Şimşir & Mete, 2021). The term digital health includes advanced medical technologies, disruptive innovations and digital communication (Mesko et al., 2017). Digital health technologies are technologies that use the digitisation of data and information to improve the health sector in various aspects such as prevention, diagnosis, treatment, monitoring, research, innovation, education, management and evaluation of health services (Mayol, 2024).

The health sector has significant potential to develop innovative products and technologies (Aslan ve Güzel, 2019). The use of digital and telemedicine technologies in healthcare is attracting particular attention (Kukhtevich, et al., 2020). The use of information and communication technologies (ICT) in health care is receiving increasing attention (Hochmuth, 2021). The digital transformation of healthcare includes changes related to the internet, digital technologies and their relationship with best practices for new therapies and better health management procedures (Stoumpos, 2023), as well as the planning and financing of healthcare (Gavrilov et al., 2020). With digitalisation in health, human health is tried to be improved by using mobile technologies, internet, e-mail, social networks, wearable technologies (Hudes, 2017). With the development of technology, the internet of things, inter-machine communication, cloud computing, big data, wearable and portable technologies, which manifest themselves in many areas and form the building blocks of digital transformation, deeply affect the health system (Aslan & Güzel, 2019). Digital technologies in healthcare services increase the chances of success by strengthening the interaction between patients and clinicians through fast and precise transformation of big data (Bhavnani et al., 2017). Digital self-tracking devices that enable individuals or patients to collect, monitor and analyse digital health data on their own health status are one of the important reflections of digitalisation in the field of health (Şahinol & Başkavak, 2020). Technological innovations such as wearable and information technologies, virtual reality and the internet of things have become an integral part of our daily lives, and this innovation has contributed to transforming businesses and operations in healthcare (Stoumpos, 2023).

Artificial Intelligence and Health Sector

The origins of the concept of 'artificial intelligence' are quite old, and the father of the concept is Alan Mathison Turing, who put forward the question 'Can machines think?' and opened his intelligence to discussion. In 1943, during World War II, the concept of computer science and artificial intelligence was born thanks to electromechanical devices developed for the needs of cryptanalysis (tr. wikipedia.org). Artificial intelligence (AI) is a general term that refers to systems designed to model intelligent behavior with minimal human intervention (Delanerolle, et al., 2021). Artificial intelligence, primarily aims to enable machines to perform cognitive processes such as perception, reasoning, learning, communication, and action in complex environments. Its long-term goal is to develop systems that can carry out these processes at or beyond the level of human capability. Moreover, AI research seeks to understand how such cognitive behaviors emerge not only in machines but also in humans and other living beings (Nilsson, 1998).

Artificial intelligence is the technologies developed to make machines think like humans (Uzun, 2020). Artificial intelligence is a multidisciplinary informatics field that tries to realise human characteristics such as learning, perception and problem solving in a computer environment (Bilge, 2007; Peyrou, et al., 2018). Artificial intelligence is a branch of computer science that can analyse complex medical data. The potential to utilise meaningful relationships in a data set can be used in diagnosis, treatment and outcome prediction in many clinical

scenarios (Ramesh, 2004). Generating new content by looking at past behaviours, translating a sentence expressed in one language into a different language, face and voice recognition, artificial content generation and predicting future value based on past data are among the application areas of artificial intelligence (en.wikipedia.org; Nilsson, 1998).

Artificial intelligence (AI) represents a significant milestone in the digital transformation of healthcare services (Malerbi et al., 2023). Since 1956, AI has become a powerful tool across many fields, including the healthcare sector (Delanerolle et al., 2021). It is also profoundly transforming the structure of health and biomedical research (Yu et al., 2018). AI can perform specific tasks faster and at a lower cost than humans, thereby becoming an increasingly integral component of the healthcare ecosystem (Büyükgöze &Dereli, 2019).

Artificial intelligence has begun to enter almost every sector, including healthcare (Aung et al., 2021; Glauner, 2021; Rahman et al., 2024). The use of artificial intelligence improves patient care and service quality while reducing long waiting times and costs (Glauner, 2021; Reddy, 2019). Artificial intelligence is also helping to further specialise patient care by improving patient outcomes, closing gaps in access to care and accelerating the delivery of care (Schijven & Kroh, 2023). With the emergence of artificial intelligence in the field of health, medical decision-making, medical imaging, medical recording, early diagnosis and treatment, storage of medical records, drug development, robot applications, ensuring error-free applications, preventing unnecessary treatments and many other issues come to the fore (Uzun, 2020). Artificial intelligence enabled technologies are used in four categories within health research: (1) diagnosis, (2) patient morbidity or mortality risk assessment, (3) disease outbreak prediction and surveillance, and (4) health policy and planning. (Schwalbe & Wahl, 2020).

Artificial intelligence techniques have been applied to medicine and health in general in the last decade. Diagnosis, classification, therapy and robotic applications are among the applications of artificial intelligence (Rigla et al., 2018). In the field of health, artificial intelligence is used in the areas of staying healthy, diagnosis, treatment, research, early diagnosis, decision making, elderly care and education (www.pwc.com). Artificial intelligence reduces administrative and clinical costs by restructuring health care processes. It accelerates processes such as diagnosis, diagnosis and treatment in clinical processes and aims to increase service quality by reducing human interaction (Akalın & Veranyurt, 2020; Büyükgöze ve Dereli, 2019). The main focus of 'medical artificial intelligence' is to perform clinical diagnostics and create artificial intelligence programmes that can make treatment recommendations (Demirhan et al., 2010). For correct treatment in health data, the data must be analysed. At this point, artificial intelligence and automation systems are used. Artificial intelligence techniques have the potential to be applied in almost every field of medicine (Ramesh, 2004). AI can be used to perform tasks such as the analysis and data entry of laboratory tests, X-rays, CT scans, as well as to access the current medical condition of patients to assist in medical consultation (Büyükgöze & Dereli, 2019). Artificial intelligence has the ability to optimise data to provide clinical decision support for clinicians and those working in the laboratory and/or to enable patients to actively participate in their own healthcare (Hellmann, 2023). Table 1 shows the current applications of artificial intelligence in health services in a collective manner (Park et al., 2020).

Table 1 Current Applications of Artificial Intelligence in Health Services

Technology	Application Scheme	Application Area
Robotics	Provide high-quality treatment by improving the precision and accuracy of the surgical procedures.	Medical device, Health IT*
Digital secretary	Find the golden hour of appropriate intervention by continuously monitoring the patient condition indicators and alerting the nurse when necessary.	Medical device, Health IT
Machine learning	Predict and analyze patterns based on the data affecting treatment results. Reduce the uncertainty in the medical treatment decision-making by processing large volumes of diagnostic medical images through self-learning.	Diagnostic medical image, Health IT
Image processing	Quickly process large amounts of medical images and apply the findings in judging the disease type and negative and positive test results.	Diagnostic medical image, Health IT
Natural language processing	Convert long unstructured text data, such as medical charts, to be easily read and interpreted.	Medical device, Health IT
Voice recognition	Capture patient voice and language and store important information in electronic medical records.	Medical device, Health IT
Statistical analysis	Predict patient treatment results through rapidly analyzing large amounts of patient health record data.	Medicine, Health IT
Big data analysis	Provide personalized recommendations to the patients and therapeutics by processing large amounts of data maintained by healthcare institutions.	Medicine, Health IT
Predictive modeling	Predict treatment outcomes, such as predicting risky diseases, by applying mathematical models.	Medicine, Health IT

*BT: Information Technology.

The effective use of AI in healthcare is not only limited to policy regulations for AI applications, but also depends on factors such as the quality, integrity, accessibility and security of data. These elements play a critical role in ensuring the reliability of AI-based results and contribute to the safe, effective and efficient use of AI applications (Hashiguchi et al., 2021). The potential of artificial intelligence (AI) tools to improve healthcare delivery not only informs diagnostic and treatment decisions, but also appears to have significant impacts on employment.

Employment And Artificial Intelligence

Orthodox theories (Neo-Classical and Keynesian) are inadequate to explain the unemployment problem experienced today. Constant changes in the digital age have led to the emergence of new approaches (Mankiw, 2019). There have always been fears that technological developments could lead to unemployment since history. After the mechanization process accelerated with the industrial revolution, the Luzdism movement, pioneered by Ned Lud, was initiated. Textile workers began to destroy the machines in response to the machines taking their jobs (Wikipedia, 2024). Today's unemployment is structural and long-term, especially affecting the young population. After technological developments rapidly entered the production process, the concept of technological unemployment explains a large part of the unemployment problem experienced today (Ataman, 1998).

In 1758, British workers destroyed wool mowers, known as the Ludism movement. While highly technically equipped and experienced workers were expected to work on weaving looms, the need for experienced and qualified workers disappeared with the industrial revolution (Koca, 2020).

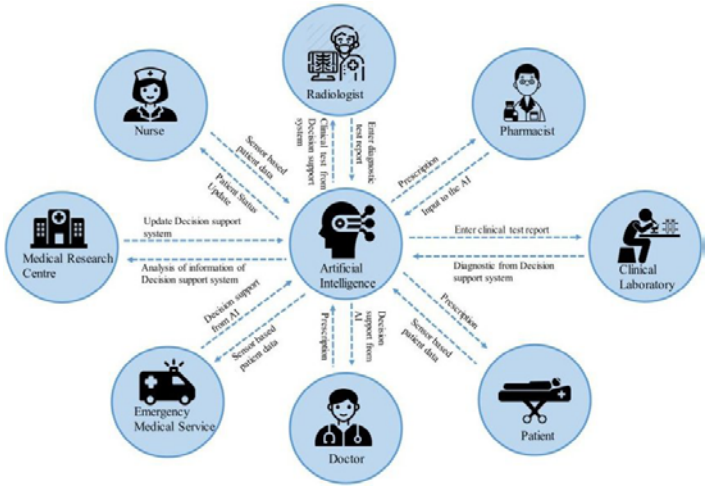

Figure 1: Smart Healthcare using AI (Rani, et al., 2021).

Figure 1 presents a schematic representation of the architectural structure, core components, and interaction mechanisms of artificial intelligence–based smart healthcare systems. The figure illustrates the integration of artificial intelligence into healthcare services by depicting, in a layered manner, the sequential processes ranging from data collection and processing to decision support systems and clinical applications. The effects of technological developments, the acceleration of the transition to automation, and the fact that machines and computers make people's jobs easier while also making them unemployed are felt more today. It is estimated that this situation will accelerate with the major changes that will occur in the field of artificial intelligence in the future. First, while jobs that require less thinking skills and blue-collar jobs are being lost to automation, the risk of white-collar and complex jobs being lost to artificial intelligence in the future increases. The healthcare sector has rapidly changing workforce dynamics due to digital transformation, and artificial intelligence and automation technologies play a decisive role in this transformation process. Developing technology is reshaping healthcare services in a wide range from medical decision support systems to robotic surgery, from patient care processes to hospital automation. The multidimensional impacts of artificial intelligence technologies on employment are examined under subheadings in line with the key themes highlighted in the literature:

Transformation in the Workplace

The widespread adoption of artificial intelligence technologies has led to a profound transformation in workplaces, affecting production processes as well as organizational structures. In particular, automation, data analytics, and decision-support systems enable work processes to be carried out more rapidly, efficiently, and with fewer errors. While this transformation reduces the significance of certain traditional occupations, it simultaneously gives rise to new data-driven and technology-oriented job roles. The literature emphasizes that this process should be understood not as the complete elimination of jobs, but rather as a restructuring and redefinition of job tasks and responsibilities (Autor, 2015). In the context of the healthcare sector, the delegation of administrative and routine tasks to artificial intelligence systems allows healthcare professionals to concentrate on more complex and expertise-intensive activities (Topol, 2019).

Job Skills and Workforce Adaptability

One of the most significant impacts of artificial intelligence technologies on employment is the transformation of the skill sets demanded from the workforce. Skills such as digital literacy, data analysis, critical thinking, and the ability to work with advanced technological systems are becoming increasingly essential. This shift necessitates continuous training and reskilling policies to enable the existing workforce to adapt effectively to emerging technologies. Particularly in the healthcare sector, there is a growing demand for healthcare professionals who are capable of working with artificial intelligence–supported systems (OECD, 2019). The literature emphasizes that if this adaptation process is not managed successfully, skill mismatches and structural unemployment may intensify within the labor market (World Economic Forum, 2020).

Human–Artificial Intelligence Collaboration

The impacts of artificial intelligence on employment should be examined not only within a substitution-based framework but also from a complementary perspective. Human–artificial intelligence collaboration enables the integration of human intuition and judgment with the

computational power of artificial intelligence, particularly in complex decision-making processes. In the healthcare sector, this collaboration contributes to reducing error rates by providing a "second-opinion" mechanism in diagnostic and treatment processes (Topol, 2019). The literature characterizes this approach as a model that enhances productivity while simultaneously improving the quality of work outcomes (Jarrahi, 2018).

Human–Machine Interaction

Human–machine interaction constitutes a critical factor in ensuring the effective use of artificial intelligence–supported systems in the workplace. User-friendly interfaces, transparent algorithms, and interpretable outputs increase employees' trust in these systems. In the healthcare context, the adoption of artificial intelligence applications by healthcare professionals depends not only on their technical accuracy but also on their alignment with ethical principles and professional responsibilities. The literature indicates that inadequate human–machine interaction may lead to resistance to technology adoption and limit potential productivity gains (Parasuraman & Riley, 1997; Davenport & Kalakota, 2019).

Recruitment, Employment Termination, and Artificial Intelligence

Artificial intelligence technologies are increasingly being utilized in recruitment and employment termination processes. Algorithmic systems provide time and cost efficiencies for human resources departments in tasks such as résumé screening, candidate matching, and performance evaluation. However, these applications also raise ethical concerns, including algorithmic bias, discrimination, and a lack of transparency. The literature emphasizes that the use of artificial intelligence–based decision-making mechanisms without human oversight may undermine fairness and equity in employment practices (Bogen & Rieke, 2018). Accordingly, artificial intelligence should be employed as a supportive tool rather than as an autonomous decision-maker in recruitment and employment termination processes.

Human Resources and Artificial Intelligence

Artificial intelligence applications in human resource management offer significant contributions in areas such as talent management, training and development planning, and performance analysis. Artificial intelligence–supported systems enable more objective and strategic decision-making through the analysis of employee-related data. In the healthcare sector, data-driven workforce planning contributes to improving service quality and balancing employee workloads. The literature highlights that the effective integration of artificial intelligence into human resource management requires the establishment of ethical principles, the protection of data security, and the safeguarding of employee privacy as fundamental prerequisites (Stone et al., 2020)

Employment and Artificial Intelligence in the Healthcare Sector

The health sector is being restructured with artificial intelligence technologies. Digital transformation is taking place in many areas, from accelerating diagnosis and treatment processes to decreasing clinical and administrative costs, from wearable technologies and personalized health applications to robot healthcare workers (Akalın & Veranyurt, 2020). In this digital transformation in the field of healthcare, the developments that may occur in employment are a subject that all healthcare professionals are curious about, and the extent to which automation along with digitalization can cause transformation in the healthcare sector is also an important issue that needs to be investigated. Excluding doctors and pharmacists who specialize in analyzing laboratory samples and images, the automation of even a small part of the work done by specialist healthcare professionals has not been successful. It can be said that one of the smartest choices for those looking for a career that will not directly feel the threat of automation is medical specialties that require direct communication with patients. However, there is no guarantee that this prediction will hold 20 or 30 years in the future. Because it is impossible to predict what technology will and will not make possible in 20 or 30 years (Ford, 2021).

Named after Thomas Watson, one of IBM's pioneers, Watson has had a major impact on the field of medicine. The artificial intelligence program designed by IBM

answers questions asked in natural language (Lee & Kim, 2016).

The feature of Watson technology is that it can be an indispensable diagnostic tool for doctors in rare and challenging cases by memorizing a lot of information and establishing connections that even careful researchers may miss in a very short time (Ford, 2021).

Artificial neural networks are a form of artificial intelligence widely applied in healthcare systems for diagnostic and predictive purposes (Institute of Medicine, 2007). These technologies are important for both patients and doctors in making accurate diagnoses and ending unnecessary operations. These developments in the health sector are also reflected in the employment field, causing significant changes in the workload of doctors. The role of artificial intelligence technologies in reducing treatment costs and reducing workloads has great effects on employment.

The main artificial intelligence applications that can soon be used in the field of health are given below (Rouhiainen, 2020):

• Virtual care assistants,

• Surgeries with advanced robotic technology,

• Administrative workflow support.

The health sector is expected to be exposed to positive and negative effects in the field of employment after the active and active use of artificial intelligence technologies increases.

Among the positive effects, the positive effects of people taking over jobs that they find boring and do not want to do, as well as the negative effects of automated jobs in many areas, narrowing employment, are also expected.

The uses of robot-human collaboration are constantly increasing. The health sector is also affected by this cooperation. With the use of robots, also called iron collar workers, in the healthcare sector, the shrinkage that will occur in the employment of nurses and healthcare workers creates concern for those working in this sector. Although it is not possible for robots to directly take away the jobs of healthcare workers, it is possible to say that their impact on gaining knowledge and skills is more important and impressive. For example, the individuality of the information in the mind of each doctor and the simultaneous bringing together of the information in the articles written on health (Bacaksız et al., 2020).

In this age where the Internet offers tremendous ease of information sharing and access, medical skills and knowledge remain isolated in the minds of individual doctors. Artificial intelligence can bring together information in individual minds and the information in isolated medical articles, thanks to its power to process big data, and reveal its encompassing power (Kaynar, 2024).

There is a tremendous amount of information that can be useful to a doctor trying to diagnose a patient or find the best way to treat her or him. New discoveries are constantly being made, innovative treatments are being developed, and clinical evaluations are being published in medical and scientific journals around the world. This is an ongoing process. For example, there are more than 5,600 journals in the online database called MEDLINE. Each of these journals publishes dozens or even hundreds of different research articles. However, there are also millions of medical records, patient histories, and case studies that contain crucial clues about the current case. According to one estimate, all this data doubles every five years (IBM, 2024).

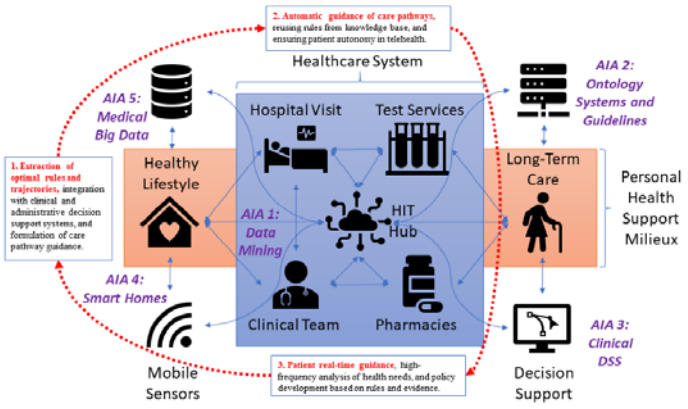

Figure 2: Patient-centric framework for healthcare artificial intelligence and analytics (AIA) (Azzi, et al., 2020).

Figure 2 illustrates a patient-centric framework for healthcare artificial intelligence and analytics (AIA),

depicting how diverse AI and analytics technologies are integrated around patient needs. The framework emphasizes the flow from data capture through intelligent processing to informed clinical and care decisions, thereby supporting personalized and continuous care within complex healthcare pathways. When medical artificial intelligence applications develop and can become real consultants that can consistently provide high-quality second opinions, the costs arising from doctors' hesitation to take responsibility for the patient can be avoided (Kılıç & Kılıç, 2022). Most physicians recommend that patients undergo all possible tests during the examination and diagnosis process to avoid possible legal liabilities. With a second opinion provided by an artificial intelligence system, the possibility of doctors gaining a safe harbor against possible lawsuits arises. In this case, there is a possibility that insurance costs arising from medical malpractice will decrease and unnecessary medical test screening costs will decrease (Diri, 2024). The success of machines in making accurate diagnoses and determining effective treatment methods could eliminate the need for doctors to directly examine the patient each time. This raises the possibility of a new class of medical professionals emerging in the future. On the other hand, it is necessary to teach these specialists how to communicate with patients, examine them, and how to create a standard diagnosis and treatment with the information they obtain and enter it into the system. In this way, it will be possible to undertake many routine cases and be effective in dealing with the increasing number of chronic problems such as diabetes and obesity. According to this situation, which is predicted to arise thanks to machines, the possibility of creating new employment areas increases compared to the employment contraction (Ford, 2021).

Many estimated studies show that in the next 15 years, as aging doctors retire, there will be a shortage of 200 thousand doctors. It is seen that with the new regulations to be made in the health insurance system, 32 million new patients will be created, and the aging population will need more care. As students, who have suffered many financial losses to study medicine, turn to high-profit specialties to feel more financially comfortable, the places where the need for doctors will be felt most intensely will be the first step health services (Stark, 2011).

With the use of artificial intelligence systems, which cover the majority of the knowledge that doctors have acquired during almost a decade of difficult training, new generation practitioners can handle routine cases on their own; It will be possible for them to refer to cases that require more expertise to doctors (Mesko & Görög, 2020). In this case, university students can also find a more attractive and new career option in a market environment where employment is constantly shrinking. Here, it is observed that artificial intelligence systems will not only reduce the burden on doctors but will also bring about the possibility of a new employment field. It is expected that new employment areas will emerge, especially with the increasing need for the healthcare sector and the intensification of robot-human cooperation (Bacaksız et al., 2020).

It is inevitable that developments in artificial intelligence will lead to huge productivity increases and, moreover, full automation in areas that do not require direct interaction with patients. For example, radiologists receive years of training to interpret many medical images. On the other hand, image recognition and processing technologies are advancing rapidly and the possibility of one day taking on the traditional role of radiologist is increasing. People in photos posted on Facebook can already be recognized by software. An automated ultrasound system has been approved by the Food and Drug Administration to screen women for breast cancer. This device, designed by U-Systems, where dense breast tissue makes standard mammogram technology ineffective, was developed to detect cancer in approximately 40% of female patients. Radiologists still need to interpret the images, but doing so now takes a three-minute period. In images made with standard ultrasound technology, this time varies between 20 and 30 minutes (Durning, 2012).

By using artificial intelligence as a second opinion, a double-reading strategy is revealed and cancer detection rates are increased with this method.On the other hand, the rate of patients being called back for new tests is also decreasing significantly. A study published in the New England Journal of Medicine in 2008 also shows that detection success rates increased as machines took over the role of the second doctor. With computerized detection

systems and radiologists working together, the results are as good as if two separate doctors interpret the images separately (Manjoo, 2011).

Robots, which are slightly cheaper and larger than vending machines, are slowly starting to take over pharmacies. Pharmacists go through a challenging four-year training process. On the other hand, it is also seen that the work done is based on repetition and is essentially routine work (Stasevych & Zvarych, 2023). The most important point to pay attention to here is not to cause a potentially fatal error. On the other hand, a large part of the work that pharmacists do can be described as almost perfect for automation. The fact that robots are responsible for delivering medicines prepared in hospital pharmacies to the patient, and the machines used for this purpose are largely used to transport laboratory samples, medicines, clean laundry and patient meals, may lead to a decrease in employment in these areas. In 2010, El Camino hospital in California rented 19 transport robots. A hospital administrator stated that outsourcing the same job to humans would require spending more than a million dollars annually (King, 2010).

In early 2013, General Electric announced plans to develop a mobile robot that locates, sterilizes, cleans, and delivers most instruments used in operating rooms. The devices, which will be tagged with radio frequency chips, will be easily located by machines (Holland et al., 2021). So far, automated robots have made little breach in the wall of medicine, except in certain areas of pharmacy and hospital logistics. Frequently used surgical robots are being designed to expand the possibilities of surgeons. Robotic surgeries are more expensive than traditional surgery methods. Although efforts are continuing to develop robots that are much more ambitious and can perform self-surgery, it is still necessary to have a doctor next to the patient who is ready to intervene (Ford, 2021).

The populations of developed countries are aging rapidly. By 2030, elderly people in America are expected to exceed 70 million and constitute 19% of the population. In 2000, this rate was determined to be 12.4% (The Population Project, 2024). In Japan, the problem gets worse because birth rates are low. It is estimated that one-third of Japan's population will be over the age of 65 by 2025. Even now, Japan has a shortage of 700 thousand elderly care workers (The Economist, 2013). It does not currently seem possible for elderly care robots to fill these gaps. Some of the reasons why elderly care robots are not effective are that these robots are very expensive and cumbersome. However, on the other hand, it is thought that there will be an increase in robotic innovations in this field as the need for elderly care robots increases in the future (Erebak, 2020).

More than any other sector in the economy, the healthcare industry is surrounded by a greater number of complex rules and regulations. Therefore, it is worth noting that technology is not the only element to consider. In almost every activity in the health sector, it is necessary to comply with state regulations and obtain the necessary licenses from authorized institutions. On the other hand, every action and every decision can lead to a lawsuit if it causes a mistake. Compared to most other professions, healthcare professionals have much less reason to fear unemployment. The main reasons for this are reasons other than the technical difficulties associated with automating jobs. This situation may be pleasing for healthcare professionals, on the other hand, it can be said that the disruption that technology will create in employment areas will increase economic risks by reducing healthcare costs. While developing technology increases unemployment and lowers salaries in other sectors, further disrupting the income balance, the burden of rising healthcare costs will become even more unbearable. If the burden of health expenditures cannot be restrained, the large-scale consumer demand that is vital for economic growth will be further undermined, as the share that households can allocate to their non-essential expenses will further decrease (Ford, 2021).

The healthcare sector has been particularly effective in qualitative changes in employment transformation due to the impact of artificial intelligence. In other words, the quality of the work done has gained importance and skills have begun to come to the fore.

This transformation is deepening employment patterns and unemployment. The structure of occupations is now more important than ever (Gücenmez, 2023). When considering

the effects of digitalization on the labor market and job transformations, it is necessary to evaluate these effects in two areas: positive and negative effects.

First of all, artificial intelligence technologies have led to increased efficiency in the healthcare sector, reduced the possibility of errors and shortened analysis times. Routine tasks, such as nursing, medical secretarial, appointment scheduling, billing and patient monitoring, have become automated. Jobs that do not require the skills and advanced knowledge required for routine tasks, such as nursing, patient monitoring, and patient care, may face employment shortages (Demirci, 2018).

On the other hand, in the context of the use of these technologies in the field of health, new business opportunities also arise. New professions such as medical software auditors, clinical artificial intelligence specialists, and bioinformatics data engineers are emerging and new employment opportunities are being created (Akalın & Veranyurt, 2020).

In summary, artificial intelligence increases the demand for skilled labor in the healthcare sector, reduces routine tasks, and widens the technological skills gap. Although it is not possible to talk about a net contraction in employment in the medium and long term, it is more realistic to say that a job transformation is taking place.

CONCLUSION

With the impact of digitalisation, various new technologies have been widely used in many sectors. Especially artificial intelligence is one of the important technologies that have started to be seen with digitalisation in health services in recent years. It is seen that artificial intelligence is used in the health sector to increase the effectiveness of treatment, to eliminate uncertainty in treatment processes, to quickly analyse patient registration data and to process images. For example, for the correct detection of radiological images, artificial intelligence can be used to detect points that experts will miss. In addition to clinical results, artificial intelligence plays an active role in the administrative processes of health services. The use of artificial intelligence is increasing day by day in processes such as efficient use of resources, planning through data, and development of public health policies.

With the active use of these technologies in the healthcare sector, this situation also creates concern for doctors, nurses and healthcare professionals. In addition to the individual information in doctors' memories, the large database in artificial intelligence provides significant convenience in using it in disease diagnosis. This situation creates the definition of a second consultant doctor and can lead to significant convenience for healthcare professionals. Thanks to the double reading strategy, doctors can gain an advantage in detecting diseases and serious health problems. Shortening the time spent in disease diagnosis and diagnosis is also among the important contributions of artificial intelligence technologies. When human-robot collaboration (HRC) technologies are used correctly, significant positive developments and financial savings can be achieved in the healthcare sector.Thanks to the robots and elderly-care robots to be used in hospitals and pharmacies, taking over routine and boring tasks, healthcare professionals can have more time to improve themselves and be more useful to their patients. Using and revealing high data power can also make the job of doctors much easier. In addition to the individual use of information in the memories of each doctor, the use of big data, which includes all diseases recorded from past to present and their treatment methods, thanks to artificial intelligence technology applications, enables the most accurate diagnosis and treatment.

This study examines the effects of digital transformation in the healthcare sector, and is about the positive developments in the healthcare field with artificial intelligence technologies and the possible transformations in healthcare employment. Sustainable policies should be developed to ensure optimum utilization of the transformation that will occur with artificial intelligence technologies. Healthcare workers must be retrained for these technologies. Universities and policymakers should be aware of these impacts and restructure their education plans and policies to align them with these technologies. On the other hand, in order to protect against the possible negative effects of these technologies, ethical frameworks should be determined and these practices should be disseminated and regulated within a legal framework.

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