Applications of AI in Health Services

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The effects of artificial intelligence (AI)-based technologies on the healthcare sector are explored in this study. This research examined numerous practical uses of AI in healthcare, in addition to a comprehensive literature evaluation. Based on these findings, it appears that large hospitals are currently utilizing AI-enabled technologies to assist with patient diagnostic and treatment activities across a wide variety of ailments. Additionally, AI technologies are affecting the effectiveness of nursing and hospital management. Although AI is generally welcomed by the healthcare industry, its implementations present both utopian (new possibilities) and dystopian (overcoming obstacles) scenarios. To present a well-rounded picture of the usefulness of AI applications in healthcare, we address the specifics of these potential obstacles. The rapid development of AI and associated technologies will aid in the improvement of operational efficiency and the creation of new value for patients. However, to gain the benefits of technology like AI, comprehensive service transformation and operations planning are essential.

Keywords: Health Services, AI, Nursing

Introduction

Digitized businesses rely heavily on information and communication technology (ICT) since it improves efficiency and gives them a leg up in the marketplace. Today, modern digital technology and devices are used extensively for value creation and innovation across a wide range of sectors as part of the Fourth Industrial Revolution (4IR). The healthcare sector is not an outlier [1]. Artificial intelligence (AI), machine learning (ML), smart sensors and robots (SSR), big data analytics (BDaaS), and the Internet of Things (IoT) are just a few examples of the digital technologies that hospitals and care providers around the world, especially in developed economies, are deploying aggressively to improve the quality of care and operational efficiency[2]. More than sixty percent of hospitals around the world have deployed IoT, according to a study by Aruba Hewlett-Packard Enterprise company. Researching the effects of high-tech digital gadgets on patient-provider interactions in healthcare is important for this reason.

The quality-of-care services and the effectiveness of medical resources have both seen significant increases as a result of recent extensive implementations of AI-supported technologies in healthcare institutions. Knowledge-intensive industries like healthcare stand to benefit greatly from AI-based solutions. This is because AI covers machine learning, natural language processing, and smart robotics [3]. At the Radiological Society of North America (RSNA) conference in Chicago, Illinois, in December 2018, dozens of startups and established image device companies presented their artificial intelligence (AI) projects designed to aid in the correct diagnosis and treatment of patients based on the results of clinical examinations.

As a result of its potential for game-changing advances in the treatment of human diseases and public health, AI has garnered the interest of researchers, clinicians, technology and program developers, and consumers in a wide range of sectors. By 2021, hospitals will spend an estimated $6.6 billion yearly on artificial intelligence (AI)-related technology, as reported by Accenture[4]. AI applications could create up to $150 billion in annual savings for U.S. healthcare by 2026."

When it comes to improving physicians' decision-making for diagnosis and treatment, AI-supported technologies are invaluable due to their ability to learn and diagnose from a vast body of medical literature and individual patients' treatment history. "AI-based diagnostic algorithms are applied in the detection of breast cancer," "serving as a second opinion' in assisting radiologists' image interpretations." It was also discovered that AI skin cancer diagnostics are more accurate than those made by human dermatologists [5]. Diagnosis can be made more quickly and accurately with the help of analysis based on a large amount of data and information. High-tech virtual human avatars are being deployed to carry out essential discussions to help with the diagnosis and treatment of patients with mental illness.

Using a network of hospitals serving half a million people in southeast England as an example, Miyashita and Brady described how patients were fitted with Wi-Fi-enabled armbands to remotely monitor vital signs after they were released from the hospital. Artificial intelligence (AI) programs that analyze patient data in real-time have drastically decreased rates of hospital readmission and emergency room visits. The number of pricey house calls made was cut by 22% as well. Long-term, 96% of patients stuck to their prescribed course of treatment, far above the 50% industry norm. Grady Hospital, a public hospital in Atlanta, USA, saved $4 million over two years by using an AI-enabled tool to detect "at-risk" patients, resulting in a 31% reduction in readmission rates[6].

Some might think that doctors won't be needed in the future if artificial intelligence can assist in the diagnostic, therapeutic, and operative phases of patient care. However, before investigating the advantages and disadvantages of AI implementations in healthcare, it is important to determine what role AI may play in this field. Many real-world examples of AI

applications demonstrate the huge and broad potential of AI, from improving basic operating processes to providing cutting-edge care for emergency patients[7].

AI-supported technologies are invaluable because of their ability to learn and diagnose from a wide body of medical literature and specific patients' treatment histories, thereby assisting doctors in making more informed decisions about diagnosis and therapy. According to "AI-based diagnostic algorithms are applied in the detection of breast cancer," with the aim of "serving as second opinion' in assisting radiologists' image interpretations." AI skin cancer diagnoses are more precise than those of human dermatologists[8]. Rapid and precise diagnosis is enabled through analysis based on copious amounts of data and information. To better diagnose and treat patients with mental illness, high-tech virtual human avatars are being used to carry out crucial dialogues.

The purpose of this research is to examine the impact that AI has on healthcare services and administrative procedures by examining numerous case studies. Through this line of inquiry, we may propose a series of measures to improve hospital productivity, patient outcomes, and disease prevention. To this end, we conducted a comprehensive literature analysis and analyzed a wide range of real-world examples to identify AI-based technologies with potential medical applications [9]. The significance of this research lies in the novel conclusions it draws regarding the future of technology-based service operations management. Hospital administrators, medical staff, curriculum developers, education and training managers, experts in human-machine roles and responsibilities, cyber security analysts, and medical ethics experts are all likely to benefit from our study's findings[10].

Literature Review

Artificial intelligence (AI) can be demonstrated by machines like computers and robots if they are built to mimic the higher cognitive processes that people ascribe to other humans. Learning and problem-solving are examples of such activities. In recent years, it seems as though everyone has grown familiar with the phrases artificial intelligence (AI), machine learning (ML), and deep learning (DL). The scope of AI extends beyond that of the other two categories [11]. Machine learning algorithms must be trained on data to do certain tasks like regression, grouping, etc. The more data you give your algorithm, the better it will function. An up-and-coming area of artificial intelligence, deep learning makes use of neural networks. To acquire the knowledge required to solve issues, deep learning algorithms also require data.

Now that AI-based technologies are part of everyday life, businesses must use them. While deep learning has made great strides in recent years in solving AI-related challenges, businesses still need to factor in the computational costs of training algorithms on massive amounts of data [12]. Our reliance on AI-based technologies in our daily lives is growing. The "Aria" artificial intelligence speaker from SK Telecom of South Korea is one example of a smart voice-activated device. Aria can be used to make an emergency call when the bearer is unable to use traditional means of communication due to injury, disability, or other exceptional circumstances. As soon as an old person yells, "Aria, please help," the system notifies either the care facility, an emergency contact person in the family, or the South Korean security platform ADT Caps, which offers machine security, personal guards, and security services [13]. If the center determines that an emergency reaction is necessary, it will dial 119 (South Korea's emergency number). Thanks to this assistance, the lives of countless elderly people who live alone have been saved. Aria also has a place in the kitchen. When asked, "Aria, please help me with a salmon recipe," the AI assistant will guide the user through the steps of preparing salmon fillets. Aria can also help with your financial management needs. You can ask Aria to do things like find you a credit card with the lowest interest rate and annual fees or send you a friendly reminder on the 15th of every month that your credit card payment is overdue [14].

Now that AI-based technologies are part of everyday life, businesses must use them [3,5,24]. Customers in the digital age expect distinctive, personalized, and responsive services that also offer the freedom to make changes while remaining safe. Real-world examples of healthcare organizations' current AI use in patient care and operations management need analysis, as do the prerequisites (such as regulation and responsibility) and requisites for advanced AI applications (such as ethics, training programs, or consulting services).

AI in Medicine

Our reliance on AI-based technologies in our daily lives is growing. The "Aria" artificial intelligence speaker from SK Telecom of South Korea is one example of a smart voice-activated device [15]. Aria can be used to make an emergency call when the bearer is unable to use traditional means of communication due to injury, disability, or other exceptional circumstances. In the event of an emergency, such as a senior citizen falling and saying, "Aria, please help," the system will automatically dial either the care facility, pre-set emergency contacts within the senior's family, or the South Korean security platform ADT Caps. If the center determines that an emergency reaction is necessary, it will dial 119 (South Korea's emergency number). Many elderly persons who formerly had to live alone are still with us now because of this assistance [15][16]. Aria also has a place in the kitchen. When asked, "Aria, please help me with a salmon recipe," the AI assistant will guide the user through the steps of preparing salmon fillets. Budgeting is only one of the many financial activities that Aria can assist with. Aria may be programmed to remind the user of upcoming credit card payments and offer advice on the best credit card to use based on the interest rate and yearly fees in response to voice commands.

Freenome (a San Francisco-based AI genomics biotech company), Recursion Pharmaceuticals (located in Salt Lake City), Benevolent AI (based in the United Kingdom), OrCam (based in Israel), and many more similar businesses are now offering AI-powered healthcare solutions and services. IBM's "Watson for Oncology" is the most popular AI application in healthcare; it aids doctors by recommending effective treatments. It was proposed by Mesko that healthcare apps that provide drug warnings, patient education content, and measures of patients' current health states be developed by combining different systems with AI features [17]. In addition, Mesko stressed the potential impact AI-enabled technologies like personal assistants might have on patient monitoring and support in the absence of human carers. Smart robots bolstered by artificial intelligence can not only execute surgeries, but also assist doctors in making diagnoses and administering treatments, saving money and time, and providing faster responses to patients' requests.

Roughly 6,000 to 8,000 rare diseases are now known, affecting over 400 million people worldwide. The average time it takes to diagnose a rare disease is five years. Patients with uncommon diseases spend a great deal of time, effort, and resources trying to receive an accurate diagnosis. The biotech business 3Billion has claimed that it has successfully used AI to diagnose over 1200 people with rare diseases [18]. In cases when many diseases are detected, 3Billion can perform up to 7,000 tests simultaneously. Recently, a doctor gave a patient a different diagnosis from what the AI-based system had suggested. "As the medical staff is not specialized in all diseases, they have to focus on just a few of the diseases they know," explained the CEO of 3Billion. When a patient's "diagnosis wanders" from one medical center to another, valuable time is lost. Those who suffer from rare diseases commonly encounter this problem. There is a limit to the number of patients that a single doctor can see at once. AI's use in medicine might potentially save hundreds of millions of lives around the world [19].

Doctors at London's Moorfields Eye Hospital developed the AI diagnosis system, which has a 94% success record in prescribing treatments for more than 50 different eye diseases. Artificial intelligence is being used to diagnose colon polyps in China. When AI was

utilized in tandem with a gastrointestinal specialist, the detection rate of polyps increased by 20% compared to when only the specialist made the diagnosis in a clinical experiment.

Researchers at the University of Southern California (USC) experimented with the help of Ellie, a simulated human participant. Patients trusted Ellie more than they did their best friends, the study found [20]. WeBot, a company in the United States that introduced an artificial intelligence psychological therapy system, came to similar conclusions. In May 2019, Eunpyeong St. Mary's Hospital at the Catholic University of Korea launched Robot Paul to accompany medical staff on rounds to inpatient rooms, and in the same month, Robot Maria was introduced to help visitors find their way about the hospital. Self-driving capabilities, chatbots, blockchain, and voice-activated access to medical records are just a few of the advanced features shared by these two robots' artificial intelligence [21].

As far as we know, IBM's "Watson for Oncology" is the only medical AI of its kind now available. A cloud-based AI platform contains 12 million research papers, 290 medical publications, 200 textbooks, and thousands of patient cases from which doctors can draw treatment recommendations for patients with cancer. However, Watson has recently come under scrutiny for its purported inaccuracy (coincidence rate) and ineffectiveness across several medical areas. According to reports, medical professionals at large institutions in the United States do not find any value in adopting IBM Watson. Coordination between the healthcare professional and the patient is essential due to the delicate nature of medical care [22]. Watson's incapacity to organically connect with medical personnel and patients has led to the evaluation of its cost-effectiveness by the medical community in the United States.

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Watson is more likely to be relied on when there is consensus among doctors on the best course of treatment. Although final diagnosis and concordance rates are affected by the circumstances of each patient's situation and the type of cancer being treated [24]. Due to differences in patient ethnicity, country-specific sickness patterns, medical systems, and culture, IBM has proposed that more data collecting is important to improve the performance and accuracy of AI. This means that AI-enabled technologies will always lack the human touch and nuance required to provide adequate patient care. These limitations notwithstanding, it is impossible to deny that the broad deployment of AI is producing a substantial shift in the healthcare service industry, and this rate of change is only projected to quicken as AI research and development speed up in the future.

Miyashita and Brady speculated that medical AI benefits could be distinct from those seen in other industries. While artificial intelligence (AI) could improve illness treatment outcomes for patients, it is not anticipated to significantly reduce healthcare costs soon. However, the most innovative hospitals are always looking for new ways to use AI-enabled technologies, such as decentralizing care units and improving administration [25]. Consumers make a wide variety of non-acute health decisions regularly. These decisions don't call for a doctor's knowledge, but they have significant impacts on patient's health and healthcare costs.

An all-encompassing view of healthcare is necessary to fully comprehend the implications of AI-enabled technology.

According to the World Health Organisation, individual health and quality of life are correlated with lifestyle factors such as physical activity, diet, sleep, stress management, substance and medication use, and recreational activities [26]. Artificial intelligence (AI)-enhanced technologies and their applications have made it possible for digital devices to provide lifestyle interventions and reminders throughout the day based on an individual's vital signs. A revolutionary change in how healthcare organizations operate, optimize, and communicate with patients, as well as how they provide care services to enhance patient outcomes, is on the horizon thanks to AI-based technologies.

AI in Diagnosis

It is hoped that using AI in medical diagnostics will lead to better treatment for patients. "Diagnostic errors account for 60% of all medical errors and an estimated 40,000 to 80,000 deaths per year in U.S. hospitals," states Taylor (p. 1). Therefore, the application of AI-based solutions across the healthcare sector can aid in reducing the number of cases when human judgment leads to an incorrect outcome [27].

The world-famous Mayo Clinic in the United States uses artificial intelligence (AI) in cervical cancer screening to detect precancerous abnormalities in women's cervixes. The AI-based solution uses an algorithm that has been trained on over 60,000 cervical scans from the National Cancer Institute to identify early signs of cancer. The accuracy of the algorithm is 91%, which is significantly higher than that of a human expert (69%), according to the study's authors [28].

London's Moorfields Eye Hospital, part of the National Health Service Foundation (NHSF), has released an AI solution that can spot the first symptoms of eye disease just as well as the most skilled doctors in the world. Over 15,000 British patients' medical records were used to train an artificial intelligence-based solution that was then fed optical coherence tomography data. The hospital boasted in a news release that their AI-powered system had "the correct referral decision for over 50 eye diseases with 94% accuracy, matching world-leading eye experts." Dr. Pearse Keane of Moorfields Eye Hospital has stated [in an interview] that "the number of eye scans we're performing is growing at a pace much faster than human experts can interpret them" [29]. Therefore, it is crucial to have access to artificial intelligence-based technologies that can aid in accelerating the diagnosis procedure.

Watson and doctors at South Korea's Gachon University Gil Medical Centre agreed on a course of therapy 55.9% of the time in a 2017 evaluation. However, the overall survival percentage for patients with stage IV stomach cancer was only 40%. In addition, in April of this year, South Korean researchers from Konyang University Hospital reported that, among 100 patients with breast cancer, Watson's therapy advice was agreed upon by 48 percent of the doctors [30].

Liang et al. investigated and researched the "evaluation and accurate diagnoses of pediatric diseases using AI" at the Guangzhou Women and Children's Medical Institution, a major academic medical referral institution in Guangdong Province, China. To test how well AI-based technologies using deep learning techniques perform, the experiment employed 101 million data points taken from the computerized records of 1.3 million outpatient visits to the medical center. To provide a level playing field between the AI and the doctors, the study divided them into five groups based on their years of experience in practicing [31]. Senior residents with more than three years of experience make up the first group, followed by junior doctors with eight years of experience, intermediate doctors with 15 years of experience, attending doctors with 20 years of experience, and senior attending doctors with more than 25 years of experience. On average, the AI-based model achieved an accuracy of 88.5%. This

proportion was higher than what was achieved by the three groups of senior physicians (90.7%, 91.5%, and 92.3%), but lower than what was achieved by the two groups of young physicians (54.1% and 83.9%). In their study, Liang et al. concluded that "AI models may potentially assist junior physicians in diagnoses but may not necessarily outperform experienced physicians." Furthermore, the results demonstrated that the AI system's diagnostic accuracy was in the 95th percentile to the 98th percentile [32].

Watson for Oncology was first introduced in 2015 at the Manipal Hospital in Bangalore, India, one of the top cancer care centers in the world, using data collected from 1,000 patients with cancer types like breast cancer, colorectal cancer, rectal cancer, and lung cancer over three years by two doctors. For rectal cancer, Watson's therapy suggestions and clinicians' recommendations showed a high degree of agreement (85%), but for lung cancer, the percentage was substantially lower at 17.8%.

These assertions were made by IBM's Associate Chief Medical Officer of Watson Health, Dr. Jeff Lenert, at the 2019 ASCO Annual Meeting in Chicago. He said that AI would improve evidence-based decision-making in the research community and boost patient happiness by revealing all available therapy options.

AI and Nursing

It's no secret that medical professionals face a deluge of paperwork when caring for patients. The healthcare industry is increasingly relying on electronic systems that integrate and digitize medical records with the assistance of artificial intelligence (AI) technology to keep up with the growing volume of work [33]. It has been found that chatbots can be a useful tool for hospitals to use in their interactions with patients and their loved ones.

The Cleveland Clinic, a nonprofit multispecialty academic medical center in Cleveland, Ohio, has been using Microsoft's artificial intelligence digital assistant Cortana since 2016 to "identify potential at-risk patients under ICU care" using predictive and advanced analytics. As part of the Cleveland Clinic's e-Hospital system, Cortana watches over "100 beds in 6 ICUs" between the hours of 7 p.m. and 7 a.m. An AI-aided system that can watch doctor-patient interactions and pick up on patterns has been created at the University of Pittsburgh Medical Centre [34].

In March of 2016, Johns Hopkins University Hospital, a non-profit academic medical center in Baltimore, Maryland, announced that it would collaborate with GE healthcare partners to use predictive analytics based on artificial intelligence technologies to support smoother operational flow. Johns Hopkins Hospital's Command Centre has 22 high-definition, touch-screen-enabled computer monitors that receive "500 messages per minute and integrate data from 14 different Johns Hopkins IT systems." Chief administrative officer for emergency services and capacity management James Scheulen claims that "emergency room patients are assigned a bed 30% faster; transfer delays from operating rooms have been reduced by 70%; ambulances are dispatched 63 min sooner to pick patients up from other hospitals; and the ability to accept patients with complex medical conditions from other regional and national hospitals has improved."

Artificial intelligence (AI)-based technology is also being employed in robotic-assisted surgery and virtual nurses. The versatility, accuracy, and precision of robotic-assisted surgery have made it the method of choice among surgeons. Surgeons can now do previously impossible surgeries using robotic technology [35]. Artificial intelligence (AI) systems can learn from successful data regarding the same type of procedures by merging real-time data with medical records, allowing surgeons to access more crucial patient information in real-time even while operating.

The 958-bed non-profit Cedars-Sinai Medical Centre in Los Angeles, California, uses Amazon's Alexa robots as virtual nurse assistants in patient rooms. Alexa can help patients remember to take their medication or show up for doctor's visits, and she can answer their health-related questions.

When a staff worker at the Eunpyeong St. Mary's Hospital of the Catholic University of Korea scans a doctor's ID card, the AI robot Paul provides a list of inpatients to be treated by the scanned physician. The robot also follows doctors about in the hospital, picking up on their speech and translating them into text so that electronic medical records may be transcribed in real-time. In addition, it facilitates the medical staff's rounds by giving them instantaneous access to patient data like medical records, imaging, and test results. Machine learning allows this robot to reduce the time spent recording data, quickly examine the outcomes of patients' medical checks, and inspect information in realtime, all of which improve the efficiency of care services. Hospital visitors can ask Maria, the hospital's guide robot, any questions they may have in the lobby. When a patient touches Maria with their medical ID card, she guides them to the right doctor's office and through the appointment schedule. Maria can also help patients find their way to the right department at the hospital [36].

The aforementioned diagnostics and administrative workflow support uses of AI in healthcare show the growing prevalence of the technology. Here, we examine some of the difficulties encountered by the healthcare industry and talk about how artificial intelligence-enhanced solutions can aid in overcoming these issues.

Opportunities

To enhance the diagnosis accuracy of AI applications, market-ready domain-specific solutions must be developed using machine learning algorithms trained on a sufficiently large sample of data that incorporates ethnic and cultural information about patients. Over time, these AI systems can get better with the help of doctors and researchers. Like any new technology, medical AI systems' effects might be perceived as both utopian and dystopian.

To enhance the diagnosis accuracy of AI applications, market-ready domain-specific solutions must be developed using machine learning algorithms trained on a sufficiently large sample of data that incorporates ethnic and cultural information about patients. Over time, these AI systems can get better with the help of doctors and researchers. Like any new technology, medical AI systems' effects might be perceived as both utopian and dystopian. From an idealistic vantage point, there are many ways to improve illness management, care quality, the patient experience, the reduction of medical errors, healthcare costs, and the efficiency of healthcare administration [37]. The dystopian worldview, however, introduces a plethora of new challenges. The increased use of patient data for analytics can increase the risks of cyber threats to privacy and security, the need for doctors to take responsibility for their mistakes, and the possibility of adverse effects on doctors' jobs. We believe it is vital to explore some of the most pressing positives and cons related to implementing AI-based technologies in the healthcare sector to ensure the intelligent use of AI and its widespread dissemination.

There are many ways in which the healthcare industry might profit from the widespread adoption of AI-based technologies. Some of the more important ones will be discussed here.

The advent of IBM Watson, a landmark in the era of data-based medical research, sparked the public's interest in the advantages of utilizing cutting-edge digital technology to improve public health and the quality of patient care. The real-world examples of AI applications in healthcare highlight how state-of-the-art technology is being integrated into nearly every facet of patient care. An artificial intelligence (AI)-supported magnetic resonance imaging (MRI)-based algorithm of cardiac motion was described as having the potential to enhance the management of patients with hypertension and respiratory sickness [38]. In a similar vein, 3Billion developed an algorithm for identifying uncommon genetic diseases in 2019. According to Guo and Li, the deployment of AI-based technology can greatly improve patient care services.AI and has been demonstrated to be particularly useful in improving the quality of care services related to medical imaging when dealing with large amounts of radiology data. If diagnostic technologies powered by AI can improve accuracy, it would be a huge boon for both patients and clinicians. just for instance, analyzing the mitotic frequency of cancer cells is a straightforward process that calls just a microscope or pictures, but it can be time-consuming. This can be done more efficiently and accurately by AI software, freeing up doctors' time to focus on other matters. The intelligence of AI-enhanced medical software can grow when more data is collected and new medical research is discovered. The diagnostic accuracy of AI-enhanced medical software is fast closing the gap with that of human doctors and, in some situations, surpassing it. The public's interest in the benefits of applying advanced digital technologies to improve public health and patient care quality was piqued by IBM Watson's launch, marking a watershed moment in the era of data-based medical research. Research into the application of AI systems will significantly supplement the job of medical professionals by alerting them to areas that humans frequently miss or helping to reduce medical errors. The real-world examples of AI applications in healthcare highlight how state-of-the-art technology is being integrated into nearly every facet of patient care. An artificial intelligence (AI)-supported magnetic resonance imaging (MRI)-based algorithm of cardiac motion was described by Dawes et al. as having the potential to enhance the management of patients with hypertension and respiratory sickness. In a similar vein, 3Billion developed an algorithm for identifying uncommon genetic diseases in 2019. According to Guo and Li, the deployment of AI-based technology can greatly improve patient care services.

AI has been demonstrated to be particularly useful in improving the quality of care services related to medical imaging when dealing with large amounts of radiology data. If diagnostic technologies powered by AI can improve accuracy, it would be a huge boon for both patients and clinicians. just for instance, analyzing the mitotic frequency of cancer cells is a straightforward process that calls just a microscope or pictures, but it can be time-consuming [39]. This can be done more efficiently and accurately by AI software, freeing up doctors' time to focus on other matters. The intelligence of AI-enhanced medical software can grow when more data is collected and new medical research is discovered. The diagnostic accuracy of AI-enhanced medical software is fast closing the gap with that of human doctors and, in some situations, surpassing it. By highlighting areas that humans often miss or aiding in the reduction of medical errors, advances in the use of AI systems will significantly augment the work of medical practitioners.

Noom is one of the most downloaded health coaching apps for smartphones since it is both diet software and a mobile diabetes prevention program. "We work with customers across the globe to help them create healthier habits, reduce their risk of chronic health

problems, reverse disease, and foster healthier relationships with themselves in the process" is how the organization describes its job. The success of this coaching software depends on the user's complete immersion in the process [40].

Participation from the patient is essential for an accurate diagnosis and for the patient's safety throughout therapy. The time spent in these conversations with doctors is often viewed as beneficial by patients. Participation in treatment decision-making and completion of assigned responsibilities improves patients' evaluations of the quality of their care. Boulding et al. observed that patients' reports of their level of involvement in their care were associated with better treatment results and patient satisfaction. Therefore, healthcare providers should make patient participation and involvement a priority to improve the quality of care provided.

Patient participation in the system-supported treatment process may increase if patients have heard through the media or their doctor about the potential for faster and more accurate diagnosis, reduced medical errors, and decreased medical cost, although many patients are unfamiliar with artificial intelligence (AI) and AI-supported medical systems [35]. Healthcare practitioners, in light of the exponential growth of AI and AI-powered medical equipment, must strategize ways to inform their patients and their families about the advantages and safeguards of these developments. Patients who are made more aware of the potential advantages of AI in healthcare settings are more likely to welcome its implementation.

During colonoscopies, Chinese doctors who employed AI detected 20% more polyps than those who did not. Wang et al. reported this finding. Polyps as small as 5 mm are often missed by gastroenterologists during colonoscopies, but the AI-supported approach can find them. Artificial intelligence aids doctors in finding and eliminating polyps that could cause injury, which improves care delivery and reduces the possibility of errors.

Researchers at the University of Tokyo Medical School have revealed an artificial intelligence system built on unique algorithms and order parameters. When combined with deep-learning AI medical software, this strategy yielded an accuracy of 83.5% on a small sample of patients. Before incorporating a deep-learning and decision tree AI system, the accuracy was only 63.7%, but after doing so, it increased to 87.3%. Recent developments in clever AI systems hold great promise for reducing error rates and improving the quality of care provided [41].

Many people worry that radiologists are the healthcare workers most likely to be replaced by robots. This expectation is plausible given that a system using AI can process 10–100 times as many images per day as a radiologist can. In addition, the AI system produces more precise results than human radiologists. AI technology can help improve care by giving radiologists more time to engage in in-depth, person-to-person talks with patients. The improved data extraction made possible by AI also helps clinicians anticipate and avoid mistakes.

Healthcare Spending

Previously, we discussed how AI-enhanced healthcare systems can handle a variety of diagnostic tasks without human intervention. A pill cam equipped with AI has the potential to replace the time-consuming and invasive upper endoscopy used to check for stomach cancer. The costly traditional methods of evaluating bone marrow structure characteristics while testing for acute leukemia have been superseded by a novel AI-based method. These AI solutions expedite and lessen the cost of diagnosis and treatment [14].

This is by no means the only application of AI technology. Some AI systems' ultimate objective is to promote healthcare operations innovations that increase or free up value at various points in the value chain. Bookkeeping, inventory management, and system maintenance are just a few of the clerical jobs that AI systems excel at more so than humans. The use of AI in chatbots and healthcare robots could dramatically increase efficiency.

Employment opportunities

Is it possible that one day AI and robots will make all jobs obsolete? Throughout industrial progress, from the First Industrial Revolution to the Fourth Industrial Revolution, various common manual jobs have been replaced by technologies. However, a large number of new positions have emerged to back up the rise in production. New opportunities in digital editing and typography have emerged as the printing business has declined. However, many have found new opportunities in the rapidly expanding navigation and geographic information systems (GIS) sectors as the number of map publishers has decreased.

As explained by Javanmardian and Lingampally, "AI solutions are already producing the kind of internal gains that suggest much more is possible in healthcare players' back offices." This could help healthcare organizations increase output and efficiency, as seen by Noom's growth from 77 employees in 2017 to 1100 employees in June 2019. Noom is an artificial intelligence-driven app that encourages healthy eating and reduces the risk of developing serious health conditions. The app's AI algorithm, however, was able to determine why some users abandoned the app before their objectives were completed. Noom Coach was created to inform customers about the need for a mental drive in addition to diet and exercise for long-term health. So, Noom Coach started giving people one-on-one, consistent guidance to help them get healthy. By employing the AI system, Noom concluded that it is impossible to influence human behavior by purely technological methods and that an appreciation of human psychology is essential [23]. As a result, Noom has been able to dramatically increase its staff size.

Transfer learning was used in a collaboration between San Diego State University and Guangzhou University Medical School in China to develop an AI-enabled eye disease diagnosis system for age-related macular degeneration and diabetic macular edema. In a matter of seconds, this AI can diagnose the ailment and its stage of development. When compared to the consensus diagnosis of five experienced ophthalmologists, the diagnostic accuracy was also higher than 95%. These examples demonstrate how AI-based systems can improve productivity by eliminating wasteful human intervention, speeding up the diagnostic and treatment processes, and discovering novel approaches to healthcare delivery.

Personalized treatment regimens, state-of-the-art diagnostic tests, and caring physicians and nurses are all hallmarks of a well-functioning healthcare system. To ensure both high-quality care and large cost reductions for medical care, widespread deployment of AI to facilitate this ideal care service is necessary. According to a survey by ABI Research, a marketing research consulting firm, smart applications of AI in the healthcare business might save as much as $52 billion in the United States by 2021. Large healthcare facilities in the United States and Israel have reportedly already used AI-based programs to aid in illness prevention, as reported by ABI Research. There is expected to be a yearly growth of 176% in the number of AI-supported devices for patient training to prevent chronic diseases (such as diabetes and high blood pressure) in these two nations, from 53,000 in 2017 to over 3.1 million in 2021. Therefore, artificial intelligence in healthcare has the potential to greatly affect

healthcare spending generally. These savings can be used to expand successful projects that improve health and prevent disease on a national scale.

Artificial intelligence has the potential to vastly improve many facets of people's lives, but it also introduces new concerns that must be addressed. The healthcare industry is unlike any other since people's lives are at stake. The following are some instances that call for cautious approaches to their resolution.

A tragic accident involving a Tesla Model S equipped with autonomous driving features happened on May 7, 2016, raising the question, "Who should be accountable for the accident?" A similar concern arises in the medical field when AI-based technologies are used to treat patients; who is responsible if something goes wrong? The set of man-made machine learning algorithms that power AI systems. Following discussions with technologists, consultants, and doctors, the medical center's administration decided to purchase the system. The hospital's medical staff utilized the system to provide the necessary care to the patient. Then, if not the hospital, the doctors, or the firm responsible for designing the system, who is to blame for the problem? The numerous technological, managerial, and ethical factors that must be taken into account make this a difficult question to answer.

Despite the widespread adoption and increasing sophistication of AI-related technology, the ethical concerns of this area have received less study. Dr. Stephen Hawking has expressed concern that the growth of artificial intelligence (AI) and clever robots would lead to a situation in which human power is out of control. In addition, he suggested establishing a new international agency to regulate AI. Lupton stresses the importance of ensuring that moral and ethical AI activity patterns help rather than hurt society. With the proliferation of AI-based technologies and systems across various fields, they must operate following commonly held ethical principles. Especially in the rapidly evolving healthcare sector, social agreements should be the foundation for who is held responsible for any unintended consequences of AI applications.

When compared to other service industries, healthcare stands out due to the unwavering trust patients place in their doctors. This is explained by the placebo effect, which occurs when a patient receives medical care to which he or she has not given informed consent but experiences a sense that the patient's ailment is being treated. The doctor-patient relationship is vital because it increases therapeutic success through mutual trust. If an AI-based technology or system takes on the role of a doctor, the care delivery process will involve the patient forming a rapport with a machine. Patients must be able to trust the AI-enabled device or system for the new engagement to be effective. Those who have never used a computer or who are unfamiliar with artificial intelligence may have problems putting their faith in an AI system. The doctor and patient may be able to work together to find a solution if the doctor can show the patient how the AI will enhance care.

Safety and Security

Data collection and dissemination in AI-based technologies/systems raise privacy problems. It is difficult to promote the sharing and regulation of data related to diseases across different databases due to the sensitive nature of patient information. As a result, software developers must adhere to privacy laws, which may hold down AI development. Because AI makes judgments based on machine learning of the cumulative data supplied, without considering the specific circumstances of individual patients, ethical, moral, and legal

considerations arise. As a result, we need to discuss the ethical requirements, legal limits, and societal norms that AI technology should observe.

Many previously autonomous industries now rely heavily on one another because of the internet. Even the medical industry isn't immune to this rule. The hospital used to be seen as a location where people with illnesses went to be treated. Today, however, a healthy body and mind are the result of a combination of great medical care and preventative measures including a balanced diet, regular exercise, and other well-being practices. This has led to the rise of preventative medicine, which has served to further muddy the waters between preventative measures, conventional medical care, and technological interventions. Artificial intelligence is unconquerable by the constraints of time and space. It also means that the concept of a closed healthcare system can no longer be upheld. Robot Maria, Alexa, AI speaker Aria, etc. are examples of smartphone apps that can help integrate many aspects of people's well-being. Remote monitoring, diagnosis, treatment, and management of patients are all possible thanks to AI-based technologies.

As artificial intelligence (AI) technologies become more widespread in the healthcare sector, there is a growing need for consultants, professionals, and specialists in ICT, convergence, and human resource management. Consequently, the delivery of healthcare has shifted to a team effort involving both in-house and external professionals. Therefore, traditional bureaucratic administration has no place in modern healthcare facilities. This will probably lower the confidence of hospital administrators. However, this new kind of management is a dynamic system that integrates all parts of the healthcare delivery chain to guarantee the best possible outcomes for patients.

In anticipation of higher-skilled jobs in the AI future, Amazon has announced that it will retrain 100,000 employees by 2025. Jeff Wilke, CEO of Amazon's consumer division, has said, "As technology changes work, they have the opportunity to advance in their career and take advantage of those changes". The Health Innovation Big Data Centre at the Asan Medical Centre in Seoul, Korea, is another organization that has begun training AI specialists to commercialize their innovations.

Conclusions

The fast-paced, digital environment of today demands novel strategies. Value-adding ideas can only be implemented and converged with the help of technology. Therefore, firms must use AI and related technologies if they wish to maintain their competitive edge. The healthcare industry is a major target for the upcoming uses of AI because of its revolutionary nature. Artificial intelligence (AI) applications are altering not only the diagnostic and treatment phases of patient care but also the patient's way of life since their health depends on a wide range of self-care practices. We examined the implications of AI's proliferation in healthcare systems, including both opportunities and challenges. The healthcare industry as a whole needs to work together to address these challenges and opportunities.

The versatility of digital tools has been greatly enhanced by recent innovations. Another crucial factor is the expanding availability and usefulness of digital technologies. As a result, there has been a widespread shift in consumer behavior across sectors, and the digital (and AI) divide is narrowing. The provision of healthcare services is no longer monopolized by medical experts. A person's health is affected by several things; these include diet, exercise, stress reduction, disease prevention, and treatment. Many people nowadays who are afflicted with illness or injury turn to the internet in search of answers. AI and other digital tools are

frequently used by medical practitioners as well. To evaluate the benefits and risks associated with new healthcare technology, it is necessary to have a holistic picture of the field as a whole. The primary focus of this study was on the use of AI in the improvement of healthcare delivery. Academics and healthcare practitioners may benefit from this study's findings by learning more about the many ways in which AI may one day aid in the delivery of care.

It is necessary to collect and analyze data of various types (e.g., incorporating ethnic and cultural traits of patients) because the machine learning algorithms used by AI-based systems require a large quantity of data for an accurate diagnosis. Significant progress has been made in applying AI to healthcare, and this is expected to increase in the future. Although there are both benefits and drawbacks associated with utilizing AI, this is still the case. Therefore, more work needs to be done to investigate, distribute, and implement artificial intelligence in healthcare. We have some suggestions for improving the management of AI programs in healthcare settings.

The first step is to establish rules that promote open data sharing across AI applications. Increasing the usefulness of AI in healthcare will require ongoing data collection and sharing. For this reason, "the better the data quality, the more confidence users will have in the outputs they produce, lowering risk in the outcomes and increasing efficiency". According to Johnson et al., healthcare companies should emphasize data validity improvement operations and assess the reliability of presented values. It is important to collect precise and realistic qualitative data because disease patterns vary from person to person based on characteristics such as race, culture, lifestyle, the socioeconomic position of the patient's neighborhood, etc. Therefore, appropriate data access criteria and processes should be created to expand the availability of high-quality data at the governmental level, taking into account the risks and benefits of data sharing. Each patient's right to privacy must be upheld by the law, and only aggregate data should be used for the common good.

Second, there must be a consensus between members of society on the most crucial aspects of AI, such as the privacy and legal responsibility associated with data sharing. More data, the lifeblood of medical AI, can only be acquired with more human participation. There must be community buy-in for AI quality assurance and for assigning blame in the event of incorrect diagnoses or other medical errors that may occur during the provision of care. Technology has led to medical mistakes despite widespread worry about the loss of personal information, and society has not yet achieved a consensus on data ownership or sharing.

Third, experts from many disciplines are needed to implement AI-based solutions in caregiving settings. According to a report, "AI is like a surgical knife in the end, and how closely we work with real-world experts in healthcare fields will be the success or failure of the medical AI solution," so it's important for healthcare professionals like doctors, nurses, social workers, chemists, and patients to collaborate closely during the development stage. Therefore, it is important to provide a setting conducive to teamwork for the design, implementation, and evaluation of AI applications.

Fourth, we shouldn't be too concerned about the possibility of AI eliminating our employment, and instead focus on finding productive uses for our surplus labor in new and developing industries. As the Industrial Revolution demonstrated, while automation may lead to machines performing some tasks that humans have traditionally done, it will also create new types of work. The healthcare sector should take this opportunity to retrain former employees for new, better jobs. The need for radiologists, for example, could be reduced if AI-based

technologies were widely employed for diagnosis and medical image processing. Medical institutions require radiologists who can combine medical research with information and communications technology. Medical professionals, IT experts, and policymakers should pool their resources to investigate medical informatics and develop a framework for evaluating and sharing healthcare big data.

Improving AI use and eliciting patients' confidence in the healthcare system may require exploring additional issues beyond the scope of this study. Students majoring in any field, including medicine, should take an artificial intelligence course (for example, the Computer Science and Artificial Intelligence Lab at MIT offers the required AI course for all majors at MIT, https://www.csail.mit.edu/). Future doctors need to be taught with this evolving paradigm in mind.

Second, with the help of modern technologies, healthcare organizations can lower their costs while simultaneously increasing their patient base. Artificial intelligence, for instance, can streamline non-clinical medical tasks like diagnosis and monitoring. Therefore, the general population needs access to readily available, user-friendly technologies and systems. To get the most out of the system, it's crucial to make available patient and healthcare provider education and training resources for AI and related technologies.

Last but not least, healthcare providers need to take extra precautions to ensure that cyberattacks and human error do not compromise sensitive patient data. Assuring patients that their medical records will be kept private will go a long way toward gaining their approval for public use. A solid data security system and a code of conduct for dividing up duties could prove useful in this situation.

Limitations

It is expected that the 5G network would make it easier for the use of artificial intelligence to spread throughout the healthcare service industry. Using 5G networks, large amounts of medical imaging data created by methods like MRI may be transmitted quickly and accurately, improving the quality and availability of healthcare delivery. Because the 5G network can be utilized for telemedicine even on networks without a LAN connection, patients can swiftly get medical care or consult with professionals. Ericsson, a world leader in telecommunications technology and services, predicts that the healthcare sector will generate $76 billion in income from 5G by 2026.

When an event's conclusion is unclear, acting quickly may help mitigate its effects. When it comes to healthcare, well-being, and perhaps life itself, artificial intelligence (AI)-based technology is breaking through previously insurmountable geographical and temporal barriers. It is hoped that this will change in the future, even though present AI-based healthcare systems focus on disease management rather than the patient. Because of this, it's important to adopt AI-enabled technology with a broad perspective that takes into account the complete range of human experience, not just in healthcare but in other parts of our daily life as well.

The study's suggestions are grounded in the existing application of AI-based technology, which may limit our ability to understand the full potential of future technologies. By surveying the existing literature and analyzing the implementations of AI systems in healthcare enterprises, this paper provides recommendations for optimizing their use. Our study's primary goal is to lay the groundwork for future theoretical and empirical research on the best ways in which AI systems might be used to advance medical care and public health.

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