



Strengths and Shortcomings of Artificial Intelligence & E-health to secure Health in the Global Era

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ABSTRACT

Healthcare is the most efficient and fastest-growing industry on the planet. It entails providing ailing people with curative, preventive, rehabilitative, and palliative care in order to meet the population's healthcare needs. More chronic illnesses have become the world's leading fatalities as society has progressed and people's lifestyles have changed. According to the World Health Organization, Ischemic Heart Disease (IHD), stroke, Chronic Obstructive Pulmonary Disease (COPD), and Lower Respiratory Infections (LRTI) continue to be the responsible factors in both developed and developing countries. Artificial intelligence has shown promise as a medical technology, with a wide range of applications in detection, treatment, prophylaxis, and payment systems for healthcare. Numerous emerging information technologies, including big data and mobile internet networks, have recently emerged to support AI applications in the healthcare industry. As a result, AI-based electronic E-healthcare and medical M-healthcare systems are focused at gathering data, analyzing it, and providing the end-user with a well-defined output (the physician, the patient, or the caregiver). Healthcare contains numerous clinical, nonclinical, support, ancillary, and administrative services to get delivered by hospitals, nursing homes, primary health centers, community centers, dispensaries, clinics, laboratories, diagnostic centers, and blood banks to strengthen the healthcare infrastructure of the country. It continuously evolved and developed throughout the period. Whether it may be a question to cope up with traditional diseases, or any new emergent contagious disease, disease of known or unknown etiology, microbial origin or human made genetically mutated causative organism. The healthcare and medical fraternity always were the front-line warriors to serve the diseased population of the community around the globe. During the current pandemic, technological advancements, telecommunication, tele-medicine, and digitalization of healthcare services especially curative and diagnostic services played a vital role to deliver healthcare services without any spread of diseases such as e-health and m health. E-health refers to the delivery of healthcare services through digital modes like telemedicine, telehealth, Electronic Health Records (EHR), etc. The healthcare sector utilized these technologies to strengthen the healthcare infrastructure and to manage the available healthcare resources so that proper prevention, diagnosis, and treatment can be done. Now, these technologies which includes AI, E-health have become the indivisible segment of the healthcare sector. Specially in the recent outbreak of these COVID pandemic the role of these techno-based healthcare delivering model has rooted deeply and opens a new dimension of future healthcare infrastructure. All these emerging technologies which includes Artificial Intelligence, E-health has its Strengths and shortcomings to secure Health in global Era.

Keywords: Artificial Intelligence, E-health, Healthcare, post pandemic, tele-medicine, digitalization of healthcare services.

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INTRODUCTION

The world is experiencing numerous possible shifts, which represent the current and future system, structure, population, and infrastructure. Healthcare is one of the most sophisticated and engrossing industries, adapting to the many changes that occur throughout the world. The adoption process is clearly influenced by technical innovation. Because of the integration of health care information systems with telecommunication, the healthcare process is now more efficient. AI and e-health have been regarded as prominent technology in healthcare, with a wide range of applications encompassing medical money transfer, prophylaxis, intervention, and prognosis. Recently, a slew of new information and communication technologies, such as big data and mobile internet networks, have arisen to aid AI applications in healthcare. The simulation of intelligent behaviour in machines is the focus of the computer science discipline of Artificial Intelligence (AI) [1-3]. Artificial intelligence refers to the automation of mental processes including judgement call, problem-solving, and learning (AI). As a result, AI-based electronic (E)-healthcare and medical (M)-healthcare systems are focused on gathering data, analyzing it, and providing the end-user with a well-defined output (the physician, the patient, or the caregiver). E-health is the application of information and communication technologies (ICT) to the support of health and health-related sectors. Information and Communications Technologies have

advanced at a breakneck pace over the previous 50 years. These developments aided the industry's exceptional expansion of the emerging country's healthcare sector. E-health is now referred to as the most convenient way to give healthcare services to patients, thanks to Artificial Intelligence and Information and Communication Technologies. Artificial Intelligence has improved patient and hospital entity access to health-related information, healthcare infrastructure, operational systems, and healthcare delivery. Patients' expectations of the healthcare sector are increasing by the day, and as a result, the healthcare industry is working to create better standards for delivering healthcare services. Diseases are getting increasingly difficult to diagnose and treat. As a result, the adaptation of healthcare information systems is critical in order to meet patient requirements and enhance healthcare structures. The use of healthcare technologies aids authorities in rethinking their manner of involvement in the healthcare system in order to provide investigative, therapeutic, and prophylactic medical services to the general public [4-6].

The Origin of Artificial intelligence (AI) and e-Health

The 1950s are thought to be the birth year of AI. British mathematician and logician Alan Turing questioned the extent to which computers were capable of reasoning in 1950. Researchers began incorporating AI as professional frameworks in established fields more than ten years later. Artificial intelligence made its way into healthcare in the early 1970s and began to be used to biomedical issues. In notably in the field of medicine, AI research exploded in the 1970s. Artificial Intelligence in Medical, a global AI journal, was founded, and the American Association for Artificial Intelligence was established in 1980 with a subgroup on clinical applications. Artificial intelligence changed into integrated into medical settings with inside a long time that followed. In 2012, Geoffrey Hinton and co-workers launched Alex Net. This fueled the current wave of interest in deep learning by confirming that deep learning methods outperform more conventional Artificial intelligence processes in terms of performance. Deep neural networks have recently demonstrated proficiency for several tasks on par with that of human operators. Over the beyond decade there was an extensive uptick of funding in AI and deep studying in healthcare applications. In terms of combination equity funding, AI in medicine had been the most significant commercial use by 2017. Physical and virtual AI branches that are used in healthcare eventually developed. In order to assist patients and providers in the delivery of care, physical AI uses devices and robots. Virtual AI is characterized with the aid of using machines, or deep studying, wherein algorithms are created thru repetition and experience. One way to look at the development of eHealth is to look at it through the lens of the three revolutions that have influenced humanity since the mid-twentieth century. The interaction of the organizational, communicative, and telecommunications revolutions has given rise to eHealth, which has changed the nature of purposeful activity and the interactions between and within organisations in terms of power and exchange. Consequently, the patient-consumer wants to have greater influence when negotiating business deals with healthcare providers and to have secure access to information, goods, and services whenever they need them. Of course, healthcare providers, individual physicians, medical organizations and hospitals, insurance companies, pharmaceutical firms, and governments are all affected by these pressures to varying degrees and are responding to the empowered patient-consumer challenge. In the field of eHealth, a patient-centred approach has arisen [7-9].

Integration of Artificial Intelligence in E healthcare to secure healthcare delivery

More chronic diseases have emerged as the leading causes of death worldwide as a result of social growth and lifestyle modification. The World Health Organization (WHO) reports that the leading causes of death over the last ten years in both developed and developing nations have been ischemic heart disease, stroke, chronic obstructive pulmonary disease, and lower respiratory infections. A prospective technology in the field of healthcare, artificial intelligence (AI) offers a wide range of applications in areas like detection, medication, prophylaxis, and medical payment systems. Big data and mobile internet networks are just two of the many new information technologies that have recently arisen to support the use of AI in the healthcare industry [10].

Artificial Intelligence Devices

Two groups of AI devices exist. The first group includes machine learning (ML) techniques that assess structured data, such as imaging, genomic, and EP data. Algorithms for machine learning are used in clinical settings to evaluate the severity of clinical outcomes or to aggregate the traits of individuals. The second category includes natural language processing (NLP) tools, which extract information from unstructured data like clinical notes and medical periodicals in order to supplement and augment organised medical data. The goal of NLP processes is to turn text into structured information that can be analysed using machine learning methods.

E Health in Developed Countries

One of the most significant interfaces with the healthcare system is digital technology, which ensures the provision of high-quality healthcare services. As a result of the impact of technology on the healthcare sector, developed countries began to use e-healthcare to usher in a new era of healthcare. Countries like the United States are always evolving, and their national healthcare industry is expected to grow to 5.7 trillion dollars by 2025. Various developed countries are using virtual reality tools, mobile technology, and IT integration to redefine the patient experience. But no one is immune to the effects of technology in today's environment. China is one of the world's developed countries, with the most people. China's population is projected to have increased by 15-30% in the recent several years. As a result, in the field of healthcare, China is utilizing communications technology to revamp the healthcare infrastructure. In China, the most popular concepts are robotics, digital data, and telemedicine. Wireless and remote monitoring technologies are being used in hospitals to cut operational costs and bed occupancy. Robotic technology is being utilized to train healthcare personnel as well as provide support to medical professionals during surgeries in Japan, where the level of advancement is slightly higher [11].

E health Status in India

India has established itself as the fastest-growing and most well-known country in many sectors, including the healthcare market, which has been booming for the past decade. Recent advancements in information technology and telecommunications have resulted in significant transformations in the healthcare sector, piquing the interest of healthcare professionals in India. Both the public and commercial sectors are working together to improve the quality of healthcare in India. The Indian government has initiated a nationwide program in this regard called the 'National Digital Health Mission (NDHM)' in the year 2020, which is entirely technology-based and aims to modernize India's health industry. In this regard, India has partnered with the Netherlands in order to give digital healthcare services to each patient in India with the promise of safety and security. The effort aims to create a unified healthcare system that can recognize each user and preserve medical data for a longer period of time. Another goal of this project is to improve the capability of India's healthcare infrastructure. The Open Digital Ecosystem (ODE), which will be a single source of information for the government, healthcare specialists, stakeholders, and patients to accelerate the transformation of healthcare in India, is part of the mission's complete approach. According to industry developments, workforce occupation, financial environment, paying capacity, and other factors, India is divided into rural and urban regions. While rural areas are difficult to access leading to a shortage of awareness, public transit, and convenience amenities, millions of patients have profited greatly from the introduction of e-health technology. Although implementing E-health technology is difficult for India, it is a top priority for the country, and it is performing admirably to assure the highest quality of healthcare services to patients. By recommending healthcare services via digital mode, the active participation of healthcare specialists makes the installation and use of electronic health technology easier, as well as lessens resistance among the population [12-14].

Need of AI and E health in India [15]

The healthcare sector in India is significantly skewed in favor of the urban population, which accounts for 28 percent of the country's population. Every year, about one million Indians die as a result of insufficient healthcare, and 700 million people lack access to specialized care, with 80 percent of specialists living in urban areas. Due to the following factors, India has been slow to deploy e-governance and e-healthcare.

- ✓ For a long time, the health industry has been devoid of competition, and healthcare has been managed solely by the Public Health System (PHS).
- ✓ Customer who is weak and has little bargaining power.
- ✓ There are no finance structures in place, such as insurance or social security.
- ✓ Doctors have a strong professional culture that is adverse to new ICT uses.
- ✓ Doctors and nurses place a higher value on their abilities than on computers.
- ✓ In medical and nursing education, there is a lack of technological assistance.

APPLICATIONS OF AI IN SECURING HEALTH [16-23]

Radiology and Artificial Intelligence

Skilled professionals examined electronic information for radiography diseases to locate, describe, and diagnose them. As a result of recent AI discoveries, non-deterministic, deep learning algorithms have demonstrated significant increases in the perception and interpretation of complex data and image recognition tasks. These features are used to evaluate radiographic qualities such as the 3D shape of a tumor, intratumoral texture, and pixel intensity pattern (refers to Figure 1).

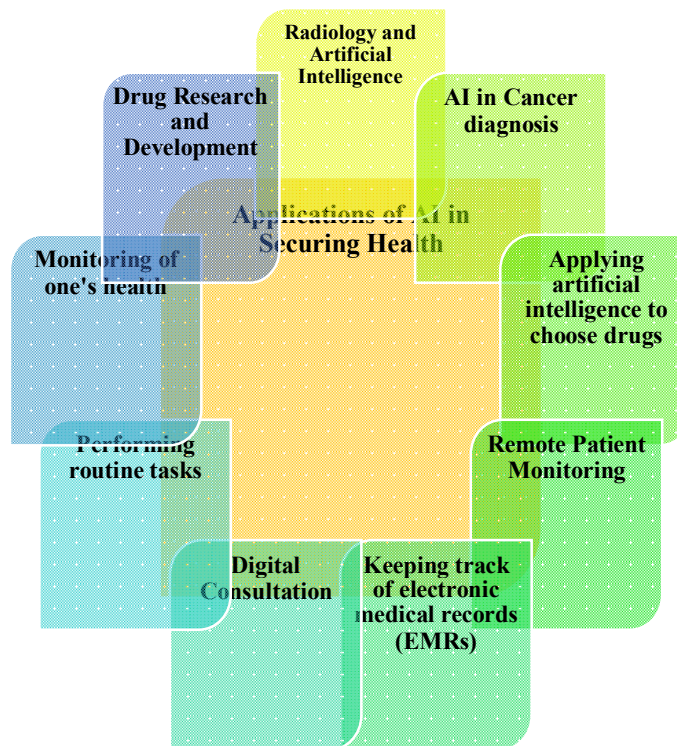


Figure 1: Applications of AI in Securing Health.

AI in Cancer Diagnosis

The most common type of cancer is skin cancer, which is primarily found visually after a clinical assessment, dermoscopy images examination, a biopsy, and histological assessment. The fine-grained variability in skin lesions' appearance makes diagnosis difficult. Nevertheless, deep convolutional neural networks (CNNs) may match the performance of all rated experts when trained end-to-end using a large collection of photographs and just using pixels and disease labels as inputs.

Applying artificial intelligence to choose drugs

It might cost millions of dollars and decades to develop a new medication. AI technologies can increase the effectiveness of drug development by simplifying the management of clinical trials. Testing every potential combination can be avoided by building a neural network using the results of multiple experiments. It can expedite the drug screening procedure and help with the discovery of new treatments.

Remote Patient Monitoring

Keeping track of Electronic Medical Records (EMRs)

Electronic medical records are "patients' digital medical records based on traditional paper medical records" [19]. These medical records could have come from a pharmacy, a hospital, or a private clinic. With the assistance of cloud computing and AI, healthcare professionals may better manage their own EMRs that are accessible from anywhere in the globe. When it comes to gathering data for clinical research and health information management, EMRs are also essential for healthcare practitioners. It can also be used to track the development of persistent illnesses [20].

Digital Consultation

Due to smartphones, digital counselling has gained popularity. Apps such as Babylon in the United Kingdom employ artificial intelligence (AI) to provide medical advice to users by evaluating symptoms and medical reports and comparing them to a database of disorders. If the situation is serious, the app will advise you to see a doctor, but if it isn't, it will automatically recommend effective medication based on your symptoms. Buoy, a symptom checker chatbot that employs prepared responses and helps patients choose among choices based on their health concerns, is another AI-powered digital consultation [21].

Performing Routine Tasks

AI makes it easier and more reliable to interpret tests, CT scans, X-rays, and manage electronic health data. Cardiology and radiology both require a lot of time, but AI might one day be able to shorten this process. Cardiologists and radiologists will examine the trickier situations that call for human intervention [22].

Monitoring of one's health

One's health can be monitored via wearable devices like the Fitbit, Apple Watch, Garmin, and others. In 1990, Wearable Health Devices (WHDs) were initially developed to empower patients by enabling them to track their own health and wellness. These devices monitor the user's healthy lifestyle, which is essential for the early detection of cardio-vascular issues and for transmitting information to doctors for treatment. Additionally, self-monitoring of health status increases people's awareness of the value of maintaining good health [23].

Drug Research and Development

Medication development that involves conventional drug testing is more time- and money-consuming. Because of their capacity to meet the medical needs of patients suffering from viral illnesses to complex diseases like cancer, TB, and Alzheimer's, pharmaceutical companies are already taking AI-based systems into consideration for the development of new pharmaceuticals. AI-based drug development tools aid the pharmaceutical industry since they simplify drug creation (Reiss Robert, 2020). A tool for AI-based drug creation was utilised to search for existing medications that could be altered to lessen the impact of the Ebola virus during the epidemic. As a result, the AI algorithm discovered two medications that were highly efficient in preventing the onset and transmission of the disease and protecting many fatalities (Navito,2015).

Key Strengths of AI and E Healthcare

Digital Healthcare Infrastructure[1, 18]

It has been established that the virtual care infrastructure is the most effective technique to provide citizens with healthcare services. The use of the digital healthcare in the country can be accelerated thanks to e-health technologies. The traditional healthcare infrastructure hampered the accessibility of treatment facilities and increased the hardship of hospital beds, mobility accessibility, and lengthy waits times for healthcare professionals. These limitations are now being replaced by shorter wait times, rapid access to healthcare services, and free doctor teleconsultations via digital means. To create the new, developing trends in the healthcare industry, the infrastructure for healthcare must be completely redesigned.

To create the new, developing trends in the healthcare industry, the infrastructure for healthcare must be completely revamped. The investment in e-healthcare technology has now constrained the use of healthcare resources including buildings, medical and paramedical staff, cost of purchase, and material utilities (refers to Figure 2).

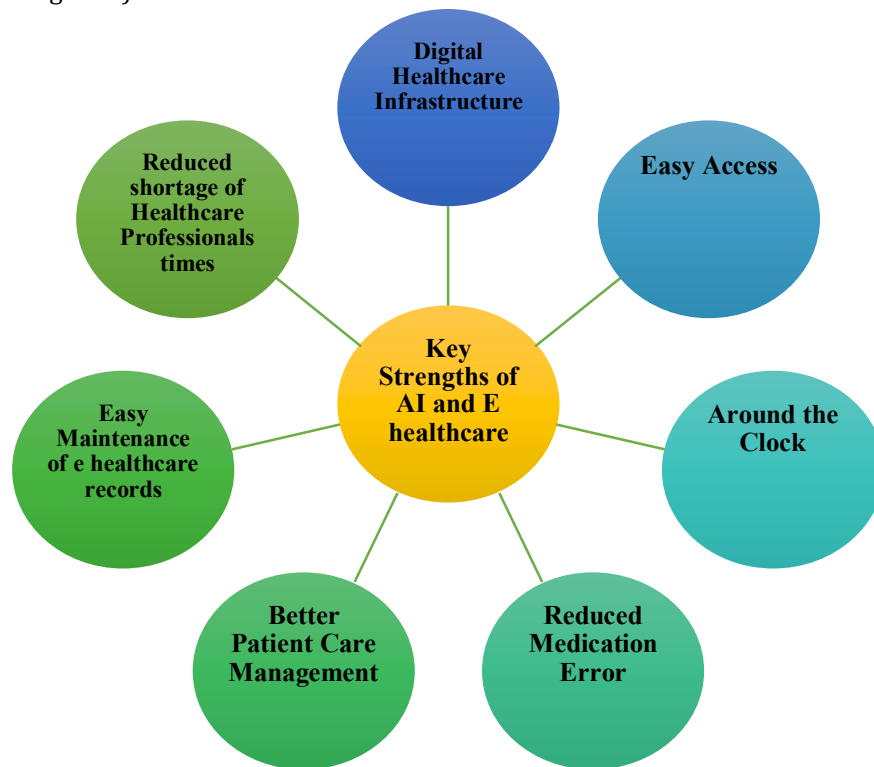


Figure 2: Key Strengths of AI and E Healthcare

Easy Access

The increased accessibility to healthcare services without any restriction on geographical areas is the most advantageous major shift in the healthcare field since the traditional healthcare system to electronic

technology. Patients can easily get in touch with a doctor to receive medical care without being constrained by his availability at medical facilities. Because there aren't enough transportation options, it's difficult for people in rural and underdeveloped areas to visit multispecialty hospitals for doctor consultations. Even paying for the convenience of travelling from one place to another can be expensive.

Around the Clock

Even if the healthcare sector is constantly working to provide patients with the highest-quality services, when healthcare experts and facilitators work only during certain hours of the day in any hospital, utilisation of those resources slows down. Patients formerly had to struggle from having to be accessible in hospitals only during certain periods, but since the advent of e-health technology, care providers are now offered 24/7. It is now simpler and more comfortable for doctors to provide services on time or within the allotted time thanks to early detection and care. Patients now have greater access to healthcare facilities at any time, wherever in the globe, especially to tele-consultations and the automation of medical information.

Reduced Medication Error

When working continuously, a healthcare practitioner must work meticulously to provide patients with exceptional healthcare services without diminishing those services or making poor decisions. In recent years, healthcare professionals have noted pharmaceutical errors, prescribing errors, sentinel events, and adverse events, all of which need to be reduced on a constant schedule. These omissions raise concerns about the appropriateness of the healthcare services provided by potentially causing clients' deaths, physical loss, impairments, or degradation of any organ. The use of e-health systems lessens the likelihood of these mistakes and increases the likelihood that patients will have access to the greatest medical care.

Better Patient Care Management

The medical industry profited from the e-health technology's incorporation into the main channel of healthcare by reducing the compromised patient care delivery. The demand for healthcare facilities draws patients to all medical institutions, which encourages patient congestion at healthcare facilities and leads to improper management of standard operating procedures in hospitals, which also has an impact on the effectiveness of healthcare professionals and the provision of high-quality healthcare services. Healthcare organisations were able to deal with the OPD crowding thanks to e-health technology, which also let them determine how many beds were available in the hospital so that exceptional circumstances could be treated first. The technology is currently being utilized to solve these problems.

Easy Maintenance of e healthcare records

Retaining patient data has long been one of the most difficult tasks for the healthcare business. The traditional methods of health coverage experienced difficulty in storing the patient's IPD and OPD records, clinical findings, demographic characteristics, documented orders, history of the disease, line of therapies taken by the patient, invasive procedures performed, and drugs and doses separately in the Medical Record Department. However, healthcare managers find it difficult to create enough space and storage for such a large amount of data. Therefore, the idea of electronic medical records (EMR) emerged as a result of the integration of e-health technologies, making it simple to retain medical data.

Reduced shortage of Healthcare Professionals

The health industry has always been devoted to assisting sufferers by offering medical services, preventive services, and life-saving procedures, all of which can be carried out by qualified, skilled, and competent healthcare professionals. In emerging economies, the ratio of people to health workers varies depending on how many skilled and trained workers are available. The absence of healthcare workers undermines the healthcare system and makes it difficult to provide timely care, which has an impact on hospital patients' experiences. Today's e-health technology has found a solution by offering healthcare services online with less reliance on medical staff, allowing for timely patient care and assurance of high-quality healthcare.

CONCLUSION

The geopolitical landscape includes technical developments to meet client preferences from the health industry. The potential that AI holds for reshaping and enhancing healthcare in underdeveloped regions is extremely exciting. The established application examples illustrate that it is a practical tool for addressing health issues, cutting expenses, and enhancing access to and the quality of healthcare. When making decisions and implementing AI in healthcare, an evidence-based approach should be used rather than just eagerness to try out new techniques. Both developing and developed nations must pass laws and rules to regulate the use of this technology in healthcare and safeguard its users. Additionally, e-health technology has shown to be a fantastic potential for healthcare organisations to expand incredibly well while also achieving the greatest patient satisfaction levels. Thus, in order to compete with the times

and provide accurate, timely, and safe healthcare services to the patients, e-health technology requires the concentrated attention of healthcare professionals. E-health technology has the ability to influence the current healthcare system and transform it so that patients, healthcare organisations, and authorities all work together under one umbrella to their collective gain. The healthcare industry in emerging nations must embrace the reorganised form of plans to help with the establishment of e-health technology strategy. Effective planning is required for the virtual contact between clinicians and patients with the guarantee that the patient's medical information will be maintained through an electronic medical record. Consequently, in order to manage the healthcare system in an extraordinary manner and establish new patterns in healthcare, e-health technology requires a careful, competent, appropriate, and changed approach.

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