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Artificial Intelligence in Healthcare System: A Narrative Review

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ABSTRACT

Recently, Artificial Intelligence has been used widely in healthcare field. The concept of AI has created a revolution in healthcare, and such an uprising could be another step forward to meet future healthcare demands. AI forcing paradigm shift to digital transformation of the healthcare system, this shift is driven by increasing accessibility of healthcare data and rapid progress of analytic techniques. The purpose of this study is to discuss the impact of AI applications in healthcare system based on narrative literature review.

The impact of AI in healthcare system has been categorized into the following aspects: (i) medical imaging and diagnostics, (ii) virtual patient care, (iii) health services management, (iv) predictive medicine, (v) clinical decision-making, and (vi) patient data and diagnostics.

The long term impact of AI on healthcare system is demonstrated in reducing the administrative workload of healthcare professionals (HCPs) by speeding-up decision- making process, reducing medication errors, early detection and prediction of diseases and their prognosis, enhancing patient engagement and compliance with the treatment plan, in addition to discover new drugs and vaccines.

The use of AI applications is crucial for patient safety and accountability. Effective use is a prerequisite to concisely address ethical, regulatory, and trust issues while advancing the acceptance and implementation of AI. Although AI has a numerous application on healthcare system, it has some reservations, such as data privacy, system compatibility, and user acceptability. Further research is needed to focus more on discussing these issues.

Keywords: *artificial intelligence; patient care; healthcare technology; digital transformation; COVID-19.*

1. INTRODUCTION

Creating intelligent devices that can mimic human intellect is the goal of the interdisciplinary field of computer science known as artificial intelligence (AI). Systems and tools that are capable of intelligently accomplishing tasks are referred to as artificial intelligence (AI) (Tagliaferri et al., 2020).

Global healthcare systems are dealing with exponential increases in healthcare cost. Tight budgets, aging populations, and an increase in chronic illnesses have put pressure on healthcare systems, which has been made worse by the COVID-19 pandemic (Williams, 2020). According to Lee et al. (2021), the pandemic has compelled digital transformation and increased patient participation in healthcare decision-making. While healthcare businesses must be transparent and empathetic in order

to preserve trust, digital health platforms are crucial for consumer satisfaction and trust preservation (Mistry et al., 2021).

Artificial Intelligence is now being used in many different fields. Artificial Intelligence systems in healthcare have enormous potentials to not only completely change the roles of clinicians, -how they work, and how they interact with the electronic systems that surround them on a daily basis-, but also to replace the current approaches with a fresh strategy where innovation will be the primary driver for delivering more efficient healthcare services (Sun & Ortiz, 2024). These (AI) tools help healthcare providers to manage patients by using data that is analyzed and extracted from multiple sources, and then allowing for the creative use of these tool for the most efficient treatments (Najjar, 2023, Panch et al., 2018).In the medical literature, the benefits of AI have been discussed in great detail. AI can learn features from vast amounts of healthcare data using complex algorithms, then use the findings to support clinical decision and practice. In order to increase its accuracy in response to input, it can also be outfitted with learning and self-correcting capabilities (Deliu &Chakraborty, 2024) . An AI system can help healthcare providers by giving them the most recent medical data from textbooks, journals, and clinical protocols to help them provide appropriate patient care. Furthermore, an AI system can assist in lowering the unavoidable therapeutic and diagnostic mistakes that occur in human clinical practice. Furthermore, to help with real-time inferences for health risk warning and health outcome prediction, an AI system gathers valuable data from a sizable patient population (Jiang et al., 2017, Ng & Tan, 2021). Accordingly, the aim of this paper is to discuss the impact of the AI in healthcare system's

2. LITERATURE REVIEW

Since physicians initially tried to use computer-aided programs to enhance their diagnosis in the 1950s, artificial intelligence (AI) has been a part of medicine (Yang et al., 2019), and due to the highly increased processing power of contemporary computers and the abundance of digital data available for gathering and use, interest in and advancements in health AI applications have increased recently (Meskó et al., 2017).

Healthcare practice is gradually evolving because to AI. Clinical, diagnostic, rehabilitative, surgical, and prognostic techniques are just a few of the health domains where artificial intelligence (AI) may be applied. Artificial Intelligence is also having an influence on clinical decision-making and illness diagnosis which are two crucial areas of medicine. Artificial Intelligence systems may identify illness and direct healthcare choices by ingesting, analyzing, and reporting large amounts of data from many modalities (Cho et al., 2020).

Applications of artificial intelligence (AI) can handle the enormous volume of data generated in the medical field and uncover fresh information that would otherwise be lost in the overflow of medical big data (Doyle et al., 2020). According to Yang et al. (2019), these technologies can also find novel medications for patient care and health services management. An examination of the key research datasets reveals bravery in the use of AI. However, Meskò et al. (2017) found that by concentrating the medical profession on clinical creativity and critical thinking, the technology may save care costs and unneeded repetitive procedures.

3. ROLE OF AI IN HEALTHCARE

Medical Imaging and Diagnostic Services

With the growth of biomedical imaging data and the complexity of its interpretation, artificial intelligence (AI) is a potential new field in healthcare. Regardless of human size, skill level, or time restrictions, AI may teach robots to have human-like skills and provide excellent results (Egger et al., 2022). Although AI has shown effectiveness in radiology, its impact has spread to other imaging modalities and fields. AI has revolutionized public health emergencies and enhanced patient care since the early 1990s by creating complex detection algorithms for recognized occurrences in medical imagery (Castiglioni et al., 2021). In medical imaging, it might be difficult to reliably identify established results across a large number of images with different contrast, field of view, and acquisition settings. A new golden era of biomedical imaging may result from closing this knowledge gap between the two fields (Liu & Yeoh, 2021).

Artificial Intelligence has been widely used in medical imaging, especially in the two main domains of image reconstruction and enhancement, as well as diagnostics and illness detection (Gichoya et al., 2022). AI has made significant steps in the medical area, particularly in the diagnosis and detection of diseases. It is capable of analyzing medical imaging methods and detecting a variety of illnesses, such as cancer, heart disease, kidney stones, pulmonary embolism, Alzheimer's disease, and Crohn's disease. Large volumes of imaging data may be analyzed by AI's machine learning algorithms to precisely find anomalies and patterns linked to illnesses. Better patient outcomes and early detection will be achieved.

AI also improves the quality of images, which helps with more accurate illness evaluations. It can track the course of the disease and the efficacy of treatment, as well as recommend individualized treatment alternatives. Artificial Intelligence has revolutionized the diagnosis, treatment, and detection of diseases and has the potential to completely change healthcare globally (Willemink et al., 2020).

The use of pre-processing techniques can significantly enhance the quality of scanned medical pictures by utilizing deep learning algorithms. More precise diagnoses and more efficient treatments are now possible because to the development of several deep learning-enhanced methods that are especially made to improve simulated medical images (Avanzo et al., 2020).

Virtual Patient Care

Baig et al. (2017) emphasized the integration of virtual care and active wearable technology solutions, as well as the development of wearable technology and the potential of machine learning and artificial intelligence in healthcare. Additionally, by employing wearable, non-invasive sensors, AI helps manage chronic conditions including diabetes mellitus, hypertension, sleep apnea, and chronic bronchial asthma (Kim et al., 2018).

A research proposes a smart sensor system that uses wearable, biomedical sensors to track physiological variables in order to monitor behavior and health condition in the house and surroundings. For the study of elder care, the data is gathered and saved on the cloud (Monteriù et al., 2018).

In a case report published in 2021, Patel and Tarakji also described a woman whose atrial fibrillation was found to be the likely cause of her stroke after a thorough negative evaluation. The patient was cautioned to use a wearable digital device to record Electrocardiograph (ECG) readings. Those recorded signals were later verified by her electro-physiologist. As a result, consumer wearable technology facilitates accurate diagnosis.

Sukei et al. (2021) showed how mobile sensor data may be used to create machine learning models for predicting emotional states in relation to mental health illnesses. These models can handle a variety of data with a significant amount of missing information. These models could give healthcare providers useful instruments to measure their patients' emotional states.

Wearable technology, AI, and remote healthcare services have advanced as a result of the COVID-19 pandemic (Natarajan et al., 2020). Early COVID-19 prediction may be made using wearable sensor data, and real-time wearable research can advance our understanding of monitoring and epidemic detection (Bogu & Snyder, 2021).

In solid organ transplantation, AI can identify SARS-CoV-2 infections and forecast the course of the disease (Tschopp et al., 2020). With a 38-fold increase in growth during the pandemic, metaverse apps can offer a better experience than standard telemedicine (Wang et al., 2022).

There are new metaverse technologies for consistent, user-friendly, and affordable use, such raw data exchange and virtual comparative scanning. Additionally, real-time interactions with healthcare providers can be facilitated via Augmented Reality (AR) glasses (Wang et al., 2022). According to Chengoden et al. (2023), the use of technologies such (AI), telepresence, virtual reality (VR), and (AR), can improve patient outcomes and improve the 3D immersive experience.

A type of telemedicine known as Remote Patient Monitoring (RPM) enables medical professionals (HCPs) to keep an eye on and report patient problems from a distance. It enhances patient engagement and medical action through the use of sensors and communication technology. Remote Patient Monitoring in healthcare examines vital signs and physiological variables by integrating new techniques such wearable technology, contact-based sensors, and telehealth applications. Remote Patient Monitoring applications have been revolutionized by AI technologies including machine learning and deep learning, which can identify early patient deterioration, identify trends in patient behavior, and customize monitoring. However, issues with AI include explainability, data volume, uncertainty, unbalanced datasets, privacy, signal processing, and feature extraction (Shaik et al., 2023)

An accurate AI-powered chat bot that can comprehend natural language conversations and reply to user inquiries is Chat GPT, an AI language model created by Open AI. It offers multilingual information about medications prescription, medical conditions, and treatment techniques. Although Chat GPT has constraints related to medical ethics, data interpretation, privacy, security, permission, and responsibility, it can also assist patients in managing their case (Javaid et al., 2023).

End-user acceptability and data connectivity are problems for Wearable Patient-Monitoring (WPM) systems, and employing mobile data for communication across time and various data might lead to cost difficulties (Baig et al., 2017).

Health services management

The potential assistance for comprehensive health care administration is one of the remarkable features of AI approaches. Administrators, nurses, and physicians may all benefit from these apps in their professional role. An AI system, for example, might give medical practitioners continuous, potentially real-time updates on medical knowledge from a variety of sources, such as clinical practices, textbooks, and journals (Tran et al., 2019). The effectiveness of these apps is becoming particularly more crucial in the COVID-19 era, when information sharing is constantly required to effectively control the pandemic globally (Hussain et al., 2020). Additional uses include facilitating proper inferences for health risk alarms and health outcome prediction, as well as coordinating patient information tools (Agrawal et al., 2019).

For instance, AI applications can help hospitals and other healthcare services run more efficiently for the following reasons:

- Clinicians have immediately access to data when they need it.
- Nurses can increase patient safety when administering medication.
- Patients can interact with their healthcare providers throughout hospital stays in order to keep informed and participate in their care.

Furthermore, AI may help optimize logistical procedures. For example, it can be used to identify medications and equipment in a just-in-time supply system that relies entirely on predictive algorithms (Chakradhar, 2017). Training staff in the health sector can also be aided by engaging software. This data may assist close the gap between rural and urban health care (Guo & Li, 2018).

Finally, by anticipating data heterogeneity across hospitals and outpatient clinics, identifying outliers, conducting clinical tests on the data, integrating patient representation, enhancing future models that can predict diagnostic tests and analyses, and establishing transparency with benchmark data for analyzing services provided, health services management could profit from AI to influence the multiplicity of data in electronic health records (Shickel et al., 2017).

Predictive medicine

Applications of AI for prognosis evaluation, outcome prediction, diagnosis, and illness prediction and therapy are other relevant topics (Agrawal et al., 2019). AI may help with diagnosis, therapy, and outcome prediction in a variety of medical scenarios since it can find significant associations in unprocessed data (Jiang et al., 2017). It enables health care providers to adopt proactive illness onset management. Furthermore, predictions may be made to determine each patient's risk factors and motivators in order to better focus healthcare interventions for improved results (Hamid, 2016).

Artificial Intelligence methods may also be used to monitor patients, create and develop novel medications, and customize treatment regimens for patients (Mehta et al., 2019). More time and clearer information help healthcare providers make better judgments for their patients. Artificial Intelligence -powered automatic learning has the potential to revolutionize healthcare by enabling the development of prediction models for medications and tests that track patients throughout their lifetimes (Collins et al., 2019).

Clinical decision-making

The idea that AI applications may aid healthcare providers and researchers in clinical decision-making is one of the primary themes of AI applications. Jiang et al. (2017) claim that AI may healthcare providers in improving clinical decisions or even take the place of human judgment in functional areas unique to the healthcare industry. Algorithms have been shown to improve medical decisions by speeding up procedures and the quantity of care given, and then lowers health care costs (Secinaro et al., 2021).

As a result, AI technology can ease the work of medical experts and complement their actions. Additionally, Redondo and Sandoval (2016) discover that algorithmic platforms can offer virtual support to help healthcare providers comprehend language semantics and learn how to answer business process questions like a human would.

Patient data and diagnostics

Patient data and diagnostics are another relevant subject associated with AI applications. Medical researchers can handle the massive volume of patient data (also known as health big data) with the use of AI algorithms. Data produced by clinical procedures including screening, diagnosis, and therapy assignment may be managed by AI systems. Health professionals can learn about related topics and correlations between subject characteristics and desired results in this way (Jiang et al., 2017).

These technologies have the ability to analyze unprocessed data and offer valuable insights that may be used to patient care. They can aid physicians in the diagnosis procedure; for instance, it will be easier to obtain an overall picture of the patient's health status in order to do a high-speed body scan. A 3D mapping solution of a patient's body may then be recreated using AI technology (Winter & Davidson, 2019).

Artificial Intelligence methods for diagnosis can improve surgery and rehabilitation therapy. Many robots have been developed to assist and oversee these treatments. For instance, during motor therapy, rehabilitation robots can physically support and guide a patient's leg (Secinaro et al., 2021). Artificial Intelligence has a huge potential to revolutionize surgical robotics by creating instruments that can carry out semi-automated surgical procedures more effectively. Automating processes to eliminate human error while preserving a high degree of accuracy and precision is the ultimate goal of this technology (Tarassoli, 2019). Lastly, the COVID-19 era has resulted in a rise in remote patient diagnostics via telemedicine, which allows remote patient monitoring and offers support resources to healthcare providers (Jnr, 2020) (Saha et al., 2018).

Drawbacks of using AI in healthcare system

Despite the numerous applications of AI in healthcare system that discussed above, there are some controversial issues related to its use. data accessibility is one of these issues, since patient records are confidential and HCPs still hesitant to exchange health data. Moreover, AI-based applications raise data security- and privacy-related issues. Hackers usually focus on health records during data breaches (Chustecki, 2024).

Additionally, the overfitting issue occurs when the algorithm absorbs the connections between patient characteristics and results. This problem occurs due to numerous variables affecting the outcomes, which makes the algorithm make inaccurate predictions. Further, deep learning algorithms are less capable of giving real explanations for their predictions. An algorithm

experiences difficulty in protecting itself legally when recommendations go inaccurate (Cordero, 2023).

The healthcare workforce may be afraid of AI in healthcare, which might replace them. Another issue with AI is the cost required to cover the time and resources invested in training HCPs to use AI. AI research has been mainly performed in non-clinical environments. Hence, the generalization of findings might be limited. Similarly, the institutions are uncertain and hesitant to implement AI-based proposed solutions because of the lack of empirical data and the quality of research. Other disadvantages of AI include the high costs of creating AI-based applications, making humans dependent, creating unemployment due to replacing repetitive tasks with AI, and a lack of emotions and creativity in machines (Khan et al, 2023)

4. CONCLUSION AND RECOMMENDATIONS

The goal of the interdisciplinary area of AI is to build intelligent devices that mimic human intellect. By enhancing the responsibilities and productivity of healthcare providers, it has the potential to completely transform healthcare. Artificial Intelligence tools like machine learning, digital medicine, medical imaging can help healthcare providers to manage patients by leveraging data. The problem has been made worse by the COVID-19 epidemic, necessitating a new workforce and set of standards. Artificial Intelligence can increase accuracy and give current health information for appropriate patient treatment by using complex algorithms to learn characteristics from healthcare data.

Artificial Intelligence is widely used in medical imaging, especially in picture reconstruction and augmentation, as well as in diagnosis and illness detection. Virtual patient care, chronic illness management, and emotional state prediction have all advanced as a result of the healthcare industry's adoption of wearable technology and AI. Additionally, AI can streamline logistical procedures, train staff, support complete health services management, and deliver real-time medical information updates.

To effectively use AI's potential for long-term improvements in healthcare, further research should concentrate on developing AI technologies while addressing issues including data privacy, system compatibility, and user acceptability.

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