IMPACT OF ARTIFICIAL INTELLIGENCE ON HEALTH AND MEDICAL SERVICES

Dr. V. K.Maragathavalli
Assistant Professor, Department of Corporate Secretaryship,
Ethiraj College for Women, Chennai

Abstract
As part of the digital transformation of healthcare industry, the use of Artificial Intelligence (AI) in health and medical services has seen unprecedented growth. AI systems have the potential to aid in the analysis of large and complicated healthcare data systems to improve the actionable insights and support the clinical decision-making process. Moreover, these systems can improve the efficiency of a variety of operational processes in health care systems, and aid in the improvement of their diagnostic capabilities. This review paper seeks to evaluate the impact of AI on healthcare and medical services in a reviews of existing literature and attempts to synthesize its conceptual foundations, applications, benefits, challenges and implications. The study utilized a conceptual and descriptive review methodology based on secondary data obtained from peer reviewed journals, reports from international health organizations and reputable health care databases. The review has systematically detailed the several domains of AI such as medical diagnosis, treatment planning, patient care and monitoring, health care administration, and public health, to name a few, and in turn demonstrated the significance of AI in the provision of health services. Improved diagnosis, reduced medical errors, cheaper health care provision, better patient engagement and health care access, especially in remote and underserved locations, are the most important benefits of AI use in health care services. However, the review also identifies a number of critical challenges of AI and its use in health care services that must be solved for meaningful and productive use of AI to be realized in health care services. These challenges include, but are not limited to, inadequate data privacy, ethical concerns, algorithmic bias, unreasonable expectations on the AI, lack of regulations and poor staffing/resource adaptation to the new systems. The review has examined the essential facets of the intersection between artificial intelligence and the healthcare industry and reached the conclusion that the intersection has the potential to be entirely disruptive to the healthcare industry and its systems. However, the review has also concluded that there are multiple factors that must be put into place to ensure that the implementation and adaptation of the technology be successful and able to be utilized in a sustainable manner. The review has concluded that there needs to be: (1) Ethical controls, (2) Data protection mechanisms, (3) Cross-disciplinarily, and (4) Sustained community development. This review also acknowledges that there are Value Additions to be created to the healthcare sector and systems, thereby to the researchers, sector professionals, and policymakers.

Keywords: *Artificial Intelligence; Healthcare Services; Medical Diagnosis; Machine Learning; Digital Health; Clinical Decision Support; Health Informatics*

Introduction

The current state of technology and communications has begun to change the digital environment of the healthcare sector. The implementation of services such as telemedicine and Electronic Health Records (EHRs), and the employment of health information systems

have altered the ways in which health services are rendered and accessed (Wolff et al., 2020). The objective of these modifications is to increase the safety of patients and improve their overall health, while at the same time decrease costs and boost the availability of health services to remote and underserved populations. However, while progress has been made, the sector still faces challenges on a global scale. Operational, financial, and administrative discrepancies and inefficiencies remain as challenges for the sector on a macro, and micro economic level.

Inefficiencies in the traditional systems of care are due to the silos of unintegrated data, manual processes, and workflow delays. Human clinical decision-making processes are undoubtedly of great value, but are also the source of considerable bias, variability and error. There has been little improvement within the sector due to inefficiencies in diagnostics, prolonged treatment and poor hospital administration. Furthermore, the health workforce is subjected to considerable stress due to the rising number of patients, and increase of chronic diseases which adversely affect the sector.

Given the data-driven capabilities of contemporary health systems, the functionality of intelligent systems that augment or even replace human labor becomes even more critical.

System Emergence of Artificial Intelligence (AI), as Technology Innovation, AI Technology is Defined as Intelligent Artificial Systems That Learn, Reason, Recognize Patterns, and Make Decisions (Sahni et al. 2023). The Implementation of AI within the Healthcare Sector has Escalated as the Technology Can Process Large Comprehensive Data Sets, Recognize Patterns, and Provide Insights at Exceptional Speeds. AI Systems have Shown Great Success in Improving Healthcare Delivery by Enhancing the Accuracy of Diagnoses, Prognosing Diseases, Customizing Treatment Plans, and Streamlining Operating Systems of the Healthcare Sector.

A Persistent Increase in the Volume of Data Generated in the Health Sector has Fostered the Adoption of AI Technologies. The Use of “EHRs" (Electronic Health Records), Medical Imaging, Genomic Sequencing, and Health Tracking Devices have Collectively Generated Large Amounts of Structured and Unstructured Data (Zuhair et al. 2024). The Use of Traditional Data Analytical Approaches to Interpret and Manage Data has Proved Ineffective, as AI Systems, Particularly Machine Learning and Deep Learning Technologies, are Able to Process Large Amounts of Data. The Use of AI in Healthcare to Analyze Data is vital in Providing Timely, Accurate, and Cost Efficient Health Care.

Challenges accompany positive outcomes, and integrating AI into healthcare is no different. Healthcare organizations experience problems such as the inefficiencies of clinical workflow processes, misdiagnosis, workforce shortages, excessive administrative burden, etc.Also, large-scale adoption continues to be hindered by data privacy issues, ethical concerns around AI use, bias of algorithms, and compliance with regulations. These challenges indicate the need for careful consideration of the positive and negative aspects of opportunities for AI to be used in medical services.

There is an expanding body of literature on the individual applications of AI in healthcare (like the use of AI in radiology, drug discovery, and patient monitoring); however, we have yet to see the appearance of consolidated review studies that

comprehensively assess the concepts of AI, the applications of AI, the benefits of AI and challenges of AI in the same framework. Most studies focus on individual use cases that fall within particular medical domains, and this limits the understanding of AI's healthcare impact to be narrowed and fragmented. This research gap is visible in the form of a lack of previous literature around the synthesis of knowledge and providing a framework or structure in relation to the role of AI in the health and medical services.

Hence, this paper will study the basic principles regarding the use of artificial intelligence in the fields of health care and its specific uses in the areas of medical diagnosis, medical treatment, patient care, health service administration, and community health (Gouripur, 2024). This paper will also assess the positive and negative outcomes of integrating AI into health care and the ramifications of the use of technology in the field of health care and health services. This paper will provide a summary of various scholarly works and serve the purpose of helping the academic community and providing health care practitioners, decision makers, and scholars some assistance regarding the emerging technology of artificial intelligence in health care.

Research Methodology

This existing literature has described this study as offering a conceptual and explanatory framework, and this study is designed as a review paper. It does not collect any primary data nor attempt any empirical computations. It simply seeks to synthesize and analyze the secondary data with a view to constructing a framework to understand the influence of artificial intelligence on the provision of health and medical services.Academic Fairness and Correctness During the Review Process

This assessment draws on different and reputable sources and tries to keep academic fairness and accuracy. The sources of data were and included peer-reviewed journals, the World Health Organization, conference papers, and reliable white papers about health care and technologies. Keywords such as artificial intelligence, health care, health services, and other expressions of machine learning and digital health were used to search the academic databases of PubMed, Scopus, and Google Scholar. In selecting documents, conference papers and reports were excluded to focus on understanding the current standing and trends of AI within health care.

To maintain consistency and quality, there were specific inclusion criteria for the documents. Literature sourced was limited to English and studies that assessed the implementation of AI technologies within the health care and service delivery sector. Exclusion was made on studies that addressed technologies irrelevant to health care or those that did not have an impact on health care. Such focus facilitated the review to maintain alignment, purpose, and relevance.

The methodology emphasizes systematic literature synthesis, in which research is categorized based on concept, application, advantages, and challenges of AI. This research attempts to create a complete and unified overview of the findings of several studies on the role of AI in healthcare. Such an approach identifies predominant research trends, and

existing literature gaps and suggests future research to enhance the contribution of the review.

Conceptual Framework of Artificial Intelligence in Healthcare

Healthcare artificial intelligence pertains to the use of computer software that mimics rational human functions to assist with medical decisions, diagnoses, treatments, and health service management. Healthcare artificial intelligence is a decision-making and multi-function assistive technology that, alongside human healthcare workers, improves clinical decision-making, efficiency, and health outcomes (Panch et al., 2018). These systems learn, identify patterns, and make predictions without human guidance.

Various foundational AI technologies support all the activities in the healthcare sector. With machine learning, systems derive insight from previous data to get better with prediction and risk assessment in the treatment of illness. Deep learning, a machine-learning subset, processes medical images and complicated data, such as cells and DNA, with systematized neural networks. Clinical text is unstructured and, with Natural Language Processing, AI systems analyze healthcare documents, identify relevant information, and summarize clinical records, drug prescriptions, physician notes, etc. Computer vision equips systems to analyze images for use in radiology, pathology, and surgery, while robotic process automation enhances productivity by minimizing the amount of time manually spent on administrative tasks.

The advancement from basic expert rule systems in diagnostics to ultra-complex prediction and diagnostic AI systems is staggering. Initial systems from the 1980s and 1990s operated from tiny data sets and rule sets and so these systems had very few applications. Given advancement in the understanding of algorithms, computing resources, and data availability, the AI systems of today can analyze data in real-time, predict outcomes, and learn from iterative processes. All of these advances in AI systems have resulted in the systems now being far more useful in diagnostics and treatment.

AI systems in healthcare have been developed and integrated with the basic healthcare technologies that are the building blocks of healthcare today (Berdahl et al., 2023). These include electronic health records, imaging systems, and portable health technologies. The merging of AI capabilities into the healthcare system enables the analysis of longitudinally collected healthcare data for more personalized patient care.Integration of AI into imaging systems allows for enhanced and more precise diagnostics through collaboration with providers for image interpretation. The integration of portable health technologies allows for continuous and real-time health data collection so that timely and relevant healthcare interventions are possible. These systems all rely on AI to convert complex health and operational data into insights for actionable health and clinical decision making.

Applications of AI in Health and Medical Services

AI in Medical Diagnosis

Perhaps the most important areas of the application of AI in medicine is in diagnostic medicine. Deep learning and computer vision applications excel in analyzing medical

images including X-Rays, CT-Scans, and MRIs. Within radiology, AI technologies help clinicians in identifying and correcting diagnostic omissions, by identifying abnormalities and flagging cases which require urgent attention (Sharma et al., 2019). AI Seeks to assist in pathology with the detection of cancer in tissue samples by identifying and flagging malignant patterns which may be present, but not visible, to human pathologists. Predictive algorithms help to identify diseases earlier in their course by analyzing patient data such as family history, genetics, and lifestyle factors which helps influence treatment by ensuring that patients receive care as soon as possible.

AI in Treatment and Clinical Decision Support

Artificial Intelligence continues to improve the fields of treatment planning and clinical decision support. The use of algorithms to customize treatment regimens based on patients needs, their individual genetics, and the disease's progress are the foundations of personalized medicine. In this area of medicine, the ability to identify doutbful cardiovascular candidates becomes enhanced, the drug research period is shortened, and the associated costs of drug research are reduced (Ramalingam et al., 2023). Evidence based medicine and CDSS ai algorithms support the care and improve its quality and the care's uniformity. In this care, physicians are cautioned of possible risks and aided in the more complex decisions Keywords: personalized medicine, algorithms, individual genetics, disease progress, doubt cardiovascular candidates, enhanced drug research period, reduced costs, evidence based medicine, CDSS ai algorithms.

AI in Patient Care and Monitoring

Due to the advancements of AI in patient care and monitoring, healthcare services have transcended the traditional scope. Health monitors wearables with integrated AI track health data points in real time. Remote monitoring of chronic disease patient allows healthcare to detects early signs of decline. AI chatbots and virtual nursing assistants provide 24/7 support to patients and enhance health education to improve involvement and compliant adherence to medications.

AI in Hospital Administration

Efficiency and utilization of resources in the management of hospitals in the administrative sphere with the aid of artificial intelligence. The utilization of algorithms designed to schedule appointments. Effective management of hospital resources—beds, staff, and medical supplies—is made possible through resource allocation systems (Islam, 2024). Also, administrative and operational costs are reduced owing to AI medical billing, claims processing, and the automation of administrative tasks. Healthcare providers are able to devote more of their time to direct patient care as these technologies reduce the time spent on administrative tasks.

AI in Public Health and Epidemiology

Artificial Intelligence (AI), as a result of the technological advancements and innovations of the last few decades, has proven to be a valuable asset in the domain of Public Health and Epidemiology. Predictive analytics is a form of AI that allows for the early identification of a potential outbreak, enabling preemptive interventions in Public Health. AI captured and analyzed data during the COVID-19 pandemic in order to provide Disease Surveillance, Contact Tracing, and Resource Management. AI analytics in population health allows policymakers to detect changes trends in the population health and allocate the necessary resources in an optimized manner, resulting in the enhanced health of the population.

Benefits of AI in Healthcare

The incorporation of artificial intelligence in healthcare has enormous and valuable benefits in clinical, administrative, and patient-centered areas. One of these benefits is the ability to improve the precision of diagnosis (Kelly et al., 2019). AI systems, particularly through a deep learning, can detect and analyze complex nuanced medical images and clinical data much more rapidly, and more accurately than human control. AI systems assist clinicians by narrowing diagnoses to detect and reduce the tedium, and the human error, to achieve more accurate diagnoses of a range of diseases, cancers, and more, in addition to some neurological diseases.

That leads to another major, and in some ways, the most important, benefits: the ability of AI systems to reduce the major remaining healthcare error, and other medical error. AI systems are designed to override the remaining major clinical decision support systems, systems designed to detect prescribing, and other adverse clinical decision errors in the AI systems themselves. Not all medical error systems have been designed or can ultimately be expected to offer systems in medical error. Such AI systems can be viewed as overlays of safety in healthcare, preventable harm, and medical error systems (Wolff et al., 2020). Such benefits have also been designed. Also, systems offer AI-augmented error plus reduction of medical administrative error/overquests in systems.

Integrating artificial intelligence in healthcare delivery drives the system toward better cost efficiencies. With the capacity predictive analytics have, healthcare systems will be able to automate mundane activities and further improve on workflow efficiencies. Hospitals will be able to reduce their operational deficits due to better analytics management of hospital inventory, staffing, and equipment utilization. Likewise, AI-assisted preventive and early diagnosis improves the financial standing of hospitals by decreasing long-term treatment costs attributable to severe illnesses created by health system issues.

AI improves clinical efficiency by automation of workflow processes involved in diagnostics, treatment, and patient management. Because of AI, healthcare professionals will be able to concentrate on more intricate issues involving patients, and thus will improve on patient interaction, particularly in healthcare systems with high patient inflow. This is the result of AI minimizing administrative frustrations involved in case management. AI then is able to improve the quality of services by decreasing the time patients spend in hospitals and increasing the speed and quality of services in healthcare systems.

AI eventualities enhance patient satisfaction and engagement. Patients are able to make more decisions on how they manage their health and thus are able to adhere to treatment more and begin to trust health care professionals (Sahni et al., 2023). This is as a result of resources such as health applications and AI health assistants that are able to avail relevant health data to the patient on time, remind patients of their appointments and provide tailored healthcare advice.

The use of artificial intelligence (AI) technology has also increased access to medical care in rural or less developed areas in the United States. Remote medical care or telemedicine incorporates AI technology to improve virtual consultations, diagnoses, and remote patient care. AI technology helps primary healthcare workers in remote areas of the United States to provide medical evaluations in a timely and precise manner (Zuhair et al., 2024). Improved healthcare access increases health equity and lessens the gaps in the healthcare system.

Lastly, AI technology has a unique and positive influence on healthcare professionals in the form of more available clinical support and less workload. AI technology performs more of the data analytics and clinical decision support, allowing healthcare providers to concentrate more on the patient interaction and the more complex healthcare decisions. These operational efficiencies within the healthcare system enhance the effectiveness of the healthcare system and reduce burnout among clinicians and, thus, help create a more sustainable workforce.

Challenges and Risks of AI Adoption

The incorporation of advanced technology within medicine ought to be a very helpful endeavor. Still, even with all of this potential upside, the integration of artificial intelligence within medicine does come with significant risks that need to be considered very carefully. The first and also most immediate of these risks has to deal with how the incorporation of A.I. and technology within the healthcare field will come at the expense of a patient's confidentiality and the right to privacy when it comes to their information. AI healthcare systems require a significant amount of sensitive healthcare data and information, which increases the risk of data leaks and the likelihood of information being compromised. We must adopt and implement strict and comprehensive data protection measures to address privacy issues, and most importantly, to keep the trust of patients and protect the data that is very personal to them.

Ethical issues, and most importantly, algorithmic bias are also another challenge. AI healthcare systems diagnosing and recommending treatments and procedures are simply an automated extension of the practitioner. AI learns from that practitioner, and if the practitioner has bias tendencies, then the AI will mold to that biased tendencies. The consequence is that the automated extension is likely to inflic a significant amount of damage. Health inequities and poor healthcare system delivery are likely to worsen outside of communities that are already marginalized and underserved. This can be corrected by ethically selecting datasets and systems into the AI.

The functionalities AI deploys is a “black box” and is particularly an issue in clinical settings”. This phenomenon can limit clinician accountability and trust, especially if the AI technology is being used for significant medical decisions. Understanding the clinical decisions rationally and articulately, AI systems are more likely to face less resistance and greater acceptance in the clinical setting. Resource-limited driven healthcare sector, however, bears the brunt of the increasing positive implementation cost of AI. Health systems are expensive to develop and require sophisticated infrastructure and technical expertise, skilled personnel, and costly ongoing maintenance.

Cobbling together a small healthcare organization within a developing region may not have the means to afford these systems, thus closing even more the digital divide within healthcare.

Regulatory and legal challenges also add to the complexity of AI integration into healthcare. The current framework is well out of date and provides no clear guidance on these issues owing to the lack of legislative and policy consideration and/or regulation on determining liability, accountability, and approval of such medical AI. With clear, flexible, and responsive guidelines, the necessary Conditions can be provided to protect the Patient and the system.

Another potentially negative effect of AI is the automation of selected clinical and administrative functions, and workforce displacement. In healthcare data science technology there are new positions being introduced, however, there is workforce reduction and staff traditional functions may be eliminated.

Finally, AI systems are dependent on very high quality data. If there are issues of accuracy or inconsistencies in the data being provided that can negatively impact the overall performance of the system regarding its reliability.

Case Studies / Real-World Examples

The integration of AI in medicine has numerous case studies in today's world, enhancement's in AI's ability to recognize and interpret data has been exemplified in health care, especially in radiology. Google DeepMind and IBM Watson Health have built AI tools that recognize and interpret data from medical images, these tools have moderate to large improvement's in recognition of disease from medical images (Gouripur, 2024). These tools increase radiologists efficiency and speed by sorting and scanning in images. ai tools have also been assisting in early stage detect of cancer, early stage cancer identification greatly improves patient survival.

The field of AI in healthcare has also made advancements to, AI in robotic surgical systems is one of the most notable advancements, these robo surgical systems make surgeries more precise, and less invasive, leading to less surgery recovery time from patient. In the context of Health care in India, programs like Ayushman Bharat, and various telemedicine platform, improvement of Health care in rural area of India has been AI integrated.

The public health care and surveillance systems improvement to serve pandemics face challenges of AI (Panch et al., 2018). The COVID pandemic showcased AI's ability in

disease surveillance, resource management and diagnostic tools, exemplifying systems challenges in a crisis. The integration of AI in medicine is has been more than demonstrated. AI has the ability to improve medicine through case studies and technology.

Suggestions and Recommendations

Building ethical AI systems to maximize the value AI technology adds to health care should emphasize safety, equity, and transparency first." To ensure privacy and maintain public trust, the implementations of stronger data protection regulations is mandatory." The use of explainable AI models is necessary to strengthen clinical trust and the accountability to the clinical workforce.

Training and capacity building should be done at a systems level to prepare AI technologies' interdisciplinary healthcare teams." Collaborative efforts of health care policymakers and institutions with AI developers are necessary to create the desired balanced regulatory frameworks and innovation (Berdahl et al., 2023)." The advancement of evidence-based artificial intelligence solutions in health care care depends, most of all, on more available financial resources directed to AI-focused health care research.

Conclusion

The impact of artificial intelligence (AI) in various fields of health and medicine has been discussed in the previous review. It discusses the positive and negatives the impact of AI in the health care field with respect to the precision (accuracy), efficiency (efficacy) and improvement of accessibility in diagnosis, treatment, patient care and the organization (administration) of health care. Further, it discusses the negative impact of AI on the field of ethics, regulation and the lack of balance of AI in integrated health care systems. In the review, the author proposes that there should be a range of AI and the operational risk should be minimized to improve the efficient and effective AI integration in the field of health care. For the global population, in the review the author emphasizes the need for improvement of health systems for health equity.

References

1. Wolff, J., Pauling, J., Keck, A., & Baumbach, J. (2020). The economic impact of artificial intelligence in health care: systematic review. *Journal of medical Internet research*, *22*(2), e16866.
2. Sahni, N., Stein, G., McKinsey, O., Zemmel, R., & Cutler, D. M. (2023). *The potential impact of artificial intelligence on healthcare spending* (Vol. 30857). Cambridge, MA, USA:: National Bureau of Economic Research.
3. Zuhair, V., Babar, A., Ali, R., Oduoye, M. O., Noor, Z., Chris, K., ... & Rehman, L. U. (2024). Exploring the impact of artificial intelligence on global health and enhancing healthcare in developing nations. *Journal of primary care & community health*, *15*, 21501319241245847.
4. Gouripur, K. (2024). The impact of artificial intelligence on healthcare: A revolution in progress. *The North and West London Journal of General Practice*, *10*(1).

5. Panch, T., Szolovits, P., & Atun, R. (2018). Artificial intelligence, machine learning and health systems. *Journal of global health*, *8*(2), 020303.
6. Berdahl, C. T., Baker, L., Mann, S., Osoba, O., & Girosi, F. (2023). Strategies to improve the impact of artificial intelligence on health equity: scoping review. *JMIR AI*, *2*, e42936.
7. Sharma, Z., Chauhan, A., Ashok, L., D'Souza, A., Malarout, N., & Kamath, R. (2019). The Impact of Artificial Intelligence on Healthcare. *Indian Journal of Public Health Research & Development*, *10*(8).
8. Ramalingam, A., Karunamurthy, A., Victoire, T. A., & Pavithra, B. (2023). Impact of artificial intelligence on healthcare: A review of current applications and future possibilities. *Quing: International Journal of Innovative Research in Science and Engineering*, *2*(2), 37-49.
9. Islam, M. M. (2024). Exploring the impact of artificial intelligence in healthcare. *Journal of Artificial Intelligence General science (JAIGS) ISSN: 3006-4023*, *2*(1), 228-238.
10. Kelly, C. J., Karthikesalingam, A., Suleyman, M., Corrado, G., & King, D. (2019). Key challenges for delivering clinical impact with artificial intelligence. *BMC medicine*, *17*(1), 195.