

Ethical Challenges and Evolving Strategies in The Integration of Artificial Intelligence into The Clinical Practice: An Overview

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Abstract- Artificial intelligence (AI) has rapidly transformed various sectors, including healthcare, where it holds the potential to transform clinical practice and improve patient outcomes. However, its integration into medical settings brings significant ethical challenges that need careful consideration. Artificial Intelligence (AI) has become a transformative force in healthcare, integrating computer science, engineering, biology, and data analytics to enhance medical diagnosis, treatment, and patient management. AI systems simulate human cognitive functions to assist in disease detection, drug discovery, personalized medicine, and public health management. Through applications such as machine learning, robotics, and clinical decision support systems, AI improves accuracy, efficiency, and accessibility in healthcare services. Despite its immense potential, AI adoption raises serious ethical challenges, including issues of safety, transparency, privacy, bias, discrimination, and accountability. Data breaches and algorithmic bias can compromise patient trust and lead to unequal healthcare outcomes. Moreover, challenges related to autonomy, fairness, and informed consent emerge due to opaque “black-box” algorithms. To address these concerns, researchers emphasize the ethical design and responsible implementation of AI, advocating for regulatory frameworks, multidisciplinary collaboration, and inclusion of diverse populations in AI development. Future research should focus on developing tools for ethical evaluation, integrating AI education into medical curricula, and ensuring trust-building mechanisms between AI systems and healthcare professionals. While AI continues to revolutionize healthcare, its responsible and transparent use is crucial to maintaining safety, equity, and human values in medical practice. This review underscores the need for a balanced approach leveraging AI’s technological power while safeguarding ethical principles to ensure that innovation in healthcare remains both effective and humane.

Keywords: Artificial Intelligence, clinical practice, ethical challenges, algorithmic bias, data privacy, transparency, health care in equality, regulatory frame work, patient trust.

I. INTRODUCTION

The term AI refers to a broad field that encompasses several academic fields, including computer science, Business, engineering, biology, psychology, mathematics, statistics, logic, philosophy, and linguistics. AI is rapidly infiltrating the healthcare sector and playing crucial roles in everything from patient management and resource Allocation to the automation of time-consuming and standard tasks in medical practice. AI in healthcare is characterized as machines imitating human cognitive processes. (Baihakki & Qutayan., 2023).

AI’s effectiveness in healthcare is becoming increasingly evident. It is an indispensable tool that now assists doctors, Physicians, and other healthcare professionals. AI can be used for diagnosis, drug development, treatment Personalization and gene editing. Moreover, machine learning can assist doctors in examining patients using Digitalized diagnostic information, such as detecting lung, breast, skin cancer, or any other type of cancer disease. It has also helped in assessing the risk of sudden cardiac death and other heart diseases based on electrocardiograms and Cardiac MRI images, and medical image classification. AI is further proven to have found indicators of Diabetic retinopathy in eye images. (Chikhaoui, *et. al.*, 2022).

Although the exponential growth of Artificial Intelligence (AI) for healthcare is promising, its benefits are being increasingly overshadowed by its propensity to cause individual or societal harm quickly at a large scale. (Solanki, *et. al.*, 2023).

II. UNDERSTANDING ARTIFICIAL INTELLIGENCE

Artificial intelligence (AI) is a term applied to a Machine or software and refers to its capability of Simulating intelligent human behavior, instantaneous calculations, problem-solving, and evaluation of new data based on previously assessed Data. AI heavily influences many industries and fields, including agriculture and farming, Manufacturing and production, autonomous vehicles, fashion, sports analytics and activities, Healthcare, and the medical system. This technology has the power to impact the future of the Industry and human beings, but it is a double-Edged sword. AI applications in healthcare have literally Changed the medical field, including imaging and Electronic medical records (EMR), laboratory diagnosis, treatment, augmenting the intelligence of The physicians, new drug discovery, providing Preventive and precision medicine, biological extensive data analysis, speeding up processes, data Storage and access for health organizations. (Farhud DD and Zokaei S., 2021).

AI also plays a vital role in public health management by predicting disease outbreaks, monitoring epidemics, and helping in resource allocation during health emergencies. In drug discovery and development, AI accelerates the process by identifying potential drug candidates and predicting their effectiveness, saving years of manual research and millions in cost. Furthermore, AI-based chatbot and virtual health assistants are revolutionizing patient care by providing 24/7 medical advice, reminders for medication, and mental health support. However, while AI continues to bring revolutionary changes, it also raises important concerns regarding data privacy, ethical use, transparency, and the potential loss of human touch in healthcare, emphasizing the need for balanced and responsible integration of this powerful technology.

III. AI IN HEALTHCARE

Artificial Intelligence (AI) is revolutionizing healthcare by enhancing diagnosis, treatment, and patient care. It uses advanced technologies like machine learning and deep learning to analyze large amounts of medical data quickly and accurately. AI helps doctors detect diseases such as cancer, heart problems, and diabetes at early stages through medical imaging and predictive analytics. It also supports personalized treatment plans tailored to individual patients. In addition, AI-powered robotic

surgeries improve precision and reduce recovery time. Virtual health assistants and chatbot provide patients with medical guidance, reminders, and support. AI is also used in drug discovery, electronic medical records, and public health monitoring. Despite its benefits, AI in healthcare raises ethical concerns about data privacy, transparency, and reduced human interaction. Therefore, while AI continues to transform medicine, it must be used responsibly to ensure safety, trust, and equality in healthcare.

Artificial intelligence (AI) promises to alleviate the impact of these developments by improving health care and making it more cost-effective. In clinical practice, AI often comes in the form of clinical decision support systems (CDSS), assisting clinicians in diagnosis of disease and treatment decisions. Where conventional CDSS match the characteristics of individual patients to an existing knowledge base, AI-based CDSSs apply AI models trained on data from patients matching the use-case at hand. Yet, despite its undeniable potential, AI is not a universal solution. As history has shown, technological progress always goes Hand in hand with novel questions and significant challenges. Some of these challenges are tied to the technical properties of AI, others relate to the legal, medical, And patient perspectives, making it necessary to adopt a multidisciplinary perspective. (Amann, *et. al.*, 2020).



Figure 1: The use of artificial intelligence and robotics in healthcare.

IV. APPLICATION OF AI IN HEALTHCARE

AI for Drug Discovery:

AI technology in healthcare has helped pharmaceutical companies speed up their drug Discovery process. It on the other hand, automates the identification of targets. In addition, by analyzing off-target compounds, AI in healthcare 2021 aids in drug repurposing. As a result, in the AI and healthcare industries, AI drug discovery streamlines the process and reduces repeated work. AI and machine learning will bring in a new era of drug development that is faster, cheaper, and more

effective. Some are skeptical, but most experts believe these tools will become more crucial in the future. Scientists face both obstacles and opportunities as a result of this transformation, particularly when the approaches are coupled with automation.

AI for clinical trials:

A clinical trial is a procedure in which freshly manufactured treatments are given to people to test how well they work. This has taken a significant amount of time and money. The success rate, however, is quite low. As a result, clinical trial automation has proven to be a benefit for AI and the healthcare business. Furthermore, Artificial Intelligence and healthcare assist in the elimination of time consuming data monitoring procedures. Additionally, AI-assisted clinical trials handle large amounts of data and produce very accurate outcomes.

Patient care:

Patient outcomes are influenced by artificial intelligence in healthcare. Medical AI firms create a system that aids the patient at every level. Clinical intelligence also analyzes patients' medical data and delivers insights to help them enhance their quality of life. (Yousef Shaheen, M., 2021)

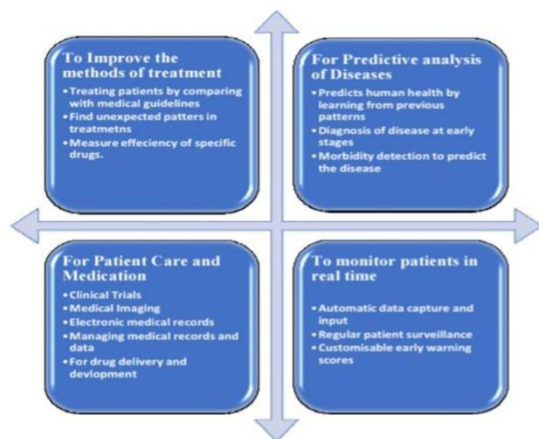


Fig 2: The areas where AI is used in healthcare (Ravi Manne, and Sneha C. Kantheti., 2021).

Ethical Challenges in Healthcare

As the prior section suggests, the use of AI in the clinical practice of Healthcare has huge potential to transform it for the better, but it also raises ethical challenges we now address.

Safety and transparency:

Safety is one of the biggest challenges for AI in healthcare. To use one Well-publicized example,

IBM Watson for Oncology uses AI algorithms to assess information from patients' medical records and help physicians explore cancer treatment options for their patients. However, it has recently come under criticism by reportedly giving "unsafe and incorrect" Recommendations for cancer treatments. The problem seems to be in the training of Watson for Oncology: instead of using real patient data, the software was only trained with a few "synthetic" cancer cases, meaning they were devised by doctors at the Memorial Sloan Kettering (MSK) Cancer Centre. MSK has stated that errors only occurred as part of the system testing and thus no incorrect treatment recommendation has been given to a real patient. This real-life example has put the field in a negative light. It also shows that it is of uttermost importance that AIs are safe and effective (Prakash, *et. al.*, 2022).

Privacy and Data Security

Patients need to trust that their personal health Information will be treated with the utmost Confidentiality. However, in Today's world, where the digitization of Healthcare has brought about an explosion of Medical data stored in or derived from lightning fast computer systems and devices, certain Vulnerability has been introduced. Given the increased dependency of AI-driven healthcare on vast amounts of Personal data, it is important to closely examine the potential risks of unauthorized viewing of or tampering with individual or pooled datasets, if Left insufficiently protected. We Associate these threats with unauthorized data Breaches that are defined as the result of a Security incident, which concerns the confirmed Unauthorized disclosure to an unauthorized Person of personal information about one or More individuals that is in the care and control of A relevant holder or where no such confirmation Is possible, which could give rise to the risk of Harm.

Bias and Discrimination:

The use of AI, contrary to human decisions, can lead to subtle unintentional biases and Discrimination. AI algorithms are trained using available data, which, if historical, may contain biases reflecting societal attitudes. Thus, AI can expand, institutionalize, and automate the Bias and discrimination of society. These algorithms may lead to Reinforcing systemic biases, which could result in a lack of efficacy for marginalized groups. This section provides a study

on the exploration of the extent to which bias and discrimination arise in AI Systems used in healthcare and whether and how they can be managed. (Alkhatib, A.J. and Darabseh, R.S.,2025).

Freedom and autonomy:

It refers to the preservation of self-determination, which includes informed consent and the right to withdraw consent. Informed consent involves the disclosure of relevant information, the individual being competent and fully comprehending this information, and the individual voluntarily accepting participation. The process of informed consent also involves clarifying concerns or misconceptions, including the possibility of third parties accessing confidential data. Obtaining consent may be difficult for black box algorithms that are too opaque to be fully understood by humans and may not be practically feasible for social media or other large datasets encompassing millions of individuals. In terms of AI-based mobile health apps, users may assume as high an ethical commitment to confidentiality as in professional healthcare, even though this is often not the case. Although the terms and conditions of health apps may be presented, these are seldom read or comprehended by users. (Solanki, *et al.*, 2023).

Justice and fairness:

Justice and fairness refer to representing the full diversity of society (rather than the privileged few) while safeguarding against discrimination towards vulnerable groups, and upholding individuals' right to challenge AI-based decisions. If people of different gender, ethnic and other Sociodemographic backgrounds are not represented in the Research, design and development of AI, these interventions could implicitly ignore the needs of these groups. For instance, gaps in training data could stem from the lack of non-binary gender identities in electronic health records, or from undocumented migrants with low access to healthcare. (Solanki,*et al.*, 2023).

Responsibility and trust:

Responsibility involves attributing accountability and liability, as well as acting with transparency and integrity in a way that builds trust. For developers, clearly stating the limitations of their work is a key consideration for instance, most suicide risk predictions do not predict when an individual may

attempt suicide, and hence whether involuntary restraint is warranted. (Solanki, *et al.*, 2023)

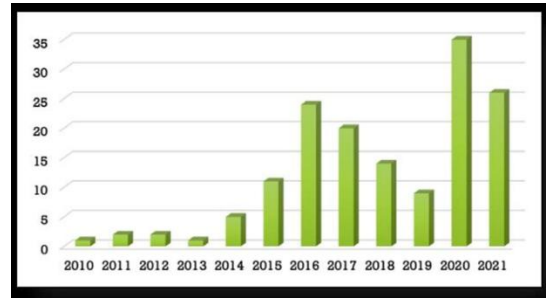


Fig 3: The number of AI ethical incidents reported between 2010 and 2021. (Baihakki & Utahan., 2023)

The bar graph in Figure 2 shows the number of AI ethical incidents reported between 2010 and 2021 (Wei & Zhou, 2022). It illustrates a clear upward trend in ethical concerns related to artificial intelligence over the years. From 2010 to 2013, the number of incidents remained very low, showing minimal ethical issues as AI technology was still developing. Starting in 2014 and 2015, a gradual increase is seen, indicating the growing use of AI in various sectors. In 2016, there is a noticeable spike, suggesting that as AI applications expanded, more ethical problems such as data privacy violations, algorithmic bias, and lack of transparency started emerging.

Although there were fluctuations in the following years, the graph shows another major rise in 2020, reaching the highest number of incidents. This sharp increase may be linked to the widespread use of AI technologies during the COVID-19 pandemic. In 2021, the number slightly decreased but remained significantly higher than in earlier years, highlighting that AI ethics has become a growing global concern requiring strict regulations and ethical frameworks.

V. MITIGATION OF ETHICAL CHALLENGES

Researchers and ethicists have suggested multiple ways to mitigate the ethical challenges associated with AI-driven healthcare innovations. These strategies advocate the inclusion of ethical principles in the Development and deployment of AI-driven Solutions in the health sector. The ethical design, development, and Implementation of AI systems for healthcare ultimately help to foster trust in these Technologies. Strategies to operationalize the

development and application of responsible AI in healthcare are beginning to take shape and explore potential standards, Certifications, tools, and practices. Further, focus group discussions allowed us to scope potential Action points and policy options to advance AI in Healthcare that were informed by a broad range of public opinion, and to help elucidate the Evidence and documentation we needed to Develop to enable the action points to be Realized by relevant agencies and industry (Prakash, *et. al.*, 2022).

VI. DIRECTIONS FOR FUTURE RESEARCH

There is a pressing demand for developing practical tools for testing the applicability of artificial intelligence in healthcare following ethical principles. Furthermore, future research is needed to recognize various stakeholders, users and beneficiaries of AI-related technology in medicine and to actively include them in dialogues about AI ethics and feasible solutions to establish ethical AI applications. For healthcare professionals to attain proficiency in artificial intelligence and implement it in daily clinical practice without compromising ethical principles, prior training is essential. To achieve this, it is imperative to incorporate artificial intelligence in undergraduate and postgraduate medical curricula, keeping in view the uniqueness of the various disciplines of medicine; extensive research investigating the ethical and legal problems of the AI application in diverse specialties and sub-specialties of healthcare is required. Comprehensive qualitative and quantitative studies, with an aim to decipher the perspectives of healthcare professionals and consumers of AI (patients), are needed.

VII. CONCLUSION

We have given an overview of what AI is and have discussed the trends and strategies focusing on the ethical challenges of AI in healthcare and research. It is certain that AI will have extensive ramifications that transform healthcare practices, altering the patient experience and clinicians' approach towards patients. However, a naïve implementation of artificial intelligence in healthcare may result in a wide array of ethical complications. There is an increasing demand for feasible solutions to the ethical implementations of AI in healthcare. This scoping review provided insights on patient privacy and autonomy, informed consent, transparency, fairness,

data bias, inequity, the “black box” element, etc. There is a need to expand and codify the existing framework and organize it into categories connected to ethical principles such as autonomy, privacy, transparency, fairness and justice. It is crucial for healthcare facilities, governmental and regulatory organizations to build guidelines to tackle ethical issues, act in an accountable and responsible way and construct governance techniques to monitor the complications.

Findings from the scoping review revealed that there is a variation in the scientific literature how trust in AI in relation to its implementation in healthcare has been conceptualized. Trust is often conceptualized by its determinants and having a mediating role, positioned between characteristics and AI use. There were also differences in what was believed to influence trust in AI. We found three themes that influenced trust in AI in relation to implementation in healthcare.

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