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A SURVEY ON EXPLORATION OF AI ETHICS IN HEALTHCARE

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Abstract: This paper aims to provide a detailed survey of AI ethics in healthcare. The expansion and advancement of this field has made AI in need of establishing boundaries and studying ethical issues related to it and addressing them. Identifying the research gap which is the bridge between doctors and developers to ensure an outcome needed to provide ideal AI software to be used in the industry has been talked about in the paper. Challenges in the current systems and advantages of using smarter systems developed by taking into consideration all ethical guidelines are mentioned. Machines having no emotions are dealing with sensitive cases of patients which have caused the loss of human life. Measures to prevent such incidents and having intelligent machines but under the properly established control of humans is something lacking, and this article covers it all by decoding factors such as governance, protocols, and mitigating partiality.

Index Terms - AI in Healthcare, Ethics in Health care, Ethical Implications of AI in Healthcare, Responsible AI in Health care, Bias in AI in Healthcare, Fairness in Healthcare AI.

I. INTRODUCTION

AI is typically comprehensible as “a branch of research combining computer science, engineering, and allied fields to construct machines capable. Such behavior that, if seen in humans, would be seen to need intellect. These behaviors include the capacity for visual perception of pictures, voice recognition, language translation, and learning from and adapting to new knowledge. AI as a subject of study has a variety of methods it may use to accomplish this. Artificial intelligence (AI) has quickly become a game changing technology with the potential to completely disrupt several industries, including communication, banking, healthcare, and transportation. To do so, AI as a field of study can employ several techniques. Machine learning, for instance, allows algorithms to make predictions and solve problems based on large amounts of data that enables computer systems to learn and improve their performance on a specific task over time [25]. Deep learning is the subset of machine learning and uses multiple layers of artificial neural networks to solve complex problems from unstructured data, similar to how our brain does [25].

In recent years, many countries have recognized the importance of artificial intelligence (AI) and are taking steps to promote research, development, and adoption of AI technologies. These national AI strategies and policies highlight the potential for AI to drive economic growth and technological innovation in various sectors and demonstrate a commitment to leveraging AI for the benefit of society.

In the framework of decision support systems (DSSs) for medical professionals in the context of diagnosis and treatment, several hospitals are utilizing AI enabled systems. AI systems also have an impact on organizational elements of healthcare delivery, such as increasing the effectiveness of various processes, such as nursing and management tasks in hospitals [28].

Although I may have the potential to improve people's health and to contribute to the resilience and sustainability of health systems, these analyses have not yet been fully explored [29]. There are ethical concerns that arise with the adoption of AI that must be recognized and effectively handled in the best feasible evidence informed way. The ethical concerns with AI in the medical industry are wide ranging and intricate. Recent analyses of the implications of AI in public health have recommended a more cautious approach to the introduction of AI in healthcare while more research is conducted to ensure ethical design and deployment of AI.

Although there is a growing movement toward the integration of artificial intelligence (AI) into the healthcare system, there isn't yet a well established and comprehensive framework to direct the creation and application of AI based decision support in healthcare. Furthermore, ethical issues related to the creation and application of algorithms are frequently disregarded. The application of AI in healthcare comes with several intrinsic obstacles, including flaws in algorithms caused by insufficient or biased training and testing data, protecting patient privacy, and winning the trust of patients and healthcare practitioners. To make sure that AI based decision support is applied in healthcare settings with the highest care and ethics, these difficulties must be overcome.

The implementation of artificial intelligence (AI) systems in healthcare is faced with several obstacles, including the science of machine learning, logistical challenges, and adoption barriers. These factors compromise the clinical relevance and application of AI systems in healthcare. Moreover, there are risks associated with the unintended negative effects of new algorithms on health outcomes, dataset shift, and unintended discriminatory bias. To ensure the ethical use of AI in healthcare, developers of AI algorithms must closely monitor and address these risks. It is crucial to create information systems that can recognize unfairness and respond to it appropriately. In this regard, healthcare organizations must prioritize the development of comprehensive frameworks that consider the necessary sociocultural or clinical pathway changes for the successful adoption of AI systems in healthcare while mitigating potential ethical concerns. This study will focus on better understanding of discourse around the ethics of AI in health and identify where gaps in the literature exist. Drawing upon the Ethics Guidelines for trustworthy AI, this review aims to identify the ethical issues of AI application in healthcare, highlight gaps and propose steps to move towards an evidence informed approach for addressing ethical issues.

Category	Statistics
Public Awareness	58% of Americans are concerned about the use of AI in healthcare without proper regulations and ethical considerations (Source: Pew Research Center)
Bias and Discrimination	AI algorithms trained on biased data can lead to discrimination in healthcare outcomes. For example, a study found that an AI algorithm used to predict healthcare needs was less accurate for Black patients than for White patients (Source: JAMA Network Open)
Privacy and Security	Healthcare data breaches are increasing, and AI technologies can exacerbate the problem if they are not properly secured. A survey found that 58% of healthcare organizations experienced a data breach in the previous 12 months (Source: HIPAA Journal)
Human Oversight	Many AI systems in healthcare are not transparent, making it difficult for humans to understand how they are making decisions. Lack of transparency can lead to mistrust of AI systems and pose ethical challenges.
Legal and Regulatory	AI technologies in healthcare are subject to a complex set of legal and regulatory frameworks that can differ between jurisdictions. Ensuring compliance with these frameworks can be challenging for organizations deploying AI systems.

Figure 1: Some statistics related to AI ethics in human and healthcare services

II. EVALUATION PARAMETERS

Search approach: Depending on the statistics and numbers provided in the papers referred for collecting the information, we have ensured the use of factual data and not assumptions.

Quality assessment: The articles were also evaluated based on the date they were published. We searched for the latest articles and research papers that were relevant to the topic of research chosen.

Data extraction: We have also researched if the articles and the information presented in the papers are valid.

Synthesis: We also want our survey paper to be comprehensive and understandable by other researchers and to ensure the same, we have checked the articles shortlisted to have been explained and researched well.

Reporting: The author credentials and sources listed in the research papers were also evaluated for the purpose of writing our survey paper.

III. OBJECTIVE

The development and implementation of artificial intelligence (AI) in healthcare has the potential to revolutionize the way healthcare is delivered, improving patient outcomes, and reducing costs. However, as AI becomes more prevalent in healthcare, there are growing concerns about its ethical implications. Ethical considerations are critical to ensure that AI is deployed in a responsible and sustainable manner, and that its benefits are realized without unintended harm to patients. The paper will provide a comprehensive review of current research in the field and identify areas where further research is needed. By addressing the ethical implications of AI in healthcare, this survey paper seeks to facilitate the development of AI systems that align with the principles of autonomy, beneficence, nonmaleficence, and justice. Along with understanding the domain of research and identifying existing research gaps, this paper is a service to the scientific community. The objective of the survey paper is to make the reader comfortable in reading and easily understand the research topic.

1. Assess the potential ethical risks and benefits of the present AI systems being deployed in healthcare settings.
2. Examine how AI systems affect healthcare decision making and evaluate the implications for patient care and outcomes.
3. Determine the causes of bias in healthcare related AI systems.
4. Examine the institutions and healthcare professionals' legal and moral obligations regarding the usage of AI systems in patient care.
5. Examine how AI technologies may affect patient privacy and data security in the healthcare industry and suggest solutions.
6. Research how AI systems will affect the way healthcare providers and patients interact and create plans to make sure ethical concerns are considered.

IV. RESEARCH QUESTIONS

1. How can AI be developed and deployed in healthcare settings in an ethical and responsible manner?
2. How can biases in AI systems used in healthcare be identified and mitigated to ensure equitable treatment for all patients?
3. What are the legal and ethical responsibilities of healthcare providers and institutions when using AI systems in patient care?
4. How can healthcare organizations ensure transparency and accountability in the use of AI systems in healthcare?
5. What are the implications of AI for patient privacy and data protection in healthcare and how can these be addressed?

V. LITERATURE REVIEW

Artificial Intelligence is improving over the years, and it has been termed particularly useful in the field of healthcare. It is being increasingly used in diagnosis, treatment, assisting the doctor to provide a more correct synopsis of the patient's health etc. AI approaches are being used worldwide for improving health systems and treatment activities. But as using AI in giving and improving healthcare to the patients is important, it is just as important that the AI systems use ethical measures to provide the guided treatment. We went through some research papers to study just how these ethical issues are important in healthcare and the current limitations of using AI in healthcare in terms of following ethical guidelines and regulations.

The research paper 'The ethical issues of the application of artificial intelligence in healthcare: a systematic scoping review' written by Golnar Karimian, Elena Petelos, Silvia M. A. A. Evers'[30] outlines various research conducted and the ethical issues that were seen in the implementation of AI technology in health systems. They

conducted a scoping review using the methodological framework for scoping studies and using a PRISMA flowchart. Their study identified and evaluated information from various articles that examined the ethical aspects of artificial intelligence in healthcare from two databases: Medline (through PubMed) and Embase (through OVID). Databases were searched using a combination of search terms related to AI and ethics and overview was generated.

The research papers selected were such that they outlined work using technologies like AI and/or ML and/or DNNs and/or DDS/CDDS and also when there was a mention of ethics or ethical considerations. The research papers included quantitative and/or qualitative studies. The studies chosen also outlined various aspects of ethical principles like respect for human autonomy, prevention of harm, fairness, explicability, and patient privacy. The research paper mentions that responsible AI revolves around four topics: fairness, accuracy, confidentiality, and transparency. Training of the model on unbiased data is also important as when the ML or AI model gets trained on quality data only then the model would not give prejudiced or biased outcomes. Data collection, cases of individual discrimination in data also results in biased outcomes. There have also been discussions about the extent to which ML/AI algorithms result in unfair discrimination with respect to race, gender, demographic characteristics, and ethnic groups etc. According to the literature search that they conducted, there were eighteen eligible studies that were shortlisted. Most of the studies that were shortlisted were recent and were conducted in various settings like ICU, primary health care, mental health care, community hospitals etc. The data found outlined ethical concerns of AI in healthcare. Also, the study focused on participants like healthcare professionals, care providers, experts in health related information.

The findings from these studies were also published which outlined the AI based technology used, human autonomy, and other ethical principles like fairness, explicability, and patient privacy. Prevention of harm was the least explored topic of the literature studies, whereas the others like human autonomy, explicability and patient privacy were the most discussed topic of the literature. These studies suggested that bias in the initial phases of the development of the algorithm resulted in outcomes which might lead to discrimination, lack of diversity inclusion, lack of equity. 'Kathleen Murphy , Erica Di Ruggiero , Ross Upshur, Donald J. Willison , Neha Malhotra , Jia Ce Cai , Nakul Malhotra, Vincci Lui and Jennifer Gibson' put forth the paper 'Artificial intelligence for good health: a scoping review of the ethics literature'[31] which discusses the ethical issues with respect to AI in healthcare, included from a global perspective. Searches for peer reviewed literature were taken from eight electronic databases, a filter for health related studies were also applied while searching for various articles. The identified records were then reviewed and then included or excluded based on the search criteria. The data extracted from the research papers were such that the objective of the research paper, the health context of interest; the AI applications or technologies discussed; the ethical concepts, issues or implications raised; any reference to global health; and recommendations for future research, policy, or practice were considered. From the studies the most commonly discussed themes were found out which were data privacy and security, trust in AI, accountability and responsibility, and bias. The collection and use of patient data raised concerns for privacy and their ethical use.

The issues of privacy of information, security and patient and health professional trust were discussed in the literature. Accountability and responsibility concerns rose from the fact that who would assume responsibility for the errors in the AI systems. This research paper also highlights that bias creeps into the system when the AI models are trained on biased data. Inaccurate or incomplete datasets, datasets that focused on a certain population and were not inclusive of various backgrounds of people gave rise to inaccurate or biased outcomes. The research paper also focused on the gaps in the literature, it mentioned that there are evident gaps in global health, and there were very few ethical considerations regarding its challenges faced in AI. There was also little discussion on health equity. References to global health revolved around the use of AI in health care systems, it hardly focused on the gaps in AI in healthcare within and between the countries.

VI. METHODOLOGY

Research Design: To give a summary of the ethics literature pertaining to the use of artificial intelligence in healthcare, the study will employ a scoping review methodology, which is a methodical approach to mapping the literature on a specific issue.

Creating the Research Question: To direct through scoping review, the paper creates a concise research question. The ethical concerns surrounding the use of AI in healthcare were probably the main emphasis of the study question. This stage is essential because it clarifies the review's objectives and gives the literature search and analysis a clear path to follow.

Search Strategy: Using a combination of keywords and search terms relating to artificial intelligence, ethics, health, and healthcare, a thorough search will be carried out in relevant databases, such as PubMed, Scopus, and Web of Science. To ensure its thoroughness, the search strategy will be created in cooperation with a certified librarian or information specialist.

Finding Relevant Literature: To find pertinent publications about the ethics of AI in healthcare, we carried out a thorough literature search. They most likely used appropriate keywords and search terms relating to AI, healthcare, and ethics to search several databases, including PubMed, Google Scholar, and other pertinent sites. To ensure thorough coverage of the pertinent literature, the writers may also have looked over the reference lists of the publications that were identified and consulted with specialists.

Inclusion and Exclusion Criteria: Articles meeting the following inclusion and exclusion criteria will be taken into consideration for inclusion in the review: (a) articles or research paper discussing the ethical implications of artificial intelligence in healthcare [30]; (b) articles or research paper published within a specific timeframe (e.g., the last 10 years); and (c) focusing on original research, reviews, or conceptual analysis of ethics in the context of artificial intelligence in healthcare. Articles or research papers that don't fit these requirements, like ones that don't emphasize ethics or the use of artificial intelligence in healthcare, will be disqualified.

Limitations and Implications: The scoping review's shortcomings, such as possible biases or restrictions in the literature used, will be addressed and examined. There will also be a discussion of the findings' implications for practice, policy, and research in the area of the ethics of using artificial intelligence in healthcare.

VII. ADVANTAGES

The benefits and drawbacks of AI applications in healthcare are still up for debate, and it can be challenging to convey this ambiguity to both practitioners and patients. To resolve ethical concerns with AI in healthcare and win consumers' confidence, it is crucial to develop trustworthy AI.

Firstly, the paper offers a comprehensive analysis of the ethical considerations associated with the use of AI in healthcare. By conducting a review of existing literature, we have identified and addressed key concerns, including but not limited to privacy, bias, transparency, accountability, and potential impacts on physician patient relationships. This approach ensures that the paper's recommendations are based on a thorough understanding of the relevant ethical issues and can be used to guide responsible and ethical implementation of AI technologies in the healthcare industry.

In addition, the paper proposes potential strategies to mitigate the ethical challenges linked to AI in healthcare. These strategies involve establishing ethical frameworks and regulations for the development and deployment of AI, encouraging transparency and accountability in AI systems, and engaging stakeholders in the design and implementation of AI technologies. The paper's practical recommendations can be leveraged to foster responsible and ethical use of AI in healthcare and promote trust among patients and healthcare providers.

Moreover, the paper emphasizes the significance of partnership and cooperation among various actors, such as policymakers, healthcare practitioners, patients, and tech innovators, to ensure the ethical implications of AI in healthcare are adequately recognized and resolved. The paper recognizes that effective collaboration between stakeholders is vital to promote a shared understanding of the ethical challenges and to foster sustainable solutions for the ethical application of AI in healthcare.

VIII. LIMITATIONS

Lack of Clear Ethical Guidelines: The lack of clear ethical rules is one of the main obstacles to the use of AI in healthcare. Although there are ethical frameworks for the use of AI already in place, they are not sufficient to handle the particular ethical issues that occur in the field of healthcare. As a result of inconsistent and variable ethical procedures relating to AI in healthcare, which may result in biases, discrimination, and unfair decision making, there may be a lack of clear norms.[31]

Bias and Discrimination: Because AI systems depend on data to make decisions, biased data used to train them may result in biased results. As it may reflect the biases present in the data used to train the models, bias in AI can maintain current health inequities[30]. For instance, if AI algorithms are developed using data from a certain demographic, such as one that is primarily Caucasian or male, they may not be accurate or dependable for other populations, which could result in discrepancies in the quality of healthcare for underrepresented groups.

Ethical Concerns in Data Collection and Privacy: To train and run algorithms, artificial intelligence in healthcare primarily relies on data, particularly patient data. Patient data gathering and utilization create serious ethical issues with regard to data security, privacy, and consent. Before using patient data for AI applications, patients' privacy and confidentiality must be safeguarded, and their informed consent must be sought. However, given the complexity of AI systems and the possibility of data use for many purposes, it might be difficult to gain valid consent.

Legal and Regulatory Challenges: The legal and regulatory environment surrounding the use of AI in healthcare is still developing, and it might not be sufficiently comprehensive to handle all the ethical issues raised by its implementation. Implementing AI in healthcare practice may be unpredictable and difficult due to unclear laws and regulations. Healthcare organizations and providers may have trouble navigating the legal and regulatory environment, which could lead to risks and liabilities.

Lack of Diverse Perspectives: The study might lack a variety of viewpoints on the moral issues of AI in healthcare. The authors admit that because they concentrated on academic literature, they might have overlooked other important sources of data, such as gray literature, policy documents, or viewpoints from key players in the industry[31]. Because of this restriction, the review's findings and conclusions may be biased since they may not adequately reflect the wide range of opinions and experiences connected to the ethical implications of artificial intelligence in healthcare.

Limited Future Directions: On the ethical issues of AI in health, the paper might lack a variety of viewpoints. We have overlooked other important sources of data, such as gray literature, policy documents, or viewpoints from industry players. Because it might not adequately reflect the wide range of opinions and experiences connected to the ethical implications of AI in health, this restriction could lead to a potential bias in the review's results and conclusions.

Healthcare Application	AI Model	Algorithm
Clinical Decision Support	ODD Predictor	Logistic Regression
Medical Imaging	Cancer Detection	Convolutional Neural Networks
Patient Monitoring	Early Warning System	Random Forest
Electronic Health Records	Predictive Analytics	Support Vector Machines
Drug Discovery	Virtual Screening	Deep Learning
Genomics	Personalized Medicine	Decision Trees
Telemedicine	Remote Diagnosis	Bayesian Networks
Healthcare Operations	Resource Optimization	Genetic Algorithms

Figure 2: Table showing different systems using various AI algorithms in healthcare unit

IX. DISCUSSION

Artificial Intelligence has high potential to improve healthcare and be of support in diagnosis or even optimizing treatment. But not integrating AI carefully, introduces new risks and amplifies existing ones. The clinical implications of AI are vast because of recent medical advancements. Accuracy and efficiency of diagnosis, reactive to proactive approach, disease treatment to health management and operational efficiency are the areas that come into picture when talking about AI in healthcare. Examples include bionic eyes, brain implants and exoskeletons which are capable of making a human lift impossible weight.

Despite such advancements, healthcare disparities persist in zones of access, quality, specialization, impact and ethics. Talking about ethics, between 1970 – 2004, the reason of black people's deaths was racism more than prostate, breast and colon cancers. The reason was because doctors were generally privileged white people who ignored and avoided treating people of color. It is thus important to discuss ethics, morals, principles, bias, discrimination, equity and equality too in the healthcare context. With the rise in technology such as bionic eyes, people who can afford such AI become 'valid humans' and others who can't become 'invalid'. There is a belief that machines do not make mistakes and humans do. But to what extent is it true? In cases of robotic surgery, there have been device and instrument malfunctions and system errors. A case where the patient's life was lost because an early tumor couldn't be detected and cured because of a video imaging problem. Sparking, unintended use of instruments and falling of broken parts into patient's bodies have also been reported. In June, 2016, National Library of Medicine reported the following related case study.

The case study involves a 40 year old female who underwent robot assisted repair of vesico vaginal fistula. During the procedure, the monopolar scissors got stuck in the cannula during insertion, and the instrument could neither be advanced nor withdrawn from the cannula. The system did not show any error signal or alarm. The drape connection to the arm was checked, assuming that there was a problem in the pulley system, but it was found to be alright. A bipolar forceps was then inserted smoothly, but the same problem occurred when the same scissors were reintroduced after cleaning the pulleys on the scissors. The scissors could not be brought out even with force, and the emergency grip release wrench was of no use. Therefore, docking was required to remove the robotic arm along with cannula and the instrument from the patient. On close inspection, it was revealed that the tip cover accessory of the scissors was over advanced on to the shaft beyond the orange line during instrument preparation. This caused the scissors to get stuck in the cannula, and it could not be removed with force. Ultimately, the cannula was forcefully pulled away from the scissors to remove it, and the tip cover was repositioned. The surgery went on uneventfully after that. It is important to note that the whole operation could have been successful only if there was a 'human touch' involved for proper instrument preparation and handling. It is also important to have a backup plan and emergency measures in case of such incidents during robotic surgeries. But AI fails to ensure these ethical measures like a human doctor would.

We are ignoring risks related to AI in healthcare services. Patient safety, gender or racial bias, data security and privacy, uninteroperable AI, wrong or outdated predictions are among the compromises. Partiality in AI is a concerning factor. The reason for partiality arising is because the questions are biased which trains the model in that way. Testing is conducted partially and unexpected outcomes are ignored. Also, assumptions are made which form the basis of designing patterns then. Mitigating partiality in AI is possible with methods which provide transparency in study population and setting. Model architecture and evaluation should be looked into deeper while developing the software to ensure not maximum but complete correctness. Basis for machine learning models and results should be made easily available in order to check accuracy. Patient safety can be ensured if biasness is mitigated, there is transparency in the process and results while developing AI models and ensuring clinicians understand AI which in turn requires governance by humans. AI or ML algorithms working in one country may not work in another because of demographics, etc. Since the AI model trained at one place may not be able to predict answers for another country. An eye disease software model trained in South India was unable to work with hundred percent accuracy in China due to the difference in size of the eyes. Adding on to governance, protocols established while deployment of software should be checked and protocols to annually maintain the program should also be governed. Lack of maintenance and failure to update AI to newer versions are factors for ethical concerns as well.

Relating to health equity, it's imperative for all stakeholders to constantly build and develop their technical health equity acumen, especially regarding AI and ML. For example, medical scheduling software makes black patients wait longer in waiting rooms than white patients. It is because the algorithm predicts black patients to likely miss appointments in the first place, which has resulted in the model being trained in that manner.

AI can seem as a 'silver bullet' for the healthcare industry's numerous problems. Like the ML algorithms helping doctors to quickly read radiology scans. But to achieve perfection, developers need high quality data to ensure algorithms have high capability. AI trained on low quality data risks producing inaccurate results.

X. CONCLUSION

In a nutshell, this paper is a service to the scientific community. It's research for young researchers. Instead of reading several papers, just reading ours serves the motive to understand the role of AI in human and healthcare services. It lists and analyzes the latest research work in the area. Shedding light on the strong background of AI, the article dives deeper into highlighting the challenges and identifying the research gaps. The novelty of this research is a focus on the lack of 'human interference' in a positive way to go hand in hand with AI to ensure complete accuracy. Even though AI has drawbacks currently, with time, proper 'human touch' and overcoming the gaps, it is possible to see miracles in the field of healthcare.

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