The Ethics of AI in Medical Research: A Call for Open and Honest Discussion
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ABSTRACT
Artificial intelligence (AI) in healthcare is gaining rapid popularity in terms of its application and research. A significant reason for its success is due to the advances it has made and the ease of use it incorporates. Because of its implications, issues, and benefits in terms of ease, AI has been debated and researched extensively. This study examined the ethical dilemmas associated with artificial intelligence in medical research. The research uses a qualitative research method based on content analysis. Authentic Internet resources were used to collect secondary data. Once AI is fully integrated into healthcare, several ethical dilemmas will likely arise, including patient privacy, data security, algorithmically biased results, transparency, and human error. Minimizing ethical dilemmas with continuous monitoring is possible, but they cannot be eliminated. It is possible with the advancement of technology and AI enables it to imitate the cognitive processes of humans, which may enhance its reliability but can also lead to negative consequences. As a result, the new technological developments must be applied ethically. An open and honest discussion is essential for the awareness and understanding of AI ethics, honoring patient rights, and maintaining public trust.

Keywords: AI Ethics, Ethics in Medical Research, Algorithm Bias, Privacy and Security

INTRODUCTION
Emerging technologies, like artificial intelligence (AI) and machine learning, are bringing positive changes and advancements in many fields of life including medical and public health (1). AI is a system that imitates human-like learning, reasoning, and decision-making to achieve defined objectives, independent of computer programming (2). AI is an umbrella concept, that covers, natural language processing, robotics, and machine learning, these supportive techniques are augmenting different areas including, health and medical research, education, and other related fields (3). AI has the potential to significantly enhance the efficiency of any given healthcare system, by improving precision, timely and accurate diagnostics, quality service, and affordable cost (4–6). Machine learning algorithms can identify unexplored patterns in large and heterogeneous data, helping innovation and advancement in diagnostic, better treatments, and optimal allocation of resources in the healthcare and welfare sectors. Globally healthcare sector faces a scarcity of resources (7), it can be optimized through AI applications for administrative redesign and clinical decision-making (4,8).

Different entities, including technology firms, pharmaceutical enterprises, medical research organizations, healthcare service providers, and public health agencies, are actively amassing, utilizing, and progressively
disseminating individual-level health data. This information encompasses factors such as age, self-assessed health status, disease category, and income details, spanning an extensive array of data from sources like smartphone apps, wearable devices, medical records, and social and demographic information (9,10). These datasets frequently undergo amalgamation, aggregation, and interconnection to enhance the effectiveness of products and services within our society. However, sharing and reusing personal data can pose risks and challenges related to privacy, fair and open data use, and data security (11–15). Traditional safeguards and oversight practices struggle to address the changing notions of consent and anonymization in data-intensive contexts (16,17). Also, algorithmic bias and human-induced errors in system development are challenges to medical ethics (18–20).

Creating strategies and establishing consistent protocols for managing individual data is of paramount importance to strike a balance between harnessing the advantages of data-driven technologies and safeguarding the rights of data subjects and communities (21). Achieving this equilibrium involves considering the viewpoints of both data subjects and data collectors/legal entities, which can sometimes diverge interests (21). An expanding body of scholarly work centers on investigating the inclinations and perspectives of the general public, research participants, and patients concerning data sharing. Elements such as the level of identifiability, transparency in data-sharing practices, and obtaining informed consent all play pivotal roles in addressing the concerns related to privacy (22–24).

Health data governance deliberations need to be scrupulously addressed in a way that reconciles security hesitations with societal expectations, comforting privacy, security, equity, and openness. The approach will make it possible to optimally use health data in the building of favorable initiatives. As the key stakeholders in the analysis of private health data at the personal level, the researchers need to take the ethical angle of research, understand the legal requirements and then translate them into practice (25). It is crucial to take into account the various viewpoints of the stakeholders regarding the use of AI in medical research because doing so will help identify any flaws and potential gaps that moral and legal considerations should fill. Differences between the policies and practices arise as a result of such discrepancies, and so governance preconditions can be obtained. AI implementation has brought up as many moral dilemmas in healthcare as technological development. Despite the research undertaken to overcome at least some of these ethical issues, there is still a necessity for a more comprehensive study.

This study aims to sort the ethical dilemmas of patient privacy and data security that come with AI application in medical research, as well as algorithmic bias, transparency, and human error. Understanding the ethical issues associated with the AI usage will help to develop a new technical solutions and legal regulations that will provide more safety to the application of AI in medicine. Results of the study will help the AI and healthcare professionals to address such issues while applying AI in medicine to ensure ethical considerations. Through identifying and resolution of ethical issues and challenges, patient’s right of privacy and ethically advancement of the artificial intelligence can be ensured.

**RESEARCH METHODOLOGY**

Qualitative research methodology was employed, and content analysis was done through systematic review methods. A deductive approach was adopted to highlight and evaluate the ethical issues of AI application in health and medical research. To get a more nuanced understanding of the issue, a different approach from the traditional review was used (26–28). Traditional review methods use established analytical frameworks, that miss the contextual information from the data, whereas alternative methods look for more related contextual...
information from the data (29). The research was carefully planned and rigorously implemented, below is a brief and comprehensive explanation of steps.

Systematic execution of the research was ensured for rigorous review of available literature about the issues related to AI applications in healthcare. Execution includes the criteria setting for inclusion and exclusion, selection of relevant databases, and qualitative synthesis of studies to extract useful information. Results were thematically organized, for easy analysis and interpretation summarization of the finding with supporting evidence and finally systematic presentation. Results of the study brought useful insight for medical and AI research.

The research was planned and executed as follows:

- A systematic approach.
- A qualitative synthesis of the data.
- A thematic organization of the studies.
- A comprehensive presentation of the results.

This study confirms the transparency and replicability of systematic reviews approach, in order to ensure the use of existing evidence in future research. Systematic reviews provide the following benefits (Table 1):

**Table 1: Benefits of Systematic Review**

<table>
<thead>
<tr>
<th>Accuracy</th>
<th>In systematic reviews, studies are identified and appraised systematically and transparently, which makes them more accurate.</th>
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<tbody>
<tr>
<td>Reliability</td>
<td>Systematic reviews use a consistent process, other researchers can reproduce them.</td>
</tr>
<tr>
<td>Credibility</td>
<td>A rigorous process is used to identify and appraise studies, which makes them more credible.</td>
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<tr>
<td>Breadth</td>
<td>Systematic review provides a broader overview than a traditional literature review.</td>
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<tr>
<td>Depth</td>
<td>A systematic review measures the quality of the studies, which provides a deeper understanding of the literature.</td>
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Stepwise detail of the review process is as follows;

**Methodological Procedures for Search, Inclusion and Exclusion**

The research employed distinct criteria and techniques to delineate and examine the realm of AI ethics and ethical concerns linked to AI in medical research. Only peer-reviewed articles that met empirical, conceptual, or review criteria were considered. Exclusion criteria were applied to AI application and ethical issues studies, published in edited books or conference proceedings, and non-electronically accessible articles. The search involved a thorough examination of relevant academic journals using specific keywords. Two senior investigators manually reviewed all papers, ensuring alignment with search parameters; the initial search brought 195 articles. Additionally, a second search was performed to address potentially missed studies. The final sample for analysis comprised 40 articles after applying inclusion and exclusion criteria.

**Conducting Review**

At the beginning of the study, a search protocol was established defining exclusion and inclusion criteria for
the literature search. Based on the guidelines described in the protocol, keywords from the latest research were derived to ensure the inclusion of all relevant AI-Ethics-Medical research. Books, reports, and conference papers were excluded from the search pool because of their obscure review process and limited access. Journal articles were especially searched for; they are regarded as reliable and authentic because of the rigorous peer review procedure.

Literature was searched from April 2020 to March 2023. Definitive work during this period serves the guiding principles of including articles, further refined by keyword search by academic search engines like Google Scholar and ScienceDirect. After thorough screening in the first phase of the search, 109 articles were shortlisted. However, in the second phase of scrutiny more articles were excluded because of their scope of work, only the 50 most recent and influential research articles with validated knowledge were compiled for the analysis (Table 2).

### Table 2: Qualitative Database Development

<table>
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<tr>
<th>Methodological Procedures</th>
<th>Description</th>
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<tr>
<td>Inclusion and Exclusion Criteria</td>
<td>Inclusion: Peer-reviewed articles meeting empirical, conceptual, or review criteria. Exclusion: Studies published in edited books or conference proceedings, and non-electronically accessible articles.</td>
</tr>
<tr>
<td>Search Process</td>
<td>- specific keywords search for in-depth examination of relevant academic journals. - All papers reviewed by two senior investigators manually. - Search resulted 195 articles initially - A second search performed to address potentially missed studies - 40 articles finalized for analysis.</td>
</tr>
<tr>
<td>Conducting Review</td>
<td>A comprehensive inclusion and exclusion criteria were established, to analyze only reliable research of peer reviewed journal articles.</td>
</tr>
<tr>
<td>Time Span</td>
<td>April 2020 to March 2023</td>
</tr>
<tr>
<td>Analysis</td>
<td>The final 35 articles were reviewed to thoroughly understand the AI-Ethic-Medical issue.</td>
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**RESULTS AND DISCUSSION**

**A. Data Protection and Privacy**

Protection from cyber and other threats and the privacy of medical datasets is critical to AI-medical research. Medical datasets contain sensitive personal information, including medical, insurance, and genetic data. It is,
therefore, crucial to ensure the confidentiality of personal information. Institutions applying AI techniques must adhere to strict security standards to protect data. That can be achieved through rigorous encryption frameworks in sorting and transmission of data, it will prevent unauthorized access and decryption of the data. Moreover, strict control over data access through authorization can ensure limited rights to view, process, or modify data. A more sophisticated “need-to-know” protection layer considerably avoids data breaches or unauthorized use. Data anonymization can also add an extra layer of privacy protection; it assigns a unique ID to the identifiable information and refrains from linkage to the individual-specific data. Anonymization minimizes the possible risk of re-identification.

Additionally, routine assessments and security audits to examine the vulnerabilities in the system are critical to rectify possible loopholes. Implementation and compliance with data protection standards, e.g. GDPR and HIPPA, can help the development of feasible data protection frameworks. These standards cover the basic requirements of consent, storage, and breach issues.

Data protection and privacy are extremely important when applying AI for medical research. Robust encryption protocol, limited and authorized access to data, anonymization, and security audits can help achieve privacy and protection (30–36).

B. Algorithmic Bias

Though AI algorithms are becoming more intelligent, it is crucial to acknowledge that they can be biased, potentially leading to unfair or discriminatory decisions. The bias can stem from the data used to train the algorithm or from inherent flaws in the algorithm’s design. If the data used to train the algorithm is biased, it can perpetuate and amplify the biases present in society. For instance, an algorithm is trained on historical data about disease incidences in a particular location. In future diagnostic decisions, it may increase the chances of new cases in the exact location.

Furthermore, the design of the algorithm can also cause bias. It may happen when the algorithm relies on closely correlated features with protected attributes, e.g. ethnicity or gender identification, leading to unfair results. Adoption of a proactive approach is critical to address this bias. This approach includes carefully compiled data for training, that is representative, diverse, and free from biases. Assessment of the algorithm’s design for potential biases is also crucial to mitigate the issue.

Algorithmic biases can be mitigated by critical design audit, transparency, and accountability of design and deployment through documentation of the decision-making process. The involvement of diverse stakeholders in the scrutiny and evaluation process is essential to avoid bias. Iterative monitoring and evaluation are also essential to desist algorithmic biases’ reoccurrence and maintenance of fairness (37,38,39–47).

C. Transparency and Accountability

Though AI algorithms can significantly increase and improve decision-making efficiency, complexity and opaqueness are growing concerns. Challenges to understanding the workings of algorithms because of the complexity make it further difficult to take corrective measures.

Transparency of the AI process is essential, clear, and understandable inner working of the algorithm for experts and novices alike. Public availability of algorithms’ source code and scrutiny and assessment of logic function can help identify possible biases or flaws for improved transparency. Documentation of the algorithms, explaining data sources, functionality, and decision-making process enhances transparency. Comprehensive and understandable documentation allows users to conclude the algorithms.

To hold the AI system accountable for the decision, a clear job description and a line of responsibility imply
responsibility for development, deployment, and performance. Assessment and monitoring by experts from associated fields can help establish the accountability framework for the system. Third-party audits, with diverse expertise in medical research ethics and AI-machine learning, as well as the feedback from the users and affected individuals, can improve the system’s performance and transparency and build trust by highlighting potential biases in decision-making. Third-party audits, with diverse expertise in medical research ethics and AI-machine learning, as well as the feedback from the users and affected individuals, can improve the system’s performance and transparency and build trust by highlighting potential biases in decision-making (48–57).

Table 3. Transparency and Privacy in Artificial intelligence

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<th>Issues</th>
<th>Description</th>
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</table>
| Data Protection and Privacy   | ⚫ Data security and privacy is vital, especially, while training the machine with large datasets.  
                               | - Substantial encryption, controlled and authorized access, and anonymization techniques are essential.  
                               | - Compliance with relevant privacy and protection standards are mandatory. |
| Algorithmic Bias              | ⚫ AI algorithms can produce biased and discriminatory decisions.  
                               | - Bias may be a result of skewed or biased data or biased design of algorithm.  
                               | - Biased can be mitigated through algorithm audit, transparency, and monitoring and evaluation of the system. |
| Transparency and Accountability| ⚫ Making source code publicly available to achieve transparency.  
                               | ⚫ Providing comprehensive documentation.  
                               | ⚫ Establishing clear lines of responsibility and mechanisms for auditing and independent evaluation leads towards accountability. |
| The Role of Humans            | ⚫ Healthcare professionals are responsible for interpreting and applying AI. AI should complement and support human expertise, not replace it. |

D. The Role of Humans in AI-powered Medical Decision-Making

Artificial intelligence is remarkably augmenting medical and health research, and the development of sophisticated models allows precise and critical decisions to be made by analyzing complex data. However, artificial intelligence still lacks the judgment potential of human decision-making related to treatment. While AI provides immense help and insight to healthcare professionals, humans are still responsible for final decisions regarding the interpretation and execution of AI-generated information, considering preference, context, and norms. This approach keeps the human element intact to address inherent issues of medical data and foster the healthcare system. Based on the
patterns and correlations in the datasets, trained AI systems are prone to biases and errors. There is a chance of omission error and a lack of patient-specific information, yet it shows high accuracy because of the task-specific design. However, clinicians and related professionals use intuition, empathy, and contextual knowledge to address these issues in decision-making with ethical consideration. Furthermore, human-to-human interaction gives patients a sense of understanding, comfort, and compassion, which leads to hope and better recovery.

While AI algorithms have become increasingly sophisticated and are used to make more complex decisions, they should not replace human judgment in healthcare. AI integration into medical practice should complement and support healthcare professionals' expertise and medical researchers' findings. As a decision support system, AI algorithms can help healthcare providers increase the accuracy of their clinical decisions while maintaining patient-centered care (58, 59, 60–68).

CONCLUSION
The application of artificial intelligence in medical and health research raised many critical concerns, especially the privacy and security of data with sensitive and personal information. Protection of patients' private information including medical, financial records, and genetic data is vital and needs to be secured. Confronting algorithmic bias may avert the discriminatory decisions caused by the biased design of algorithms or biased training. Vigilance and corrective measures are crucial to address the bias. Inherited complexity and opacity of artificial intelligence algorithms, make it challenging to be liable, therefore, transparency in design is essential. By ensuring transparency, algorithmic decisions can be comprehended and trusted. Lastly, while AI algorithms are utilized to assist in the complex decision-making process in medicine, it is vital to retain human involvement to prevent substituting human judgment with AI algorithms. Despite advances in artificial intelligence, humans must remain a critical component of diagnosis, treatment, and decision-making.

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