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Review Article

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Ethical Considerations in the Application of Artificial Intelligence in Health Systems: A Narrative Review

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Abstract

Artificial Intelligence (AI) has emerged as a transformative technology in healthcare, enabling the management of vast data volumes and predictive analysis of the future of issues to support decision-making. This narrative review examines ethical dimensions of AI integration in health systems, drawing from articles published from January 1, 2000 to November 30, 2023, across seven databases—Cochrane Library, PubMed, SCOPUS, Science Direct, BMJ Journals, ProQuest, and SAGE. Using Boolean operators such as "AI" paired with "health", "health system", or "hygiene", the study identifies critical ethical concerns including the preservation of human dignity, confidentiality, informed consent, and the dual principles of beneficence and nonmaleficence. It further highlights systemic challenges like algorithmic bias, transparency gaps in decision-making processes, and disruptions to social justice, alongside legal complexities surrounding accountability for errors, fraud, and compensatory mechanisms. To address these challenges, the study advocates for multilayered solutions. These include establishing ethical audits, formulating policies to ensure equitable global access to AI benefits, and enforcing robust data protection frameworks. Designers are urged to develop comprehensive systems safeguarding patient confidentiality and extending privacy protections to healthcare personnel and affiliated individuals. International regulatory standards must align with social and ethical norms rooted in human dignity, while frameworks for error identification and damage compensation should be prioritized. Continuous adaptation of AI capabilities to evolving medical expertise, coupled with strict adherence to ethical guidelines, is emphasized as essential for sustainable integration of AI in healthcare systems.

Keywords: Artificial intelligence, Beneficence, Computer security, Confidentiality, Hygiene, Informed consent, Privacy, Respect

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Introduction

Technical developments in the past few decades, such as medical and agricultural biotechnology, food and nutrition, omics (genomics, transcriptomic, proteomics, cytomic, metabolomics, interatomic, *etc*.), metaverse, big data, digital medicine, P7 medicine, biometrics, tissue engineering, regenerative medicine, while providing many facilities, also, have created many ambiguities and confusions (1-6).

Today, the health and hygiene systems are at a crossroads regarding the use of Artificial Intelligence (AI) in the provision of community health and medical decisions.

In different specialized fields of medicine, management of medical organizations and fields such as pharmacy, nursing and diagnostic laboratories, specialized subset areas of AI such as speech processing, Robotic Process Automation (RPA), Robot-Assisted Surgery (RAS), Machine Learning (ML), Distributed Ledger Technology (DLT), Natural Language Processing (NLP), deep learning techniques called Generative Adversarial Networks (GANs), Virtual Reality (VR), Augmented Reality (AR), patient monitoring with Computer Vision (CV) have their own ambiguities (7-10).

The World Health Organization (WHO) emphasizes things such as: preserving the patient's dignity, autonomy, confidentiality, privacy protection welfare and safety, transparency, explaining ability and comprehensibility, responsiveness, accountability, guaranteeing the independence of action and human initiatives, inclusiveness and equality, identifying social and moral norms, ensuring public interest, a framework for identifying medical errors and compensation, and reliability of AI (11).

According to this emphasis, compliance with items like the patient safety and informing decisions with AI, trust and informing decisions with AI, data collection and using information in human decision-making, in the systemic thinking framework, is among the priorities for reasonable and ethical use of AI (9,12-14).

Recently, multi-stakeholder consensus-based decision-making protocols for developmental and exploratory clinical decisions are guided by AI. Thus, in the medical community, a positive outlook has been created about the judgement and validation of the "collecting and analyzing the opinions of experts on the clinical evaluation report" (15,16). A growing number of AI-based clinical decision support systems have provided promising results in preclinical and in-silico evaluations. The benefits of some of these evaluations in improving the patient' care and safety have been apparent (17,18).

However, it is necessary to be careful that the use of a valuable technology that can lead people to new scientific events does not involve unethical issues and misconduct. Also, care should be taken that the AI should be controllable, and ultimately, decisions are made based on human intelligence and analysis. This is not possible unless special attention is paid to its moral issues. In this article, the ethical challenges of using AI in the health system are reviewed.

Materials and Methods

The study was written in a narrative review method. A narrative review is a type of literature review that provides a comprehensive overview of a specific topic, synthesizing existing research without the rigorous methodological constraints of systematic reviews. The purpose of the study is to determine the ethical dimensions of using AI in order to facilitate decision-making about the extent of its use in the health system. The English full text of the published articles were downloaded in seven databases (Cochrane Library, PubMed, SCOPUS, Science Direct, BMJ Journals, ProQuest, and SAGE) from January 1, 2000 to November 30, 2023, with sensitive keywords and the Boolean operators: *"AI*" *AND "health" OR "health system", "AI*" and *"hygiene"*. This database can cover a wide range of literature, including empirical studies, theoretical papers, and other relevant sources.

After using multiple databases and gathering relevant literature, a list of keywords and phrases related to our topic was developed to ensure a comprehensive search. Two researchers carefully studied the full text of the articles and removed the studies that dealt with the technical aspects of the AI and the rest that were consistent with the objectives of this study were selected.

For the ethical analysis, Beauchamp and Childress' four principles of bioethics-one of the most famous analytical models in ethical decision-making- were

used. This model has proposed four general principles in medicine and health (beneficence, no maleficence, autonomy, and justice). Also, the framework of the professional commitment of doctors in medical ethics was used. Therefore, this study provides context to the research by discussing the implications of findings and how they relate to broader issues in the field.

Results

AI is one of the most advanced technologies of recent centuries that has come to help humans to manage huge information and has the ability to predict future conditions. Naturally, the correct management of this emerging technology faces many ethical challenges. Since this technology can be made available to the society, it also affects the attitude of the society towards it. One way to ensure the ethical behavior of systems that work with AI is to program these systems with universal ethical principles. Although case-by-case decision-making for all ethical challenges requires a high-level reasoning ability, which is a special ability of human intelligence, the AI methods may also be able to produce behaviors that are accepted by those principles through logic and by abstracting moral principles.

Examining and analyzing these ethical changes and their consequences is in the field of computer and information systems. The application of philosophical theories such as speculative, Kant ethics, and value-oriented ethics forms a major part of this branch of practical ethics (19). Also, there is still the concern that ethical decision-making based on the philosophical theories will go wrong and require an ethical audit, since there are many discussions about which moral theory is correct. Some moral decisions are also made based on the combination of several moral theories.

For the ethical analysis of this issue, Beauchamp and Childress' four principles of bioethics was used, which is one of the most famous analytical models in ethical decision-making. This model has proposed four general principles as a basis for ethical decision-making in medicine and health. These four principles are: autonomy, beneficence, non-maleficence and justice (20). Also, the framework of the provisions of the medical professionalism in medical ethics, which was compiled for ethical decision-making in the field of health system, was utilized.

In the following, we will explain 10 ethical topics in AI application.

Autonomy

Today, respect for human autonomy, which is regarding to the independence and freedom of individuals, is one of the most important accepted principles in the modern medicine (21). It is considered as one of the most essential elements of doctor-patient relationship. Many ethical rules governing the relationship between the health professional and the patient, such as obtaining informed consent, privacy, confidentiality, truth-telling, find meaning in the light of this principle (22). In the use of AI, it is also very important to evaluate this process and how it is used in the context of this important ethical principle.

Respect for human dignity and individuals' right to choose

One of the most important ethical issues in the field of medicine is respect for the human dignity of people, and this issue may be threatened by the use of AI, since respect to people's choice that their data is used in what field and the people's privacy is respected to what extent is one of the concerns that should be considered in the using this technology. This issue becomes more important in the case of big data (23).

Confidentiality

Confidentiality has an important effect in maintaining patients' trust in the medical community (24). The General Medical Council clearly states that doctors are responsible for maintaining the confidentiality of patients' electronic information and must ensure the effective protection of information during the process of storing, transferring, and receiving (25). How to store information and maintain confidentiality and unavailability of people's health information is important. Web applications that are in the form of conversations may compromise this privacy (26).

Privacy

Protecting the privacy of patients is also considered as a fundamental element in establishing and maintaining the trust of the society towards the health system (24). The use of such technologies where information may be stored or conversations may be accessible to many

people may be provided to a person who did not have permission to access them during the transfer of information. Therefore, in transmitting pictures and completely personal information of the patient with AI system, other people should not find the possibility of using the information without the permission of the patient. In AI, like other information systems, the patient's right to control their information should be conserved (27-29).

Informed consent

Another thing that is closely related to the human dignity, is the informed consent of people to use their data. This issue is especially emphasized in the Declaration of Helsinki, which is the most important statement of ethics in research in the world (30).

People should know that the data obtained from their biological or disease samples is used for what purposes? Who will have access to it? What will it be used for? In what communities and for what purpose is it used? If they are against using their data for a specific purpose, how can they express this opposition? And most importantly, what is the process to stop using their data? Many large companies have large genetic and bioinformatics data and obtain different analyzes from them with the AI. The important question is how much of this data has the informed consent of its owners? How much of the informed consent that exists is real and are the individuals aware of what is going to happen to their data? (31).

Beneficence

In the context of the health system, this concept means carrying out activities that promote the public interest and the health of society. The beneficence is one of the main values and criteria for ethical decision-making in the field of health. Some philosophers such as Edmund Pellegrino argue that beneficence is the only principle and fundamental law of bioethics. According to this principle, the health system should consider the maximum benefit for patients and society (32). Medical ethics considers the doctor's duty to benefit the patient. Therefore, any action in the field of health system that increases profits and reaches more people in the society to their interests seems morally desirable. Using new communication methods, such as AI can be associated with more distribution of services and its benefits among members of the society (33).

No maleficence

The concept of non-harm means not causing damage in any action. Many believe that in any new action or activity, assessing no maleficence is the first principle (34).

In practice, many activities carried out in the field of health, have some disadvantages. Therefore, in effective ethical decision-making, it will be necessary to accurately evaluate the advantages and disadvantages and the cost-effectiveness of that action. Therefore, the principle of not harming is not an absolute and complete principle. In line with the principle of beneficence and its accurate evaluation, no maleficence finds the complete meaning. In using AI in the health system, its disadvantages should also be considered.

Justice

The justice has various interpretations and different concepts. One of the common interpretations of justice means fairness or equal distribution of opportunities, interests and responsibilities (35). The fairness has another interpretation, such as equal treatment of people or fair enjoyment of resources and facilities. In the field of health system, to express and examine this deep concept, it is divided into three categories: justice in provision of resources, justice in serving, and justice in consequences (36).

The use of this technology can help people benefit from medical services in deprived, remote, and crisis areas in order to realize this important social and bioethical principle. This method is cost-effective. To achieve this goal, all parts of the country should be equipped with modern technology and this communication should be coordinated, systematic and monitored. At the same time, if access is not balanced, the social gap between developed and developing countries will increase. This can increase the possibility of exploitation of less developed countries.

The future of AI is in the hands of high-income companies, and this issue itself can be a threat to small and low-income companies. It is feared that by using this type of technology, the scientific and

even economic gap between the world's societies will increase and reach an irreparable stage. There is a concern that less developed countries will face security threats due to the need for data analysis and their dependence on developed countries in this field, and even their data will be provided to competing countries (37). The next point to consider in this discussion is the concern of job loss for personnel, managers and even doctors and medical staff due to the use of alternative robots. Currently, with the current technology, the use of AI is not dangerous, and manufacturers and designers point to its auxiliary role. Other challenges that AI can create in the field of justice and fuel discrimination between cultures and societies are the biases that exist in the programs already given to AI machines (38,39). For example, some people or groups are considered high-risk by AI processors. Based on this biased information, many people will be placed in certain categories and this is against social justice. It is even possible that based on pre-existing data, in class systems, some people are considered criminals or have anti-social personalities, which is not the case in reality.

Legal challenges

Errors and compensations are another ethical issue that should be given special attention in the use of AI. In human errors, a person or a group of individuals are responsible for causing the error, and since it is possible to identify these people, it will be possible to reveal and compensate that. But in the use of AI, if an error occurs, it is not clear who will be responsible for this error and how will the compensation process be managed?. In all AI tools, the probability of error and the possible damage person or group should be evaluated and the respective programs should be considered for compensation (40,41). In medical errors and raising the issue in the courts, it is not clear how to deal with such medical cases. Therefore, the use of AI requires the creation of legal infrastructure, including the establishment of related laws and the determination of decision-making authority and handling of legal issues in this field.

Fraud and falsification of information

The transparency in the information presentation processes in AI is particularly important. If the transparency and provision of information to the society is limited, the society will not be able to trust the processes that are managed by AI. The result of this lack of trust will be very expensive for the society. The use of fake titles and deception and exaggeration of capabilities may occur commonly. It is possible that profit-seeking people infiltrate the virtual world with fake addresses and create false personalities and intend to abuse patients. Therefore, it is better that all communication between doctors and patients is controlled in this area (42).

Discussion

Summary of evidence

According to the above-mentioned points and based on the universal principles of medical ethics and the obligation to adhere the human dignity and patient autonomy, the important challenges of using AI in health system will include:

Monitoring the preservation of the dignity of patients and their relatives in all components of the health system.

Protecting patients' autonomy in all stages of health service delivery.

Establishing a comprehensive framework for accountability and reliability of AI.

Guaranteeing the process of improving patient welfare and safety in the structure of the health system.

Providing a comprehensive framework for guaranteeing and maintaining the preference of public interests over the interests of cartels, trusts, companies and stakeholders.

Establishing a comprehensive framework to ensure the transparency of AI performance at all stages.

Setting a comprehensive framework for explaining ability and comprehensibility.

Anticipating the accountability of AI intelligence and providing a framework for this purpose.

Establishing comprehensive international regulations to ensure the independence of action and human initiatives against AI.

Providing a comprehensive framework to guarantee the learning of AI for universal use and equality in benefiting from its benefits.

Privacy of patients, patients' relatives, health system staff and people related to this collection.

Establishing comprehensive international regulations

to identify and comply with social and moral norms based on human dignity.

Providing a framework for identifying medical errors and compensating damages resulting from AI. Providing a comprehensive framework for the continuous adaptation of AI capabilities to specialized medical advances in compliance with ethical norms.

Providing a comprehensive framework for the ability to share medical information and specialized decisions in global, regional and national crises and pandemics while protecting the rights of nations, countries and specific racial and demographic groups.

Conclusion

If AI programs are not designed based on ethical protocols, or if it is possible for some large companies to ignore ethical considerations, the use of AI can become a major ethical challenge in the now and future.

Ethics approval and consent to participate

The authors have respected the property rights of the articles they used for the review. The authors avoided plagiarism.

Conflict of Interest

No potential competing interest was reported by the authors.

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