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Ethical and Technical Challenges of Artificial Intelligence in Medicine and Healthcare

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Annotation

The article examines current issues related to the use of artificial intelligence (AI) in medicine. They are discussed both in scientific circles and in the media. AI is increasingly used in the world today, and the field of medicine is no exception.

Keywords: artificial intelligence (AI), medicine and healthcare, ethics and privacy, bioethics, responsibility, new biomedical technologies, positive results of using AI, challenges and risks.

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INTRODUCTION

Artificial intelligence is a technology aimed at creating machines that can imitate human intelligence. AI is based on neural networks that simulate the functioning of the human brain. These networks consist of nodes (called “neurons”) that are connected to each other and can learn from large amounts of data, analyze information, and make decisions. This modeling allows AI to perform complex tasks, including pattern recognition, natural language processing, and much more, which finds application in various areas of life.[1]

DISCUSSION AND RESULTS

Medicine and healthcare are among the main areas of application of new technologies. Machine learning-based systems are involved in many aspects of these industries: from diagnostics and treatment of serious diseases to the creation of new drugs. AI in medicine is data analysts and diagnosticians, robot surgeons, virtual assistants and applications for filling out medical records. These and other AI solutions help reduce the number of medical errors, improve the quality of patient treatment and speed up the provision of medical care. Prolong life, get rid of diseases - what are new technologies capable of? The main advantage of introducing AI into medicine is the increased accuracy of disease diagnosis, including at

early stages. Analysis of X-ray, MRI (magnetic resonance imaging), CT (computed tomography) images using new technologies makes it faster and easier to determine the presence of pathologies and make diagnoses.

AI in medicine can also act as a doctor: select medications, create an individual treatment plan. Robot surgeons perform complex operations that require great precision and accuracy. Of course, under the supervision of human specialists. AI also provides consultations, including remotely: without leaving home, patients can find out their diagnosis and receive advice on further actions.

Machine learning algorithms in medicine are used to analyze data, provide new methods of diagnosis, prevention and treatment of various diseases. The goal of artificial intelligence is to study clinical data and patient treatment results, their interrelationships [2].

AI's ability to revolutionize diagnostics, accelerate drug discovery, and improve care represents a huge opportunity to optimize healthcare. In 2021, the global healthcare AI market was valued at $11 billion. We are now on the cusp of explosive growth. The AI market is expected to reach $188 billion by 2030. This momentum not only demonstrates the enormous potential of AI to transform healthcare. It also heralds a revolutionary change in the way we approach healthcare. .[3] What are the areas of application of AI in medicine? Developments in various medical fields are being carried out all over the world. The American supercomputer Watson helps in the analysis of heart diseases and oncology. Google is developing AI DM Health to help ophthalmologists, and the Israeli company MedyMatch Technology is creating a system for diagnosing strokes by comparing patient brain scans with millions of other scans. .[3]. Artificial intelligence implemented in highly specialized areas turns out to be more promising than more general projects. For example, in performing surgical operations. In 2018, more than 5 thousand robots were already involved, assisting surgeons in more than 1 million operations of varying degrees of complexity. At the same time, the developers do not yet have plans to create full-fledged surgical robots, which is quite reasonable, given the errors that AI can sometimes make. [4]. But as assistants, robots can become indispensable for specialists and are quite capable of improving the statistics of many operations. This is especially true for such an area as microsurgery. Surgical robots are well suited for procedures that require the same repetitive actions, since, unlike humans, robots can work tirelessly. In addition, AI can identify patterns in surgical procedures to improve the accuracy of robot control to submillimeter values. Over 15 years (from 2005 to 2020), the number of cases of AI implementation in medical processes has increased almost 62 times. .[4].

These innovations provide new opportunities in the use and development of biomedical technologies, but also raise important ethical and moral issues. Of great importance is the inclusion of a bioethics course in the educational practices of medical universities. [5,6,7]. Let us consider the following reasons:

Ethics and Privacy : With the rapid development of AI in medicine, protecting patient data and upholding ethical standards are becoming critical. A bioethics course helps future medical professionals understand and apply ethical principles in their practice, which helps protect patients' rights and increase trust in medical institutions.

1. **Bioethics and Responsibility** : Issues of responsibility for decisions made by AI, especially in cases of errors or misdiagnosis, require a deep understanding of ethical norms and principles. The bioethics course teaches students to analyze and resolve complex ethical dilemmas, which is important for making informed and responsible decisions in medical practice.
2. **Accessibility and Equity** : Ensuring equal access to AI technologies for all patients, regardless of their social status and financial capabilities, is an important aspect of justice in medicine. A bioethics course helps students understand the importance of equitable distribution of medical resources and technologies, which contributes to a more equitable and inclusive healthcare system.
3. **Technical limitations** : The introduction of AI into healthcare comes with various technical challenges and limitations. A bioethics course helps students understand these limitations and take

them into account when making decisions, which contributes to a more effective and safer use of AI in medicine.

4. **Impact on healthcare professionals** : AI may change the role of healthcare professionals and impact their careers and training. A bioethics course helps students understand and adapt to these changes, which will promote a more harmonious interaction between healthcare professionals and AI.

Medical schools in Europe, America and Australia have included bioethics courses as mandatory, which underlines their importance and relevance in modern medical education. These courses help future medical professionals to be prepared for the ethical challenges associated with the use of AI and other advanced technologies in medicine.

These issues are the subject of much debate and research, as the development of AI in medicine has the potential to significantly improve the quality of healthcare, but also carries a number of challenges and risks.

We examine the issue of ethics and privacy in the use of AI in medicine, highlighting several specific examples and aspects that will ensure the safe, fair and ethical use of AI in this area.

1. **Protecting patient data** : AI systems often require large amounts of data to train and operate. This may include patients' personal medical data. It is important to ensure that this data is encrypted and stored in secure systems to prevent unauthorized access and information leakage.
2. **Compliance with ethical standards** : The use of AI in medicine must be consistent with ethical norms and standards. For example, when making treatment decisions, AI systems must take into account the interests and rights of patients, and must comply with the principles of fairness and equality of access to medical services.
3. **Transparency and accountability** : AI systems need to be transparent so that users and patients can understand how they work and what data is being used. It is also important that there is accountability for decisions made, especially if they lead to unintended consequences.
4. **Examples** : In some cases, AI is used to analyze medical images, which can help in early detection of diseases. However, it is necessary to ensure that the patients' data is not used without their consent and that the results of the analysis are shared with the doctor for further discussion and decision-making.

It is worth noting the key role of bioethics in understanding and addressing the issue of responsibility for decisions made by AI in medicine, especially in the case of errors or misdiagnoses. Bioethics provides a framework for analyzing and evaluating the moral and ethical aspects of using AI. For example, if an AI system misdiagnoses a disease, bioethical principles help determine who should be held responsible for the consequences — the AI developer, the medical institution, or the doctor using the AI. Another example is the use of AI in making treatment decisions: bioethics requires transparency of algorithms and ensuring that decisions made by AI are based on ethical standards and take into account the rights and interests of patients.

Let us consider the possibility of using AI in reproductive technologies, transplantology and pharmacy. The new science of bioethics plays a key role in regulating the relationship between a doctor and a patient, including the use of these technologies. How can AI be used to solve bioethical problems ? It is important to note that in Europe and America, thanks to bioethics, bioethical law and medical law, regulations have been developed that regulate these issues at the legal level. AI has the potential to make a significant contribution to solving bioethical problems and to the development and implementation of new biomedical technologies. For example, let us turn to transplantology:

1. **Prioritization** : AI can help develop algorithms to more fairly distribute organs by taking into account a variety of factors such as wait times, patient health status, and more.

2. **Risk assessment** : AI can analyze large amounts of data to assess the risks of transplantation, which can help reduce the chances of organ rejection and other complications.
3. **Predicting outcomes** : AI can be used to predict transplant outcomes, helping doctors make more informed decisions.

In reproductive technologies:

1. **Process optimization** : AI can help optimize the processes of artificial insemination and other reproductive technologies, increasing their efficiency and reducing risks.
2. **Data analysis** : AI can analyze health and genetic data to provide more accurate fertility recommendations.
3. **Ethical decisions** : AI can help develop algorithms to make ethical decisions in complex cases, such as choosing parents for a donor egg or sperm.

In pharmacy:

1. **Drug development** : AI can help develop new drugs by speeding up the research process and reducing costs.
2. **Efficacy assessment** : AI can analyze data to assess the effectiveness and safety of new drugs and treatments.
3. **Fraud Prevention** : AI can help prevent fraud in medical research and clinical trials by detecting anomalies in data.

AI can be a powerful tool for solving complex bioethical problems by providing more accurate data and analysis for informed decision-making. At the same time, all these aspects highlight the importance of careful development, testing, and monitoring of AI systems to minimize risks and ensure their ethical and safe use in medicine. Along with the positive results of using AI , there are challenges and risks associated with each of the aspects discussed above:

Transplantology:

1. **Priority determination** :

- **Risks** : Potential for discrimination or inequality in access to organs.
- **Challenges** : Creating algorithms that take into account all necessary ethical and medical factors for fair organ distribution.

2. **Risk assessment** :

- **Risks** : Errors in assessment leading to incorrect selection of recipients.
- **Challenges** : Ensuring the accuracy and reliability of algorithms to minimize the likelihood of errors.

3. **Prediction of results** :

- **Risks** : Relying on AI without taking into account the individual characteristics of the patient.
- **Challenges** : Integrating AI with individualized physician approaches.

Reproductive technologies

1. **Process optimization** :

- **Risks** : Possible errors in procedures that may affect the health of patients.
- **Challenges** : Ensuring strict controls and regular testing of AI systems to minimize errors.

2. **Data Analysis** :

- **Risks** : Confidentiality and protection of patient data.
- **Challenges** : Developing reliable methods for protecting data and ensuring its safe storage.

3. **Ethical decisions** :

- **Risks** : Making decisions that may violate the rights and interests of patients.
- **Challenges** : Ensuring transparency and fairness of AI algorithms.

In pharmaceuticals:

1. **Drug development** :

- **Risks** : Errors in modeling and testing new drugs.
- **Challenges** : Ensuring the correctness of the data and models used by AI.

2. **Efficiency rating** :

- **Risks** : Misinterpretation of data, which may lead to incorrect conclusions.
- **Challenges** : Developing accurate and reliable data analysis methods.

3. **Fraud Prevention** :

- **Risks** : Possibility of AI systems being bypassed by fraudsters.
- **Challenges** : Constantly updating and improving AI systems to prevent fraud.

Conclusion.

Artificial intelligence is widely used in the fields of medicine and healthcare: from diagnostics to consulting. However, despite the advantages of new technologies, they have their drawbacks.

The undeniable advantages of using AI include high accuracy. New technologies help to avoid medical errors; detect what a person cannot see; significantly speed up operations. Artificial intelligence also helps to reduce costs.

The weaknesses of AI include the possibility of errors due to unverified data. There are also risks of misdiagnosis, failure for various reasons, and hacking by criminal groups. One should not forget about the misuse of personal data, intellectual property issues, and the legal status of AI objects.

Despite the great potential of artificial intelligence in medicine and healthcare, one should be aware of the risks that new technologies carry.

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