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The Role Of Artificial Intelligence In Biomedicine: Personalized Medicine And Diagnostic Capabilities In The Context Of Uzbekistan

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Abstract: This article explores the capabilities of artificial intelligence (AI) technologies in the field of biomedicine in the context of Uzbekistan in the field of personalized medicine and diagnostics. The article analyzes the importance in early detection of diseases, optimization of treatment and formulation of approaches that meet the individual needs of patients. The benefits of implementation in the healthcare system of Uzbekistan, existing barriers and future prospects will be discussed. The study aims to adapt global experience to local conditions with an emphasis on infrastructure, training and international cooperation. The article presents practical proposals for the use of AI in the modernization of the healthcare system of Uzbekistan.

Keywords: artificial intelligence, biomedicine, personalized medicine, diagnostics, Uzbekistan, healthcare, digitalization, training, international cooperation.

Introduction: in the modern world, artificial intelligence (AI) is bringing revolutionary changes to medicine. Algorithms allow analyzing large amounts of data, identifying diseases at an early stage and offering individual approaches to patients [1].

Personalized medicine, that is, the development of treatment methods that correspond to the genetic, physiological characteristics and lifestyle characteristics of each patient, is reaching a new level with the help of. For example, in the USA and Europe, it is successfully used to diagnose cancer, cardiovascular diseases and diabetes. In Uzbekistan, the healthcare system is making important steps towards digitalization and innovation, but the possibilities in biomedicine have not yet been exhausted. This article examines the possibilities of using technologies in the context of Uzbekistan in the field of personalized medicine and diagnostics, analyzes existing problems and discusses directions for further development [2].

Literature review: Artificial intelligence is making great strides in the field of biomedicine around the world, which is fundamentally changing the process of diagnosing and treating diseases. For example, systems such as IBM Watson help doctors diagnose cancer by analyzing patients' medical history and genetic information to suggest the most appropriate treatments. This system not only improves diagnostic accuracy, but also saves significant time in developing a treatment plan. However, in China, SI has demonstrated high efficiency in the early detection of serious diseases such as lung cancer by analyzing medical images such as chest X-rays or CT scans. Such achievements are based on the ability to quickly and accurately analyze large amounts of data, which expands the capabilities of doctors [3]. In Uzbekistan, research in the field is mainly developing in areas such as digital economy, information technology, finance, transport, and education. However, in the field of medicine, this direction is still at an early stage. Although publications by domestic scientists and experts contain information on general capabilities, there are no in-depth studies of the specific application of these technologies in biomedicine, especially in the field of personalized medicine. For example, some work conducted by the Tashkent Medical Academy shows the usefulness in optimizing diagnostic devices. These analyses are mainly aimed at automating medical data and accelerating diagnostic processes. At the same time, Uzbekistan's strategy "Digital Uzbekistan - 2030" is aimed at introducing it into social spheres, including the healthcare system. Within the framework of this strategy, significant work has been launched to expand digitalization and the use of technologies in medicine, but this process is slow due to infrastructural and financial constraints. Looking at international experience, it can be said that for successful implementation. There are several important conditions: modern infrastructure, qualified specialists and a clear legislative

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framework. Only a part of these conditions exist in Uzbekistan, so additional efforts are needed to adapt international experience to local conditions. For example, although technologies are widely used in the United States and Europe, for their successful use in Uzbekistan it is necessary to take into account the characteristics and resources of the local healthcare system [4]. Methods: This study used several methods to examine the potential in the field of biomedicine in Uzbekistan. First of all, the analysis of international and domestic literature revealed global and local trends. This analysis helped to determine how technologies are used in different countries, in which areas they are most successful and what experience can be applied to Uzbekistan. An in-depth study of the current state of the healthcare system in Uzbekistan was also conducted, namely its infrastructure, level of digitalization and available resources. During this process, the state of digital healthcare systems, the quality of medical databases and technological support of hospitals were analyzed [5]. In addition, interviews were conducted with specialists to identify opportunities for adapting technologies to local conditions. These conversations heard the opinions of medical workers, IT scientists and heads of healthcare systems. Based on their instructions, the most pressing needs of Uzbekistan were identified in areas such as oncology, cardiology and endocrinology. When processing the data, statistical analysis methods were used that made it possible to assess the potential impact based on numbers. At the same time, with the help of SWOT analysis, the pros and cons, opportunities and risks of implementation were identified. These methods helped to identify specific areas in which it can be applied in the conditions of Uzbekistan.

Results: The results of the study show that the application in the field of biomedicine in Uzbekistan has great potential, but this process also faces a number of challenges. One of the main benefits is the significant improvement of diagnostic processes. For example, algorithms help doctors detect diseases at an early stage by analyzing medical images such as X-rays, CT scans, or MRIs. In particular, when diagnosing oncological diseases, the accuracy can exceed 90%, which allows for early detection of the disease and increased treatment success [6].

It also helps optimize costs by automating hospital processes. For example, processes such as maintaining patient lists, managing medications, or allocating hospital resources can be automated with the help of . Research shows that such automation can reduce costs by 20-30%, which is important for resource-limited countries such as Uzbekistan.

In addition, it serves as an important tool in improving the qualifications of doctors. For professionals with little experience, it is an auxiliary tool in decision-making, helping them analyze complex situations. This can be especially useful in solving the problem of a shortage of qualified specialists in regional and district hospitals in Uzbekistan.

However, a number of problems arise during implementation. Firstly, the lack of modern equipment and laboratories prevents the widespread use of C-technologies. Secondly, the number of qualified specialists is limited, which complicates the implementation of projects. Thirdly, medical databases are often not digitized or of poor quality, which reduces the effectiveness of algorithms. Finally, the legislative framework regulating the use is not sufficiently formed, which may cause ethical and legal problems. Discussions: The use of artificial intelligence in the field of biomedicine opens up great opportunities for Uzbekistan based on global experience. In developed countries, it is making revolutionary changes to the healthcare system. For example, in South Korea, cardiovascular diseases are diagnosed at an early stage with the help of. These systems quickly analyze medical data, identify early signs of the disease and provide doctors with accurate information to begin treatment. As a result, mortality from heart attacks or other serious complications has significantly decreased. The use of such approaches in Uzbekistan can yield important results, especially in such relevant areas as oncology and cardiology. Heart disease and cancer are among the leading causes of death in the country, and early diagnosis with the help of can help alleviate this problem. However, widespread implementation in Uzbekistan faces a number of serious obstacles. One of the most important problems is the insufficient development of infrastructure. Modern laboratories, high-performance computer systems and digital databases are necessary for the efficient operation of algorithms. Many hospitals and medical institutions currently have limited capacity, which makes it difficult to implement projects on a large scale. Financial constraints also slow down the process. The implementation of C-technologies requires significant investments, but the local budget is not enough to cover this completely. Therefore, it is important to expand cooperation with international financial organizations or foreign investors. **Conclusions:** The issue of

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personnel training requires special attention. To work in the field, not only medical knowledge is needed, but also a high level of technological and analytical skills. Currently, the number of specialists with such qualifications in Uzbekistan is very limited. Although the return of professionals who have been trained in the field abroad, or the training of local specialists abroad m can partially solve this problem, this process takes a lot of time. Domestic medical universities have virtually no special curricula in and biomedicine, which makes it difficult to train a new generation of specialists. International cooperation can play an important role in this matter. For example, specialists from Uzbekistan can gain modern knowledge and skills if experience exchange programs are organized jointly with the World Health Organization or foreign universities. Studying the experience of countries such as the USA, Europe or South Korea and adapting it to local conditions will speed up the learning process.

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