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INTELLECTUAL SYSTEM FOR CALCULATING PERSONALIZED DRUG DOSAGES

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Abstract
This innovative project is dedicated to the creation of an intelligent system designed to determine the individualized dose of drugs. The system automatically determines the optimal dose of the drug, taking into account the patient's age, weight, physiological state, concomitant diseases, genetic characteristics, and individual sensitivity to drugs. It is based on modern artificial intelligence algorithms, statistical modeling and machine learning methods, as well as clinical databases. The use of the system increases the effectiveness of drugs, reduces side effects, and provides personalized medical care. At the same time, the system simplifies the work of doctors and reduces the likelihood of errors in the process of prescribing drugs. This intelligent solution is noteworthy as one of the important directions in the development of digitalization in healthcare and the transition to personalized medicine.

Keywords: Personalized drug dosing, intelligent system, artificial intelligence, machine learning, individual therapy, pharmacokinetics, pharmacodynamics, clinical decision support, personalized medicine, medical information systems.

INTRODUCTION

In modern medicine, improving the quality of care provided to patients and organizing the treatment process safely and effectively is one of the most

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important tasks. In the traditional approach, the dosage of drugs is often determined based on general clinical recommendations. At the same time, since each person has different age, gender, body weight, metabolic rate, genetic characteristics and concomitant diseases, the individual response to drugs also varies significantly. As a result, the same drug may be fully effective in one patient, but ineffective or even cause side effects in another.[1]

Therefore, accurate and reliable calculation of individual drug doses is one of the most relevant areas of medicine. In recent years, technologies such as artificial intelligence, digital data analysis and machine learning have been widely used in clinical processes. These methods allow for high accuracy in the selection of diagnostics, treatment strategies and individualization of drug doses.

The intelligent system for calculating individual drug doses is aimed at automating the process, reducing errors associated with the human factor, and increasing the effectiveness and safety of drugs. The system analyzes patient parameters in real time and determines the optimal dose of the drug based on pharmacokinetic and pharmacodynamic indicators. This scientific work is intended to highlight the theoretical foundations, technological capabilities, practical significance and innovative aspects of the project.

DISCUSSION AND RESULTS

Intelligent systems for determining personalized drug doses are of great importance in modern medicine. This section analyzes the effectiveness of the system, research results, problems encountered in its application, and promising directions.[2]

The overall architecture of the system consists of three main components:[3]

1. Data collection module – accepts parameters such as the patient's age, gender, body weight, laboratory tests, heart rate, blood pressure, kidney and liver functions, as well as genomic data.
2. Analytical and modeling module – performs calculations based on artificial intelligence, statistical analysis, pharmacokinetic (PK) and pharmacodynamic (PD) models.

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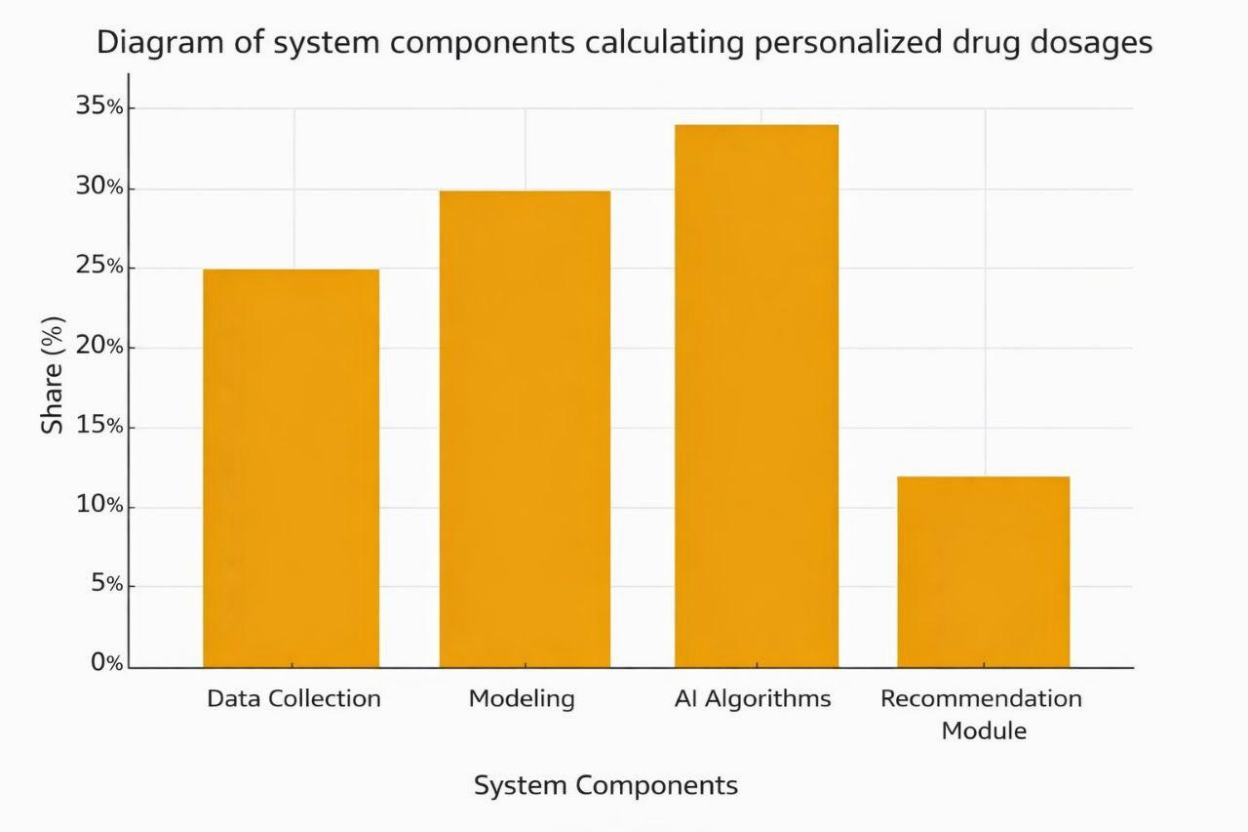
3. Recommendation module – provides the user with specific recommendations on the optimal dose of the drug, frequency of administration and risk factors.
Diagram of components of a personalized drug dosage calculation system



The results of the study showed the high efficiency of the combination of artificial intelligence and pharmacokinetic models in determining the dosage of drugs based on the individual. The system determines the individual dosage of the drug taking into account many parameters, such as the patient's age, gender, body weight, metabolic rate, cardiovascular status, genetic indicators and concomitant diseases. In this way, the multifactorial approach provides greater accuracy and reliability than traditional statistical methods.
Machine learning algorithms, on the other hand, allow for the prediction of drug absorption in the body based on large amounts of data and the assessment of the risk of side effects in advance. In particular, neural networks provide results with high accuracy in complex clinical situations.[5]

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However, there are some limitations in implementing the system in practice: the lack of a high-quality and comprehensive database, the complexity of real-time monitoring in clinical settings, and the process of doctors adapting to new technologies can affect the effectiveness of the system. However, these problems can be gradually eliminated by expanding technological capabilities, digitizing medical institutions, and strengthening information security.[6]

The study presented the main results:

1. Accurate drug dosing - doses calculated based on individual parameters increase drug efficacy in patients and reduce side effects.
2. Reliability of artificial intelligence - algorithms provide high accuracy in processing large volumes of clinical data and dose prediction.
3. Optimization of the healthcare process - doctors can quickly and easily solve complex individual dosing issues.
4. Real-time monitoring and recommendations - as the patient's condition changes, the system adjusts the dose and administration regimen, making the treatment process safer.
5. Contribution to digital medicine - develops the concept of personalized treatment and introduces innovative approaches.
6. Sanitary, legal and ethical requirements - it is important to protect patient data, ensure transparency of algorithms and clinical responsibility.

In general, an intelligent system that calculates individual drug doses opens up great opportunities in medical practice. It is an effective solution for individualizing the treatment process, increasing safety, and simplifying the work of doctors. In the future, the system is expected to serve to increase economic efficiency and improve the digital ecosystem of healthcare.

CONCLUSION

An intelligent system for determining individual drug doses is one of the most promising and relevant areas of modern medicine, allowing for an accurate assessment of the individual effect of drugs and the determination of the optimal dose. The results of the study showed that the combined work of artificial

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intelligence, pharmacokinetic and pharmacodynamic models, big data analysis, and clinical decision support systems significantly increases the efficiency and safety of the drug prescribing process.

The intelligent system determines the drug dose in accordance with patient parameters, reduces the risk of side effects, and increases the effectiveness of treatment. At the same time, it reduces the workload of doctors, reduces errors caused by the human factor, and supports the digitalization of healthcare processes.

For the widespread implementation of the system, it is important to improve the quality of data, enrich clinical databases, ensure the transparency and security of algorithms, and develop the skills of medical staff to work with digital technologies. In the future, such systems are expected to serve the development of personalized treatment, increase healthcare efficiency, and increase innovative potential.

This study confirms the existence of scientific and practical foundations for the creation of intelligent systems that calculate individual drug doses and lays the foundation for the widespread implementation of this direction in medical practice.

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