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Artificial intelligence in medicine. What technologies will improve the quality of solutions?

The volume of knowledge in medicine is growing like an avalanche, knowledge is constantly being updated and expanded. It is becoming increasingly difficult to keep all this in mind and make error-free and timely decisions. The time for the doctor to make the appropriate decision does not increase. As a result, the number of medical errors is growing. To solve these problems, support clinical decision-making systems based on AI methods are being created. This study is devoted to answering questions about what principles and models AI systems should be based on in order to meet modern requirements of evidence-based medicine and deserve the trust of doctors.

Key words: *artificial intelligence, knowledge bases, decision support, evidence-based medicine.*

The development and implementation of artificial intelligence (AI) systems in medicine is a complex and time-consuming activity that requires the interest and participation of specialists in various fields. At present, significant progress has been made in the field of image recognition (X-rays, CT), ECG interpretation, risk assessment and disease prognosis, and a number of support systems have been developed for making decisions regarding the diagnosis of diseases.

Bringing to implementation in the treatment process is hindered by the factors that require serious rethinking and consolidation of the scientific community.

1. Capabilities of AI systems. When determining the properties of AI systems needed by medicine, it is logical to take into account the range of cognitive abilities characteristic of natural intelligence. Taking as a basis the list proposed in [1] and slightly modifying it, it is easy to understand the "intelligence level" of an AI system — it is characterized by the number of simulated functions of natural intelligence. Specialists

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in medicine also note that for successful decision-making, a doctor uses a number of cognitive abilities (functions of natural intelligence) [2]. It is these abilities that need to be additionally provided in a medical system in order to increase its intelligence.

2. Technologies for creating AI systems. Today, systems are developed, as a rule, autonomously from each other. A separate system is developed for each type of task and nosological form. The way to cope with this situation is to create shells of intelligent systems that do not depend on the branch of medicine and the nosological form.

3. Trusting in the results of the system. For medical decision support systems, it is fundamentally important not only to generate advice or a result, but also to explain (argument) it. One of the solutions to the problem of meeting the modern requirements of evidence-based medicine can be use of ontologies that naturally implement the function of generating explanations based on convincing specific knowledge.

4. Terminology used. There is a wide range of term sets in use today. The same concepts are called and interpreted differently and vice versa. It is necessary to bring the terms to a common interpretation.

5. Comparison of identical solutions. Currently, in medicine there is a large number of systems that implement the same functionality, but created either by different methods or by different teams. The difficult question is to choose the best solution and compare the results obtained. One solution is to use ontologies as an integrating framework for systems with similar functions.

On the IACPaaS platform, the medical portal has been created and is actively used, containing a terminological base, shells for creating various classes of decision support systems, knowledge bases for a wide range of diseases, tools for formalizing electronic medical records. A key feature of the proposed AI technologies in medicine is the satisfaction of the requirements described above.

References

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АННОТАЦИЯ

Объем знаний в медицине растет лавинообразно, знания непрерывно обновляются, расширяются. Все это держать в памяти и принимать безошибочные и своевременные решения становится все сложнее. Время на принятие врачом решения не увеличивается. Как результат растет число врачебных ошибок. Для решения указанных проблем создаются основанные на методах искусственного интеллекта (ИИ) системы для поддержки принятия клинических решений. Исследование посвящено ответам на вопросы о том, на каких принципах и моделях должны быть основаны системы ИИ, чтобы соответствовать современным требованиям доказательной медицины и заслуживать доверие врачей.

Ключевые слова: *искусственный интеллект, базы знаний, поддержка принятия решений, доказательная медицина.*