Problematic aspects of the use of artificial intelligence capabilities in modern medical diagnostics

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Abstract

Modern medical diagnostics makes it possible to establish the presence of signs of a particular disease and enable specialists to prescribe a complex of therapeutic and medicinal measures to patients in a timely manner in accordance with the established diagnosis. However, in some cases, it is not always possible to diagnose a particular disease at an early stage due to the imperfection of diagnostic tools. In the recent period, the possibilities of artificial intelligence have been used in medical diagnostics, which significantly expands the capabilities of specialists in the field of establishing early key symptoms of the disease. However, the use of artificial intelligence capabilities in medical diagnostics is still a challenge. Among the problems, we can highlight the need for a large amount of data for training algorithms, the need for transparency and explicability of results, as well as the need for integration with existing health systems. In general, the use of artificial intelligence in medical diagnostics can significantly improve the accuracy of diagnosis, increase the speed and effectiveness of treatment, as well as reduce healthcare costs. However, to achieve these goals, it is necessary to continue research and development of new technologies.

The purpose of the work is to consider the problematic aspects of the application of artificial intelligence capabilities in modern medical diagnostics.

Materials and methods

The study of the problem of the use of artificial intelligence in medical diagnostics was carried out on the materials of articles and monographs by a number of authors, and individual clinical cases described by specialists from foreign countries were also studied. The obtained material was analyzed using a comparative research method, and the necessary conclusions were made based on the results of the analysis.

Results

Artificial intelligence (AI) can play an important role in medical diagnostics, helping doctors to more accurately and quickly identify diseases and choose...
the most effective treatment. AI can significantly improve the accuracy and speed of diagnostics, as well as help eliminate errors related to the human factor. However, it is important to remember that AI should not replace doctors, but is just a tool that helps them make decisions.

The market of artificial intelligence in medical diagnostics is constantly growing and developing. According to a report by MarketsandMarkets, the artificial intelligence market in healthcare will reach USD45.2 billion by 2026, with a projected annual growth of 44.9% from 2021 to 2026.

In the USA, Canada and Europe, there is currently an increasing demand for AI technologies in medical diagnostics. Some of the largest companies in this field include IBM Watson Health, Google DeepMind, GE Healthcare, Siemens Healthineers, Philips Healthcare, Nvidia, etc.

IBM Watson Health, for example, has developed the Onco360 system, which uses AI for cancer treatment advice based on patient genetic data and scientific research. Google DeepMind has developed a system that uses AI to determine the risk of developing ophthalmic diseases in the early stages [2].

Also, in recent years, there has been an increase in the number of small and medium-sized enterprises working in the field of AI in medical diagnostics. These companies are developing new algorithms that can help in the diagnosis of diseases, analysis of medical images, etc.

There is also a growing interest in the use of artificial intelligence in medical diagnostics in Russia. Some large companies, such as Yandex and MTS, have begun to develop their projects in the field of medical AI.

In 2019, the Russian government approved the National Strategy for the Development of Artificial Intelligence, which indicated medical diagnostics as one of the priority areas. However, compared to other countries, there are relatively few implemented projects in this area in Russia so far.

In many countries of the world, the use of AI in medical diagnostics is quite successful. Thus, Israel is one of the leaders in the global medical industry and actively uses AI in medical diagnostics. In particular, the specialists of the Shiba Medical Center have developed an AI-based breast cancer diagnostic system that uses machine learning to analyze a variety of data, such as mammograms, breast X-rays and the patient's medical history. This system has shown high accuracy in the diagnosis of breast cancer.

The Israeli company Zebra Medical Vision has developed an AI algorithm that can automatically detect dozens of diseases on lung X-rays, including cancer, tuberculosis, pneumonia and other diseases. This algorithm is used in medical institutions around the world, including in Israel.

Aidoc has developed an AI diagnostic system to detect head injuries and brain hemorrhages on computed tomograms of the head. This system can help doctors detect hemorrhages faster and more accurately, which contributes to faster and more effective medical care for patients.

Diagnostic Robotics has developed an AI diagnostic technology that can predict the likelihood of COVID-19 disease based on data on symptoms and coronavirus test results. This system is used in hospitals and medical centers in Israel for the rapid and effective diagnosis of COVID-19. Companies and medical institutions in Israel continue to actively research and develop new technologies that can improve the quality and effectiveness of diagnosis and treatment of patients [3].

European countries are also actively using artificial intelligence in medical diagnostics and have considerable experience in this field. For example, studies have already been conducted in the UK that have shown that artificial intelligence systems can detect early signs of diabetic retinopathy, increasing the accuracy of diagnosis and preventing possible complications. Also in the UK, an artificial intelligence system is being introduced to diagnose breast cancer, which shows high accuracy and efficiency.

In Germany, artificial intelligence is used to diagnose rare diseases, such as cystic fibrosis, and to identify patients at high risk of developing infectious diseases.

In Spain, artificial intelligence is used for the early diagnosis of heart disease, the diagnosis of skin cancer, as well as for the diagnosis of neurological diseases such as Alzheimer's disease.

In general, there is an active introduction and use of artificial intelligence in medical diagnostics in Europe, which makes it possible to improve the quality of healthcare and preserve the health of patients [4].

The experience of medical specialists in the application of AI capabilities in diagnostics in certain medical industries is interesting. The use of AI in pediatric
diagnostics is still in development, but there are already several examples of its use. For example, AI can help in the search for rare diseases, given that pediatric rare diseases pose a great challenge for diagnosis due to the multitude of clinical manifestations and insufficient information about the disease. So, researchers from the University of California at Los Angeles have developed an AI algorithm for the diagnosis of the rare Schwachman-Diamond disease, which was successfully tested on a large sample of patients.

AI can also help in the early detection of diabetes in children. For example, a study conducted in California showed that an AI trained on the analysis of medical records and blood test results can accurately determine the risk of developing diabetes in children [5].

AI can be used to automate the screening of newborns for hereditary diseases. For example, in the USA there is a newborn screening program for a number of hereditary diseases, which includes more than 30 tests. The use of AI algorithms can help reduce the time and improve the accuracy of diagnostics.

AI can also help in the diagnosis of Alzheimer's disease already in childhood. For example, researchers from Johns Hopkins University have developed an algorithm that, based on magnetic resonance imaging, can accurately determine the presence of the disease in children [6].

The use of artificial intelligence (AI) in urology can significantly improve the accuracy of diagnosis of various diseases of the genitourinary system, as well as optimize the treatment of patients. One of the most common diseases of urological practice is prostate cancer. For the diagnosis of this disease, prostate examination (palpation of the prostate gland) and analysis of the level of prostate specific antigen (PSA) in the blood are often used. However, these methods do not always accurately determine the presence or absence of cancer.

Modern AI technologies can be used to improve the diagnosis of prostate cancer by analyzing a variety of parameters, including PSA level, prostate size, patient age and other factors. With the help of machine learning algorithms, AI can process a large amount of data and provide more accurate diagnostics.

In addition to prostate cancer, AI can also be used to diagnose other urological diseases, such as kidney stones, bladder cancer, prostatitis and others. One example of the use of AI in the diagnosis of urological diseases is the development of an algorithm based on deep learning for the automatic diagnosis of kidney stones on X-rays. This algorithm can help doctors improve the accuracy of diagnosis and determination of the size of stones [7].

The use of AI in diagnostics in otorhinolaryngology can be useful for the rapid and accurate diagnosis of various diseases, such as hearing disorders, runny nose, throat, dizziness and other problems. For example, some studies show that AI can help in the diagnosis of hearing disorders and the detection of disorders in the structures of the ear, using data from audiometric and other surveys. In addition, AI can be used to diagnose the nature and characteristics of a runny nose and other nasal diseases using mucus samples or other biological materials.

In ENT diagnostics, AI can also be used for automatic image processing and analysis of the structure of the ears, nose and throat. This can improve the accuracy and speed of diagnosis.

Individual cases of application of AI capabilities in various fields of medicine are also of interest. In 2019, a team of researchers from the University of California developed an AI algorithm that can diagnose some forms of heart failure at an early stage. The algorithm uses electrocardiogram (ECG) data and is trained on 375,000 ECGs. The AI algorithm showed higher diagnostic accuracy than cardiologists and was able to diagnose 90% of cases of heart failure.

In 2020, researchers from Stanford University developed an AI algorithm that can diagnose breast cancer at an early stage. The algorithm uses mammography data and is trained on 64,000 images of mammary glands. The AI algorithm showed 90% diagnostic accuracy.

In 2018, researchers from the University of Oxford developed an AI algorithm that can diagnose Parkinson's disease at an early stage. The algorithm uses voice test data and is trained on more than 2,500 voice samples. The AI algorithm showed 86% diagnostic accuracy [8].

One example of the use of artificial intelligence in medical diagnostics is the use of neural networks for the diagnosis of breast cancer. In 2020, researchers at Stanford University developed a neural network that could diagnose breast cancer with 94.5% accuracy using only mammograms. This means that the algorithm was almost as accurate as the expert radiologists who can diagnose breast cancer based on mammograms.

Another example of the use of AI in medical diagnostics is the use of deep learning technology for the
diagnosis of diabetic retinopathy. In 2018, researchers from China created an algorithm that could diagnose diabetic retinopathy with up to 96.5% accuracy from photos of the retina.

Algorithms have also been developed for the diagnosis of other diseases, such as Parkinson’s disease, lung cancer, stroke, etc. Some of these algorithms are already used in clinical practice, while others are at the research stage.

Artificial intelligence (AI) allows you to implement many diagnostic capabilities in medicine. Some of them include:

1. Intelligent processing of medical images. AI can analyze X-rays, CT scans, MRI scans and other medical images to help doctors detect diseases such as cancer, cardiovascular diseases and others. The use of AI in medical images can also improve diagnostic accuracy and reduce the number of false positives.

2. Analysis of laboratory data. AI can analyze the results of blood, urine and other tests to help doctors identify diseases such as diabetes, allergies and others.

3. Diagnosis of rare diseases. AI can help in the diagnosis of rare diseases that may be difficult for doctors to identify.

4. Monitoring of the patient’s condition. AI can help in monitoring the patient’s condition and warn doctors about changes in health that may require attention.

5. Development of an individual treatment plan. AI can help in choosing the most effective treatment for each patient, based on his individual characteristics.

6. Assistance to doctors in decision-making. AI can help doctors make more informed decisions based on the extensive knowledge base and experience of other doctors.

7. Recommendations and analytics in the field of predictive medicine. AI can help predict the likelihood of developing certain diseases in patients, which allows doctors to take proactive measures to prevent these diseases.

8. Evaluation of the effectiveness of treatment. AI can help evaluate the effectiveness of various treatments and identify those methods that work best [9].

Let’s consider the above-mentioned possibilities of using AI in medical diagnostics in more detail.

1. Intelligent processing of medical images.

The use of AI capabilities in medical image processing is becoming increasingly common in medical diagnostics and treatment. Some of the AI technologies used in medical image processing include:

- deep learning. Deep learning is one of the AI technologies that is used in the processing of medical images. It allows AI to “learn” from large amounts of data to identify patterns and patterns that help to more accurately identify diseases in medical images;

- computer vision. Computer vision is a technology that allows AI to analyze and interpret medical images. This technology allows AI to automatically identify and analyze various areas in the images, such as tumors, anomalies, and others;

- pattern recognition. Pattern recognition is a technology that allows AI to find and interpret patterns in medical images. This allows AI to detect diseases in medical images, such as cancer, cardiovascular diseases, etc.;

- image segmentation. Image segmentation is a technology that allows AI to divide medical images into different areas or segments, such as organs, tissues, and others. This helps doctors analyze and interpret medical images more accurately;

- natural language processing. Natural language processing is a technology that allows AI to analyze the natural language used in medical images, such as X-ray reports, CT scans, and MRI;

- data integration. AI technology also allows the integration of data from various sources, such as images, laboratory data and medical records, for more accurate diagnosis and treatment [10].

The use of AI technologies in medical image processing has a number of advantages, including:

1. Increasing diagnostic accuracy. The use of AI technologies in medical image processing can help improve diagnostic accuracy, especially in cases where diseases are difficult to diagnose based on conventional medical images.

2. Reduction of image processing time. AI technologies allow you to quickly process large amounts of data and images, which reduces the time required to obtain results.

3. Improving the quality of patient care. More accurate diagnosis and processing of medical images based on AI technologies can help improve the quality of patient care, which ultimately leads to more positive treatment results.

Some of the examples of the use of AI technologies in medical image processing include:

- Detection of cancerous tumors on X-rays: AI technologies can help detect signs of cancer on X-rays, such as mammography or pulmonary radiography;
– automatic recognition of tumors on CT scans. AI technologies can help doctors quickly and accurately recognize tumors on CT scans;
– real-time analysis of medical images. AI technologies can help doctors analyze medical images in real time during operations;
– determination of the degree of tissue damage in case of injuries. AI technologies can help determine the extent of tissue damage in injuries such as burns or head injuries.

In general, the use of AI technologies in medical image processing is an important tool for improving the diagnosis and treatment of patients, and it is expected that they will continue to evolve.

2. Analysis of medical laboratory data.

Artificial intelligence can be very useful in analyzing medical laboratory data, such as blood, urine, genetic data, and others. Some AI capabilities in this aspect include:
– fast and accurate analysis. So, with the use of AI, they can quickly and accurately analyze medical laboratory data, which can help doctors determine diagnoses faster and more accurately and develop treatment plans;
– detection of hidden correlations. AI models can detect hidden correlations between various medical parameters that may be invisible to humans. This can help in predicting the risk of developing certain diseases and improving the quality of treatment;
– identification of diseases at an early stage. The use of AI in the analysis of medical laboratory data can help doctors identify diseases at an early stage, when they may still be treatable. This can improve prognoses for patients and reduce treatment costs.;
– predicting the reaction to medications. The use of AI in the analysis of medical laboratory data can help in predicting how patients will respond to various medications. This will allow doctors to choose the most effective treatment methods for each patient and avoid unwanted side effects.;
– conducting health monitoring. The use of AI in the analysis of medical laboratory data can help doctors monitor the health of patients over time. This can be useful in identifying changes that may indicate the development of the disease, and in adapting treatment according to the needs of the patient [11].

3. Diagnosis of rare diseases.

Artificial intelligence (AI) can be a useful tool in the diagnosis of rare diseases that can be difficult to identify even for experienced doctors. Some AI capabilities in this area of medicine include:
– analysis of medical images. AI models can be used to analyze medical images, such as X-rays, CT scans, and MRI scans, and automatically detect anomalies that may be associated with rare diseases.;
– analysis of genetic data. AI can be used to analyze genetic data, which can help identify rare diseases associated with gene mutations. AI can also help in processing genomic research data to identify potential marker genes for rare diseases.;
– analysis of symptoms and medical records: AI can analyze patients’ medical records and symptoms to identify a link between them and rare diseases. This can help doctors make a diagnosis faster and more accurately;
– use of expert systems. AI can be used to create expert systems that can help doctors diagnose rare diseases based on the knowledge and experience of experts in this field.;
– disease prediction. AI can be used to predict the likelihood of rare diseases based on a patient’s medical history and other medical factors. This can help doctors identify rare diseases in time and start treatment [12].

In general, AI can be a very useful tool in the diagnosis of rare diseases, which can help doctors more accurately and quickly diagnose.


AI can have a number of useful features in monitoring the patient’s condition. Here are some examples:
– analysis of X-ray images and CT and MRI results in dynamics. AI can be used to analyze medical images such as X-rays, MRI or CT scans. This allows you to identify diseases and conditions of patients that may be missed manually. For example, AI systems can analyze lung X-rays and help diagnose COVID-19;
– monitoring of vital signs. AI can be used to monitor the patient’s vital signs, such as pulse, blood pressure, blood oxygen level and temperature. This allows you to quickly detect changes in the patient’s condition and take appropriate measures;
– Prolonged data analysis: AI can be used for prolonged analysis of medical data, such as medical history and laboratory test results. This makes it possible to identify links between various indicators and the patient’s condition, which can help in more accurate diagnosis and treatment planning.
5. Use in predictive medicine.

Artificial intelligence (AI) has great potential in the field of predictive medicine, which is aimed at predicting the likelihood of diseases in a particular patient and developing an individual prevention and treatment strategy. Some of the possibilities of AI in predictive medicine include:

– analysis of large volumes of medical data. AI can be used to analyze large amounts of medical data, including medical records, images, genetic data, and laboratory and instrumental research results. This makes it possible to identify links between various factors and diseases, as well as to determine individual risk factors for each patient;

– development of machine learning models. AI can be used to develop machine learning models that can predict the likelihood of diseases in a particular patient. These models can take into account many factors, including heredity, lifestyle, medical history, and the results of laboratory and instrumental studies;

– personalized approach. The use of AI allows you to personalize the treatment and prevention of diseases for each patient. Based on the analysis of medical data, AI can determine the most effective methods of treatment and prevention for each patient, taking into account his individual risk factors and body characteristics;

– determination of the optimal time for treatment. AI can be used to determine the optimal time for the treatment of diseases, for example, determining the moment when the risk of a heart attack becomes the highest. This allows you to start treatment of the disease earlier, which can increase the effectiveness of therapy and reduce the risk of complications.;

– development of new methods of treatment and prevention. AI can be used to analyze medical data and identify new risk factors associated with diseases. Based on this information, researchers can develop new methods of treatment and prevention of diseases that may be more effective than current methods.;

– use of genetic data. AI can be used to analyze the genetic data of patients and identify genetic risk factors associated with various diseases. This can help in early detection of diseases and determining the most effective treatment methods for each patient.;

– optimization of treatment processes. AI can be used to optimize disease treatment processes, for example, to predict which medications will be most effective for a particular patient, what dosages should be used and what side effects may occur [13].

Accordingly, the potential of AI in predictive medicine is quite high and can help in more accurate identification of disease risk factors, personalized treatment and prevention, determining the optimal time for treatment and the development of new methods of treatment and prevention.

Discussion. Despite the fact that AI technologies can be very useful in processing medical images, there are several problems associated with their application. Some of these issues include:

– lack of data. In order to train an AI model to recognize medical images, it is necessary to have a sufficient amount of data that must be labeled and verified. In some cases, it may be difficult to get enough data, especially when it comes to rare diseases;

– poor data quality. The quality of the data used to train AI models can significantly affect the accuracy of medical image recognition. Some images may be fuzzy or contain artifacts, which can lead to errors in diagnostics;

– generalization of data. AI models are trained on specific types of medical images, which can lead to problems with data generalization. For example, a model trained to recognize tumors on MRI head scans may not have sufficient accuracy to recognize tumors on MRI scans of other parts of the body;

– insufficient transparency and information content of the data. The complexity of AI models used to recognize medical images may make them less transparent to doctors. This can create problems with doctors’ trust in the results of the analysis of medical images obtained using AI technologies;

– privacy issues. Ethics and privacy issues may also arise when using AI technologies in medical image processing. For example, it is necessary to guarantee the confidentiality of patient data and prevent possible problems with equity issues if AI is used to make decisions about patients [14].

Despite these challenges, AI technologies in medical image processing can still be very useful tools to improve the accuracy of diagnosis and treatment of patients. However, in order for these technologies to be effective, it is necessary to carefully consider these problems and develop strategies to solve them.

The use of artificial intelligence (AI) in the analysis of medical laboratory data can also have some problems, such as:

1. Data limitations. AI models can only be accurate and effective if they have enough data to train. If there
is not enough data or if the data contains errors, the AI may give inaccurate results.

2. Heterogeneity of data. Medical laboratory data may be heterogeneous depending on many factors, such as age, gender, ethnicity, etc. This can lead to the fact that AI models will give inaccurate results.

3. Difficulties in interpretation. Sometimes it is difficult to interpret the results obtained by AI models. This can lead to doctors not trusting the results obtained by AI models, which can lead to underutilization of such systems.

4. Privacy concerns. Medical laboratory data is confidential information, and the processing of this data using AI may lead to a violation of confidentiality. This can be especially problematic when storing data in the cloud or transferring data between different institutions.

5. The danger of being “tied” to algorithms. The use of AI in the analysis of medical laboratory data can lead doctors to rely on algorithms without thinking about how these algorithms work or what mistakes can be made. This may lead to underestimation of the individual characteristics of each patient and restriction of the choice of treatment [15].

In general, the use of AI in the analysis of medical laboratory data can be very useful, but it can also have its limitations and problems. Therefore, it is necessary to carefully evaluate the results and further check them, especially in the case of making important decisions in the field of healthcare.

Also, as already mentioned, the use of artificial intelligence can be useful for the diagnosis of rare diseases, but it has its limitations and problems. One of the main problems is that machine learning models used in artificial intelligence require a large amount of data for training. If a rare disease has a small amount of training data, the model may not be accurate enough for an accurate diagnosis.

In addition, rare diseases can have diverse and complex symptoms that can be difficult to diagnose. Machine learning models used in artificial intelligence may have difficulties in detecting and interpreting these symptoms, which may lead to inaccurate diagnosis.

It is also worth noting that artificial intelligence can be sensitive to data quality problems, such as errors made during laboratory research, data collection and processing. In the case of rare diseases, when the quality of data may be low, this may lead to inaccurate diagnoses.

Finally, it is necessary to take into account the ethical and legal aspects of the use of artificial intelligence in the diagnosis of rare diseases. This may include questions about data privacy, patient autonomy, and responsibility for diagnostic results.

In general, the use of artificial intelligence for the diagnosis of rare diseases can be a useful tool, but requires a more thorough assessment and consideration of its limitations and problems.

Although the use of artificial intelligence (AI) in monitoring a patient’s condition can have many advantages, it also faces a number of challenges that need to be taken into account. Below are some of them:

1. Data quality for AI training. The quality of the data used to train AI systems may be low. For example, medical records may contain errors or omissions, which may affect the accuracy and reliability of AI algorithms.

2. Lack of standards for the collection and processing of medical data. In healthcare, there is no single standard for collecting and processing medical data using AI. This can lead to the fact that AI systems will use incompatible data, which will make it difficult for them to work and lead to inaccurate results.

3. Limitations in the field of interdisciplinary interaction. Healthcare requires close collaboration of interdisciplinary teams, including doctors, nurses, pharmacists and other specialists. Interaction with AI may require changes in the processes of work and training of personnel [16].

The use of AI in predictive medicine also has its own problems and limitations that need to be taken into account:

1. The need for high quality data. The use of AI in medicine requires high-quality data. Errors or insufficient data can lead to inaccurate predictions and recommendations, which can negatively affect patients.

2. Complexity of models. AI models used in predictive medicine can be very complex and unclear. This can make it difficult to explain the predictions to patients and doctors, as well as make it more difficult to verify and confirm the correctness of the predictions.

3. Problems of model training. Training AI models requires a large amount of data and can take a long time. It is necessary to take into account various factors, such as unbalanced data, the portability of models on new patients, etc.

Thus, the use of AI in predictive medicine represents a huge potential for improving healthcare, but
also causes problems that need to be taken into account and addressed. Combining AI technology with ethical principles can help realize the full potential of AI in medicine.

There are also problems with the use of AI-based expert systems (IES) in medical diagnostics. This:

1. Limitations of expert knowledge. IES are based on the knowledge of experts in a particular field. However, experts may be limited by their own knowledge and experience, as well as by the variability of human knowledge. Therefore, the IES may be incomplete or irrelevant.

2. Difficulties with the formalization of knowledge. Some types of knowledge are difficult to formalize and present in the form of rules, which makes it difficult to use IES. For example, knowledge related to interpersonal relationships and the nuances of a patient's history may be difficult to formalize.

3. Difficulties with processing fuzzy information. Medical information may be unclear or ambiguous, and IES may encounter difficulties in processing such information. For example, diagnosis may depend on the patient's subjective feelings, which cannot always be formalized.

4. Problems with data collection. IES require a large amount of data for training and evaluation. However, medical information may be unavailable or incompatible, which may make it difficult to use IES in diagnostics.

5. Limitations of expert systems in cases of rare or new diseases. IES may not be effective enough in diagnosing rare or new diseases for which there is not enough knowledge.

The training of medical diagnosticians to work with artificial intelligence (AI) also presents a number of problems that may complicate the use of AI in medical practice. In order to work effectively with AI, medical diagnosticians need to have an understanding of how AI works, what data it uses and how it makes decisions. This requires training and additional training.

The use of AI in diagnostics requires access of medical diagnosticians to large amounts of data. However, it is not always possible to access such data due to confidentiality, legal restrictions and technical problems.

The use of AI may require a review of medical practices and standards to ensure that they comply with new technologies. For example, there may be changes in the processes of diagnosis and treatment.

The use of AI in medicine raises a number of ethical issues, including data privacy, liability for errors and protection of patients from discrimination. The need to improve technology skills: In order to work with AI, medical diagnosticians need to improve their technology skills, including the ability to process data, use software and analyze results [17].

The use of AI in medicine requires improving the communication skills of medical diagnosticians so that they can effectively communicate with patients and other members of the healthcare team about diagnostic results, decisions made and technologies used in medicine.

One of the problems faced by Russian specialists in the field of medical AI is also the insufficient amount of data that is needed for training and testing algorithms, and there is still not enough data in Russia. There are also problems with legal regulation in the field of medical AI. For example, Russia has not yet developed standards and regulatory documents that would establish requirements for the development and use of medical algorithms based on AI.

In addition, issues related to the qualification of medical workers capable of working with AI technologies are relevant in Russia. It is necessary to train doctors and other medical specialists to work with data and use AI in medical diagnostics.

Despite these problems, some projects in the field of medical AI have already been implemented in Russia, for example, the development of a cancer diagnosis system based on the analysis of medical images and a system for monitoring the condition of patients using machine learning algorithms.

It should be noted that AI cannot completely replace human experience and intuition in making a differential diagnosis. It should be used in combination with the medical knowledge and experience of specialists who can evaluate and interpret the results obtained with the help of AI. In addition, it should be taken into account that AI can make mistakes in diagnostics and requires constant training and tuning of models to improve their accuracy and efficiency.

The most important problem of the use of AI in medical diagnostics are misdiagnoses. They will take place for several reasons. Firstly, AI can be trained on incomplete or inaccurate data, which can lead to erroneous conclusions. For example, if the model is trained on data that does not take into account various factors, such as the age of the patient or the presence
of other diseases, then it can make an incorrect diagnosis. In addition, if the model is trained on data from a particular population, it may be less accurate when applied to another population.

Secondly, AI can work with images, laboratory results and other data that may be incorrectly collected or processed. This can lead to incorrect conclusions and erroneous diagnoses.

Thirdly, the use of AI can lead to problems with the interpretation of the results. For example, the model may give a diagnosis that is not clinically significant, or not give a diagnosis that is important to the patient.

Finally, it should be noted that AI cannot completely replace medical specialists, and their opinion and experience may be necessary to evaluate the diagnosis provided by AI. An error can occur if a specialist does not take into account the entire context and does not take into account the results of other studies and surveys.

To minimize diagnostic errors when using AI, it is necessary to carefully train models on large and diverse data sets, as well as check the results using independent methods. In addition, it is necessary to continue training models and improve their accuracy and efficiency over time.

There are several ways to develop the capabilities of artificial intelligence in medical diagnostics:

1. Improving machine learning algorithms and creating new models. With the continuous improvement of machine learning algorithms, artificial intelligence will be able to process and analyze large amounts of data, identify hidden patterns and predict various disease outcomes.

2. Integration of data from different sources. Currently, medical research data is scattered in various databases, which are not always compatible. The integration of data from different sources will create a more complete picture of diseases, as well as help to identify early signs of diseases.

3. Improving data availability and quality. The quality of diagnostics directly depends on the quality of the data. It is necessary to strengthen control over data collection and processing in order to improve medical diagnostics in general.

With the development of artificial intelligence in medicine, there is a need to train specialists who will work with data and use AI in medical diagnostics. Specialized training centers can be created for this purpose. The organization of such centers may include the following elements:

– training programs. Development and implementation of special courses dedicated to the use of AI in medicine, taking into account different levels of training and various professional areas;
– organization of seminars and conferences. Organization of regular events for the exchange of experience and discussion of the latest achievements in the field of AI application in medicine;
– creation of specialized laboratories. Creation of specialized laboratories for training and practical application of AI in medicine, the equipment of which must meet modern technological requirements;
– preparation of educational materials. Development of educational materials, including theoretical material, examples of the use of AI in medicine, cases and tasks;
– conducting practical classes. Organization of practical classes, including working with real data, information processing, building models and diagnostic systems using AI.

One of the main problems of organizing centers for training specialists in the field of medical diagnostics using AI is the lack of the necessary number of qualified specialists capable of teaching and working in this field. The solution to this problem may be the involvement of experienced specialists from different fields, as well as training and retraining of personnel who are already working in medicine.

Conclusions

Today, in the field of medical diagnostics, AI allows performing operations such as analyzing medical images, laboratory data, and assisting in the diagnosis of rare diseases with high accuracy. AI can help in the diagnosis of rare diseases that may be difficult for ordinary doctors, monitor the patient's condition, develop an individual treatment plan, and assist doctors in making decisions. AI can help doctors make more informed decisions based on the extensive knowledge base and experience of other doctors.

In general, the use of IES in medicine has great potential, but there are also problems that can make it difficult to use them. These problems are related to the fact that the use of AI in the field of medical diagnostics is under development. The problems described above can be solved in the near future only if the approach to solving them is comprehensive and interdisciplinary.
References