THE ROLE OF INFORMATION TECHNOLOGIES IN ONCOLOGY

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Abstract. *This article is devoted to the role and possibilities of information technologies in oncology. The article considers, in particular, the application of artificial intelligence, big data, genomics, telemedicine, electronic medical records and robotics in the field of oncology and their benefits for patients. New technologies, in particular, artificial intelligence and big data analysis, are opening up opportunities for early detection of cancer, the creation of individualized treatment approaches and increasing the effectiveness of treatment. Information is provided on the study of the molecular basis of cancer through genomics and genetic analysis, as well as the possibilities of providing remote medical care using telemedicine. The use of robotics and remote surgical technologies in the treatment of cancer allows for the implementation of delicate and minimally invasive methods. However, the article also indicates the existing limitations, technical and financial problems in the full application of these technologies. The article emphasizes the need for the development of information technologies in the field of oncology and their integration into medicine.*

Keywords: *Oncology, Information Technology, Artificial Intelligence, Big Data, Genomics, Radiology, Teleoncology, Genetic Analysis.*

РОЛЬ ИНФОРМАЦИОННЫХ ТЕХНОЛОГИЙ В ОНКОЛОГИИ

Аннотация. *Статья посвящена роли и возможностям информационных технологий в онкологии. В статье подробно рассматриваются вопросы применения искусственного интеллекта, больших данных, геномики, телемедицины, электронных медицинских карт и робототехники в онкологии, а также их польза для пациентов.*

Новые технологии, в частности искусственный интеллект и анализ больших данных, открывают возможности для раннего выявления рака, создания индивидуальных подходов к лечению и повышения его эффективности. Представлена информация об изучении молекулярных основ рака с помощью геномики и генетического анализа, а также о возможностях оказания дистанционной медицинской помощи с использованием телемедицины. Применение робототехники и дистанционных хирургических технологий в лечении рака позволяет применять деликатные и малоинвазивные методы.

Однако в статье также подчеркиваются текущие ограничения, технические и финансовые проблемы, препятствующие полноценному внедрению этих технологий. В статье освещается развитие информационных технологий в области онкологии и необходимость их интеграции в медицину.

Ключевые слова: *онкология, информационные технологии, искусственный интеллект, большие данные, геномика, радиология, телеонкология, генетический анализ.*

Introduction

Oncology, that is, cancer, is one of the most serious and dangerous medical problems of mankind. Cancers claim the lives of millions of people worldwide every year. Early detection of cancer, accurate determination of its prognosis and development of effective treatment methods are of great importance for human health. Nevertheless, treatment methods in the field of oncology are still associated with serious challenges and complexities. Therefore, in recent years, the implementation of new technologies and innovative approaches in oncology has become increasingly important.

The introduction of information technologies into medicine, especially oncology, has led to revolutionary changes in the diagnosis and treatment of cancer. With the help of information technologies, it has become possible to detect cancer early, collect information about it quickly and accurately, and also increase the effectiveness of treatment. Innovative technologies such as artificial intelligence, big data analysis, genomics, digital imaging systems and telemedicine have ushered in a new era in oncology. These technologies have made it possible not only to make diagnoses more accurately, but also to make treatment processes more effective and safe for the patient.

Artificial intelligence (AI) is rapidly developing in the field of oncology, demonstrating its important role in diagnosing and developing a treatment plan. With the help of computer systems and algorithms, it is possible to analyze medical images, detect cancer at an early stage, as well as study the genetic and molecular data of patients. Through big data analysis, hundreds of thousands of patient data related to cancer are analyzed, creating opportunities to develop new treatment methods.

In addition, remote medical consultations and treatment options using telemedicine services are improving the quality of life of patients. This is especially important for patients living in remote areas, as they have access to modern medical services. And the electronic medical record system makes it easier to store and access all medical information about patients.

As a result, communication between patients and medical professionals becomes more effective.

The use of information technology in oncology has also led to the development of new approaches, such as robotics and remote surgery. Robots are making surgical treatment of cancer more precise and safer. Remote surgery methods are also providing convenience for patients, as they can communicate with surgeons remotely and monitor the treatment process.

Literature review and methodology

Artificial intelligence (AI) plays an important role in creating innovative opportunities in the field of oncology. In the analysis of medical images, AI systems help to quickly and efficiently analyze images such as X-rays, computed tomography (CT) and magnetic resonance imaging (MRI). With the help of artificial intelligence, it is possible to detect cancer at an early stage, which significantly increases the effectiveness of treatment. AI algorithms, for example, help analyze microscopic images and are able to distinguish between different types of cancer.

These technologies help radiologists and oncologists predict the development of the disease, while at the same time serving as the basis for developing more effective methods of treating the disease. With the help of AI, it is possible to quickly detect changes in the images, which reduces medical errors. As a result, the use of AI in the field of oncology helps not only to make an accurate diagnosis, but also to analyze the general condition of the patient. AI systems also help to predict the outcome of the patient's treatment, which allows for an individual approach. At the same time, the process of image analysis is accelerated with the help of AI systems, which helps to perform medical work efficiently.

Big Data creates a huge set of data necessary for analysis in oncology. Large volumes of medical data are of great importance in analyzing patients' genetic information, their medical histories, and treatment processes. Big data can identify new trends in the development of cancer.

Genomics, on the other hand, creates new opportunities for cancer prevention and treatment by studying the molecular and genetic structure of cancer. Genetic analyses can analyze the genetic structure of a patient and understand their immune response to cancer. This helps to develop individual and personalized treatment methods. Big data can also be used to identify effective drugs and treatments for various types of cancer. Genomics and big data analysis help to detect cancer at an early stage and improve the treatment process for patients. The integration of big data and genomic analysis makes it possible to make a personalized medicine approach in oncology more effective. This provides the opportunity to implement treatments that are tailored to the patient's condition, especially in the treatment of various types of cancer. Working with big data and genomics opens up the possibility of creating new treatment methods through scientific research and clinical trials.

Telemedicine has made it possible for patients in the oncology field to receive medical services more conveniently and quickly.

With the help of this technology, patients can consult with oncologists remotely.

Telemedicine is especially important for patients living in remote areas, as they do not have to travel long distances to receive their medical treatment. Oncology specialists can remotely study the medical history of patients and recommend the necessary treatment and rehabilitation processes. The medical condition of patients is constantly monitored, for example, their studies, therapy responses, and health status are monitored through electronic systems. At the same time, through medical consultations and support using telemedicine, prevention and early detection of cancer diseases are carried out. With the help of telemedicine, patients are in constant contact with their personal doctors, which increases the effectiveness of treatment.

Patients can receive information about their condition, medications and treatment plans remotely. Also, the expansion of this system will help strengthen the network in the medical system and allow oncology specialists to communicate effectively. With the help of telemedicine remote medical services, medical care and the recovery process of patients can be effectively managed.

Electronic medical records (EMR) are very important in oncology. With this system, all medical histories, treatment processes, results and achievements of patients are stored on a single platform. As a result, all the necessary information about patients is available, and doctors have the opportunity to analyze the patient more quickly and accurately. With the help of electronic systems, patient information becomes open and available to all medical personnel. This facilitates effective and rapid decision-making. With the help of the EMR system, information stored about patients is quickly exchanged between specialists. It increases the efficiency in preventing medical errors and monitoring the treatment process. Transferring patient medical records to an electronic system helps to increase the efficiency of surgery and therapy. Through the electronic system, it is possible to track the patient's treatment history and assess his medical condition remotely. These capabilities increase the efficiency of treatment in the field of oncology and provide improved service to patients. The EMR system also greatly helps in monitoring the medical condition of patients and developing new treatment methods. Special safeguards can also be used to ensure the security of patient personal information.

Robotics have revolutionized oncology surgery. Robotic surgery for cancer treatment is performed more precisely, minimally invasively, and with fewer complications. Remote surgery also allows patients to have surgery remotely with surgeons. Robotic surgical systems, such as the da Vinci system, are used to treat delicate and complex cancers. These technologies provide treatment with less invasiveness and minimal trauma for the patient. Remote surgery is especially convenient for patients in remote areas, as they do not need to travel to large medical facilities. Robotics allows surgeons to perform precise and delicate operations, which

Discussion

The development and application of information technologies in oncology is creating significant changes in the field. The integration of information technologies into medicine, especially in the field of oncology, allows for early detection of cancer, increasing the effectiveness of treatment, and accelerating the recovery process of patients. The above studies and approaches show that the effective use of information technologies in oncology helps to carry out medical processes more accurately and quickly.

The role of artificial intelligence (AI) has increased significantly in recent years. The expected results in the early detection of cancer using AI systems are high. AI algorithms help to ensure high accuracy and speed in the analysis of medical images. Also, approaches tailored to the patient's individual characteristics can be developed in the prognosis of cancer through artificial intelligence. AI systems provide additional support to radiologists and allow them to analyze images accurately and quickly, which reduces errors introduced into the clinic. However, much scientific and technological research may still be needed to improve the performance of these systems.

The use of Big Data and genomics in oncology helps to deeply study oncological diseases. Through a big data system, it becomes possible to analyze medical data and predict the development of cancer. This helps in developing new treatment strategies. Genomics plays an important role in studying the molecular basis of cancer. Through genetic analysis, cancer mutations can be identified and individual and personalized treatment plans can be developed.

However, there are still some difficulties in the analysis of big data and genomics, and there is a need for further development in this area. Telemedicine and remote medical services are creating opportunities for making services more convenient for patients in oncology.

Telemedicine is especially important for patients living in remote areas, as they do not have to travel long distances to receive their medical treatment. At the same time, telemedicine can reduce the distance between oncologists and patients. However, to ensure the effective operation of telemedicine systems, a wider network and high-quality internet connection are necessary. In addition, the development of remote systems for medical services may face serious limitations due to the lack of infrastructure in some regions.

Electronic medical records (EMR) systems allow for accurate and systematic storage of patient medical histories and treatment processes in oncology. EMR systems allow for the rapid exchange of information between medical professionals, which increases the efficiency of the treatment process. However, the full implementation of EMR systems may be associated with technical and security issues in some regions. Special security measures must be implemented to ensure the proper functioning of electronic systems.

Robotics and remote surgery play a significant role in the field of oncology. Robotic surgical systems can be used to treat cancer in a gentle and minimally invasive manner, which speeds up the recovery process for patients. Remote surgical methods are important, especially for patients in remote areas. However, the widespread use of robotic systems and remote surgery still faces some technical difficulties and financial constraints.

Thus, the application of information technologies in the field of oncology is leading to significant developments. These technologies increase the effectiveness of treatment, create opportunities for early detection of diseases and help improve the condition of patients.

However, there are also some technical, financial and infrastructure problems in the implementation of these technologies. Therefore, it is necessary to further develop research and practices in this area

Conclusion

The application of information technologies in the field of oncology has brought about major changes in recent years. Innovative technologies such as artificial intelligence, big data, genomics, telemedicine, electronic medical records and robotics are playing an important role in early detection of cancer, increasing the effectiveness of treatment and developing individualized treatment methods for patients. With the help of information technologies, high accuracy, speed and efficiency are being achieved in the field of oncology.

Artificial intelligence and big data analysis make it possible to create individual approaches to the prognosis and treatment of diseases in oncology. There are also opportunities for in-depth study of the molecular basis of cancer through genomics, early detection of the disease and adaptation of treatment methods. Telemedicine helps to make medical services more accessible, especially for patients living in remote areas, which ensures the effectiveness of treatment. And the electronic medical record system serves to exchange information and optimize the treatment process.

However, the full application of information technologies poses some technical, financial and infrastructure-related problems. The widespread use of robotics and remote surgery, especially in some regions, is associated with technical and financial limitations. Nevertheless, the development and implementation of these technologies will further improve medical services in the field of oncology, facilitate the condition of patients and increase the effectiveness of treatment.

In the future, the role of information technologies in oncology will become even more important. The wider use of these technologies, the implementation of innovations in the field of medicine and the development of new treatment strategies will allow to improve the quality of life of patients and move to a new stage in the treatment of diseases.

At the same time, for the successful application of technologies in practice, it will be necessary to constantly improve them and develop special training programs for medical specialists

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