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Comprehensive Review of Artificial Intelligence in Medical Diagnostics and Treatment: Challenges and Opportunities

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Abstract

In recent years, medicine has faced the serious challenge of the covid pandemic, due to which representatives of the health care sector had to mobilize forces and resources to jointly overcome these problems. The rapid development of artificial intelligence, its learning capabilities, and in recent years the creation of a neural network opens up wide possibilities for the use of AI in medicine.

Aims: To analyze the modern literature on the use of AI for diagnosis and treatment and to analyze what problems may arise with the uncontrolled introduction of artificial intelligence

Methodology: When conducting a literature review, an analysis and generalization of data on the research topic from 2019 to 2024 was carried out. The literature search was carried out by keywords using the PubMed search engine.

Results: The literature review demonstrated the use of artificial intelligence in medicine, which has grown significantly in recent years and continues its rapid development, which is associated with the improvement of innovative technologies. The use of artificial intelligence in diagnostics is associated with the use of a neural network, which makes it possible to identify digitized images for rapid diagnosis. The use of artificial intelligence in surgery is reflected in the application of da Vinci. Artificial intelligence has been widely used in anesthesiology.

Scientific Novelty: The literature search established that the implementation of artificial intelligence in medicine creates certain challenges related to the protection of personal data, and the possibility of error is not excluded when using AI.

Conclusion: The use of AI is promising for diagnosis and treatment and helps doctors quickly make a diagnosis and prescribe treatment, but certain challenges created by artificial intelligence must be solved by implementing more reliable personal data protection systems, as well as control over the information reproduced by artificial intelligence.

Keywords: artificial intelligence, medicine, neural network, diagnosis, treatment.

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Introduction

In recent years, innovative technologies have been introduced into all spheres of human activity, including medicine. Development of computer programs that make it possible to monitor the work of hospitals. Today, a modern medical institution cannot imagine work without electronic registration, which systematizes data about patients, creates an electronic patient card with a note about all the procedures that the patient received. Innovative technologies have become the basis for the improvement of artificial intelligence, which combines the technical capabilities of equipment, as well as the concept of intelligence, cognitive capabilities inherent in the human brain. The rapid development of artificial intelligence, its learning capabilities, and in recent years the creation of a neural network opens wide possibilities for the use of AI in medicine. AI finds application in diagnostics. In the article, Peng-ran Liu notes that the medical field has changed significantly thanks to the introduction of artificial intelligence, and the doctor does not spend much time on deciphering X-ray images and interpreting biochemical results. The database of images of X-rays and histological preparations accumulated over the past decades makes it possible to quickly and accurately analyze and establish a diagnosis [1]. The database, which contains a large volume of data on symptoms and treatment, the consequences of treatment, creates opportunities for rapid diagnosis and treatment. According to experts, it is possible to use robots to perform surgical interventions with the help of algorithms, which reduces the possibility of technical errors. AI paves the way for the introduction of personalized medicine aimed at treating the patient considering individual characteristics, including genetic ones. In recent years, AI has been widely used to create effective medicines [2]. The most striking example is the rapid creation of drugs for COVID-19 with the help of AI. AI made it possible to reproduce the changes in the RNA of the virus, and based on this data, vaccines and medicines for COVID-19 were created, which made it possible to overcome the pandemic, which turned out to be the most difficult in the last 100 years [3]. But the implementation of AI in the process of systematization of data may raise ethical issues due to the possible leakage of personal data into the network, as well as the access of attackers to this data [4]. An error is also possible, as the synthesized AI information may contain incorrect, unverified information. And in 2024, information appeared about the negative consequences of the use of the vaccine against COVID, which indicates that information from artificial intelligence does not take into account all possible risks and needs further improvement [5]. The use of AI is promising in medicine for diagnosis and treatment with the solution of those challenges that arise when using AI [6]. The introduction of artificial intelligence in the medical field took place relatively recently, but AI has proven its high capabilities for improving diagnosis and treatment and at the same time created certain challenges regarding the protection of personal data and possible uncontrollable errors, which is unacceptable in medicine.

Research Problem

The use of artificial intelligence in medicine for diagnosis and treatment in recent years has demonstrated significant success and high efficiency. The use of AI for diagnostics for the purpose of image recognition creates opportunities for accurate and early diagnosis of diseases. AI's ability to analyze creates opportunities to work with large volumes of information for the purpose of forecasting, treatment, and diagnosis. The use of AI opens opportunities for personalized medicine, which will help to treat an individual patient, taking into account genetic characteristics. But at the same time, the use of AI in diagnosis and treatment creates certain challenges that need to be sorted out. There is a threat of leakage of personal data, there is a possibility of error, since the information synthesized by AI is not always supported by authoritative scientists and specialists, but synthesized from the information that is available in the network. Studying the possibilities of AI for diagnosis and treatment will help to understand the current level of AI application in medicine and will also help to form new promising areas of AI application.

Research Focus

The conducted research is aimed at familiarizing the audience with the achievements of artificial intelligence in medicine, as well as the possibility of using AI in diagnosis and treatment. Also, the purpose of the study was to systematize the received information and assess the current state of development of innovative technologies.

Research Aim and Questions

The aim of this study is to analyze the current literature on the use of artificial intelligence (AI) in medical diagnosis and treatment and to investigate potential challenges associated with its uncontrolled implementation. This research seeks to provide a comprehensive understanding of the advantages and limitations of AI applications in the medical field.

To achieve the set goal, we need to solve the following tasks:

1. To analyze modern literature on the current state of AI application in medicine for diagnosis and treatment
2. To analyse what problems may arise with the uncontrolled implementation of AI
3. To outline the main prospective directions of AI implementation in modern medicine.

Research Methodology

General Background

At the current stage of the development of scientific and technical progress and the introduction of artificial intelligence into all areas of human activity: economy, education, technical industry, politics, journalism and the judiciary, medicine has also received fields in which the application of AI has found its application. AI makes it possible to process large amounts of information, and therefore AI finds its application in the implementation of programs that ensure control of the work of medical institutions, systematize patient data, and provide access to treatment protocols. The use of AI is important for diagnostics, for example, the creation of a neural network of images creates opportunities for more accurate and rapid diagnosis based on X-ray images and histological preparations. AI aims to introduce personalized medicine, the use of robotic systems in operative interventions, which, according to the developers, exclude the possibility of error. But at the same time, there is the issue of violation of personal data that enters the network, as well as the possibility of a mechanical error, since the results produced by the neural network are not always referred to authoritative sources [7].

Sample / Participants / Group

During the literature review, we identified key words: innovative technologies; artificial intelligence in medicine; artificial intelligence and diagnostics, artificial intelligence in treatment. We received 685 publications by keywords in the PubMed database. Among them, 154 refer to the period from 2019 to 2024, of which 98 are freely available. Publications that contained a complete list of keywords: 54 that contained a combination of several "artificial intelligence and medicine" and "artificial intelligence and treatment", "artificial intelligence and diagnosis", «neural network» and «medicine». Of the sources we examined, 65 were recognized as relevant and contributed to the understanding of the use of AI in medicine for diagnosis and treatment. These statistics provided a comprehensive overview of the volume, availability, language distribution and relevance of publications on this topic on PubMed for the specified period [7]. (Fig.1)

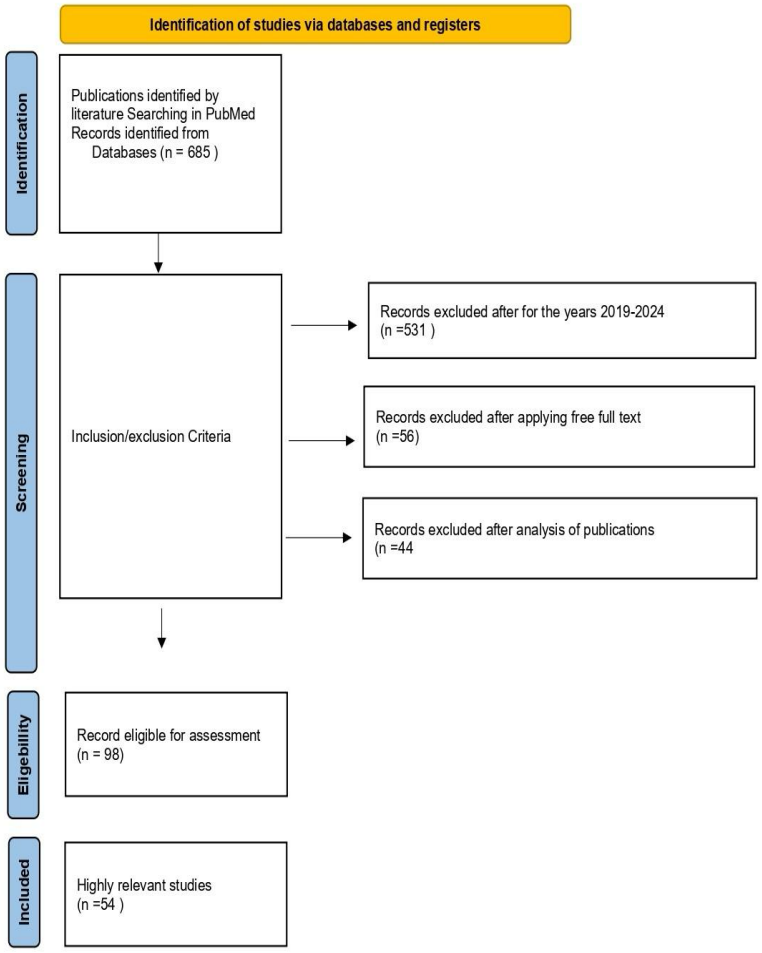

Figure 1. PRISMA flow diagram

Instrument and Procedures

We used a systematic methodology for the narrative review. In the PubMed search, we used the specific keywords innovative technologies; medicine; Artificial Intelligence; diagnostics; treatment; to search for relevant literature sources from 2019 to 2024. The procedure included several main stages:

• The search terms "Artificial Intelligence" AND "Medicine", "Artificial Intelligence" and "Treatment", "Artificial Intelligence" and "Diagnostics" were entered into a PubMed search focused on literature that explores the relationship between artificial intelligence and medicine, diagnosis and treatment.

• For the review, we selected articles for the years 2019-2024 only. This made it possible to consider the current state of application of artificial intelligence in the medical field.

• Articles corresponding to the research topic were used for further processing.

• We used only full-text versions of articles for the full review.

• Relevant data were extracted from the selected articles during a careful review of each publication.

• The articles selected for consideration were carefully analyzed by us.

• We critically approached the evaluation of the results and determined the direction of further research (Fig.2).

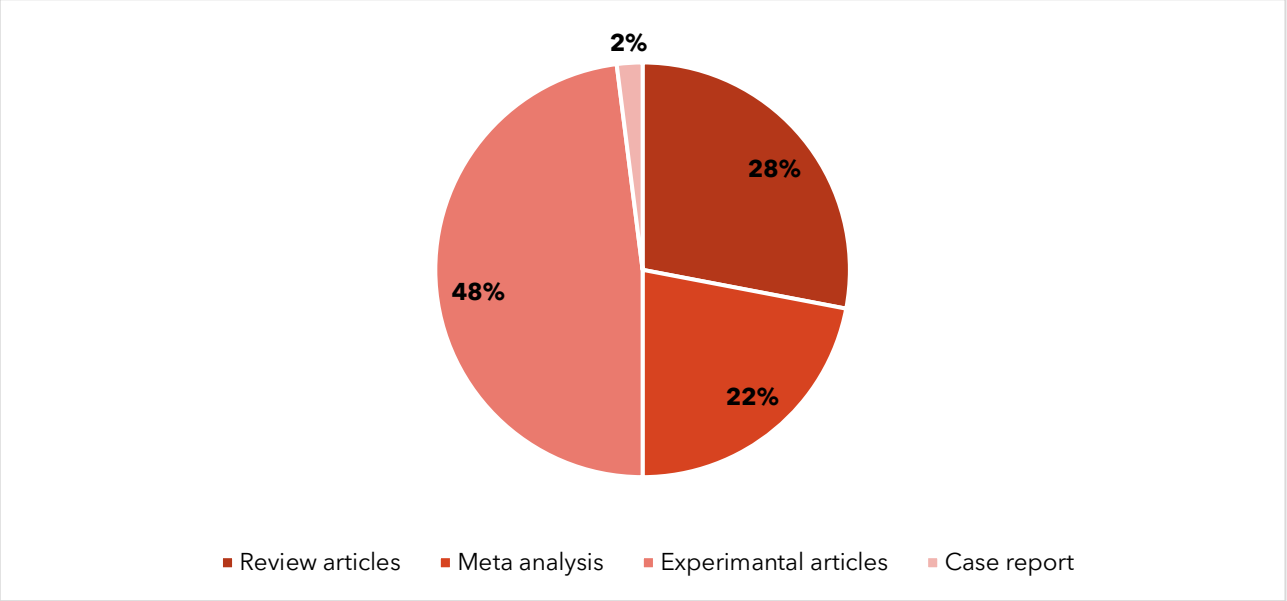

Figure 2. Frequency distribution by types of studies

Data Analysis

During the literature review, we followed several sequential steps to form theoretical knowledge about the current state of AI applications for diagnosis and treatment.

• Generalization of conclusions: By studying the literature and systematizing information from the considered sources, we tried to create a coherent narrative.

We identified the key findings from the research topic.

We have provided a description of the use of AI in medicine, and the advantages of using AI for diagnosis and treatment.

Research Results

AI combines two concepts: artificial, which is reproduced by machines, and intelligence is something that covers the sphere of human capabilities. That is, these are technologies that are capable of thinking, learning, and will be able to reproduce the capabilities of the human brain, which have not even been studied at the moment. Today, AI technologies are widespread in all spheres of life and are aimed at increasing the efficiency of the sphere in which they are used [8].

The development of artificial intelligence began as early as the 50s of the last centuries with the introduction of the labyrinth search model, in the 60s heuristic programming appeared, and in 1970 Robinson developed a program that allowed proving theorems using a set of axioms. In 1973, the Prolong programming language appears, the author of which was Albert Kolmeroe. Developers Newell, Simon, and Shaw created the Logical Theoretician program, which proved theorems from a school program [9].

MYCIN and DENDRAL systems were created in the USA in the 70s to help in medicine and chemistry and their main task was to create knowledge [10]. During these years, work on the creation of V generation robots began in Japan. The details of the research carried out at the ICOT institute were not revealed for ten years and the results of these studies were unsuccessful, but they studied a whole generation of specialists who were engaged in the development of artificial intelligence.

Since the 80s of the last centuries, developments in the field of artificial intelligence have received a powerful financial base in the economically developed countries of the world, and this process continues [11].

In 1997, the created computer programs enabled IBM Deep Blue to beat Garry Kasparov in a chess game.Since the 2000s, AI has been widely introduced into the social sphere by Facebook, Twitter, and Netflix, and in 2011, AI gained new capabilities and could generate certain functions. So, the Watson system was able to understand speech and generate answers. In 2020, AI created vaccines against COVID, as it was able to analyze the RNA of the virus using LinearFold AI [12].

The created GPT, which in 2023 received the fourth improved model, is a promising direction of AI, but has many critics [11].

Broad opportunities for the use of artificial intelligence in diagnosis and treatment appeared after the discovery of the neural network. Back in the 40s and 50s of the last centuries, M'Culloch and Pitts created a model of an artificial neuron [13]. Later, Frank Rosenblatt applied the concept of a preceptron, which became the basis for the future neural network. AI researchers Marvin Minsky and Seymour Papert criticized the discovery of the artificial neuron and preceptron, which inhibited the development of neural networks [14]. And since 2010, new technical capabilities have made it possible to improve neural networks and created opportunities for learning and correcting errors, which gives reason to use the concept of intelligence [11].

Recently, artificial intelligence has become one of the tools for diagnosing and treating diseases, predicting their course, as well as developing patient rehabilitation programs. In recent years, medicine has faced the serious challenge of the covid pandemic, due to which representatives of the health care sector had to mobilize forces and resources to jointly overcome these problems [15]. The pandemic exposed the weaknesses of the modern health care system and unwittingly turned into an incentive for the development of the electronic component of medicine. Statistical processing of data, which allows for the rapid development of appropriate treatment regimens, is extremely important for the prompt acquisition of information and the adoption of timely measures for diseases [16]. The expediency of prescribing certain therapeutic measures should be determined by statistical data, the manual processing of which takes too much time and represents an additional field of tasks for medical personnel. Artificial intelligence is today also a great tool for predicting the course of diseases [17]. In certain studies, it was particularly noted that the algorithms of artificial intelligence programs, namely XGBoost, which has great predictive power. The components of artificial intelligence programs, which are aimed at speeding up the processing of information and its registration into statistics, are very useful for medical activities, because they help to significantly save time that can be devoted to the patient [18].

A case of successful application of artificial intelligence in echocardiography is described. Since echocardiography is a field of instrumental diagnostics that requires a lot of experience in the diagnosis of pathologies, the use of artificial intelligence programs is quite useful. Since most cardiovascular diseases require rapid diagnosis, the accuracy of echocardiography should be as high as possible [19]. Recognition of images of heart structures by artificial intelligence algorithms reduces the time of diagnosis. For diagnosis, it is also important to calculate the exact ejection fraction, the indicators of which are a key characteristic of many cardiovascular pathologies [20]. Such a result is achieved as a result of the capabilities of machine learning. The system uses an algorithm that automatically starts a search for the desired image that illustrates the requested pathology. Most of the images are pre-entered into the database [21].

Echocardiography images undergo a complex processing process, passing through filters of ultra-precise layers. The process of image processing is that it is divided into hundreds of parts, each of which is subject to neural network analysis [22]. Optimizing the efforts of ultrasound specialists also belongs to one of the positive characteristics of neural networks. It is noted that when ultrasound specialists use artificial intelligence, they will not need to make a large number of movements during the manipulation of the ultrasound sensor, constantly being in an uncomfortable position, which can provoke the occurrence of disorders related to the musculoskeletal system [23]. The prospects for the application of artificial intelligence in echocardiography look quite serious, however, the developers of neural networks together with the medical community cannot completely reject the risks posed by artificial intelligence. At

the beginning of its application in clinical practice, medical personnel face a large number of challenges. First of all, the use of artificial intelligence in practice first of all cause's skepticism, since the medical staff does not yet have much experience in using such an auxiliary tool. Therefore, artificial intelligence programs should be easy to maintain and suitable for different types of medical equipment [24]. Secondly, the accuracy and quality of the image database cannot be guaranteed 100 percent. The problem may lie both in insufficient accuracy of the defined structures and in errors within the program itself. As is known, the correctness of prescribing therapeutic measures, conservative or operative treatment, depends on the correct diagnosis [25]. (Because of the potential risks mentioned above, medical personnel will be forced to do double work: perform the diagnosis themselves, and then compare these results with those offered by artificial intelligence programs. That is why this industry needs careful refinement.

Since the possibilities of using artificial intelligence in diagnostics are quite large, it is worth noting that this software can also be used in such fields as anesthesiology. It has been studied that artificial intelligence can be used in preoperative preparation, intensive therapy, and the postoperative period [26]. Artificial intelligence in anesthesiology and resuscitation is primarily aimed at increasing the level of decision-making [27]. According to experts, a remarkable feature of artificial intelligence is its ability to learn automatically without the intervention of software engineers. It is known that there are three types of machines learning namely: supervised, unsupervised and reinforced. Controlled training involves gaining extensive training experience. Usually, the program is "taught" what result would be the most desirable in solving this or that problem [28]. After training, a check is carried out in test mode, the purpose of which is to determine the accuracy of the results produced by the program and the degree of their similarity with the results laid down in the training program. As for unsupervised learning, its goals include the formation of hypotheses for research. Unsupervised learning analyzes information in a random order, allowing it to be organized in different ways [27].

Back in 1990, William Bakst used a neural network to diagnose myocardial infarction in patients who were admitted to the department with characteristic chest pains. Today, AI is used in cardiac rehabilitation as a mobile application as an aid to monitor its performance, which has shown better results in achieving goals [29]. Mobile applications can be considered a successful addition to the main training program [3]. If the patient experiences threatening symptoms: shortness of breath, excruciating pain in the chest radiating to the left arm, dizziness, etc., he has the opportunity to inform the doctor treating him almost instantly to get clear information. instructions and action algorithm [31].

The capabilities of the neural network are used in the analysis of X-ray images. With the help of AI, it is possible to determine: the severity of the course of the disease, hospitalization rates, the number of cases requiring resuscitation measures, as well as rates of fatal consequences [32]. The task of the study was to create a clinical and radiological model for predicting the course of covid pneumonia within two weeks. The sources of the main medical documentation were electronic media. During the study, a CT machine was used to obtain images of the chest. A total of 214 patients were divided into 2 groups. Pneumonia segmentation was determined using the U-net network. It is known that this type of neural network is characterized by multitasking [33]. The U-net network was developed for the purpose of segmentation of biomedical images for the purpose of automatic identification of images and their comparison with existing ones in the neural network, which makes it possible to more clearly identify changes in tissues and organs [34].

The goal of the XGBoost model was to determine the most important characteristics of CT images of the lungs against the background of the course of covid pneumonia. Research has established that the most important is the characteristic that determines the degree of severity of the course of covid pneumonia [35]. The study notes that patients who had a severe course of pneumonia had this characteristic significantly higher than those who had a mild course. With the help of Gradient Boosting tools, XGBoost creates an opportunity for machine learning, and also creates opportunities for gradient boosting, which makes it possible to solve problems quickly and get a lot of data [36].

The neural network also identified that shortness of breath is an important characteristic for predicting the results of chest X-ray examination. Another important indicator is an increase in the level of NT-proBNP, which indicates a decrease in lung function and also signals heart failure [37].

The use of a neural network for the purpose of qualitative diagnosis of gliomas of low degree of malignancy demonstrated significant success, as well as the calculation of the treatment strategy, which considers clinical and molecular parameters, significantly helped doctors to determine the strategy and tactics of providing care [38].

The enhanced training of artificial intelligence is designed to form a kind of experimental conditions that help to evaluate the quality of the performed actions. In the 1990s, blood pressure was the indicator on which the depth of anesthesia depended. Today, the standardized indicator is the bispectral index [39]. Pharmacokinetics of the drug is of great importance in anesthesiology, which can also be controlled using artificial intelligence systems. Artificial intelligence plays a big role in predicting events in the context of one or another clinical case. According to some sources, artificial intelligence has demonstrated better results (sensitivity, specificity, and area under the curve) compared to expert predictions. It is about restoring consciousness after anesthesia [40]. AI is reported to be able

to recognize potential sepsis, ventilator-associated pneumonia, post-revascularization disease and mortality. During anesthesiological manipulations, significant difficulties faced by specialists is the choice of the puncture site, if we are talking about spiral anesthesia.For the safe introduction of the patient into anesthesia, it is necessary to take into account the possibility of intraoperative complications [41]. During anesthesia, it is necessary that artificial intelligence programs accurately assess the patient's state of consciousness. The question remains whether emergency professionals need to rely on artificial intelligence capabilities during emergency care. Emergencies require immediate intervention and are complex from the point of view of a critical amount of time, for example, the algorithm for providing emergency care for postpartum bleeding, which involves the quick and operative actions of the doctor on duty, the head of the department, the anesthesiologist, the transfusionist doctor, as well as the support staff, the complex process of ordering fresh frozen plasma for transfusion and rewarming it [40].

The feasibility of using artificial intelligence in such situations should be determined individually in each case. Although artificial intelligence increases the accuracy of clinical tasks, in the absence of professional skills, its use in emergency cases can cause a large number of errors, which is unacceptable in the work of emergency medicine doctors [41].

The use of artificial intelligence in the postoperative period is no less important. Postoperative analgesia is a key issue when it comes to patient discharge. Patients often complain of postoperative pain [42]. According to some sources, painkillers prescribed for 24% of patients do not have a sufficient effect. This symptom is a negative prognostic sign, since persistent postoperative pain, which cannot be eliminated by drugs, can later turn into chronic pain [43]. To avoid adverse consequences, it is necessary to consider all the risks associated with analgesia. Risks include: insufficient analgesia, too much analgesia, respiratory depression, etc. It is reported that some artificial intelligence models are able to predict the degree of risk of re-hospitalization of patients [44].

It is clear that artificial intelligence is not able to fully perform the work in the specialty, but its ability to analyze a large amount of information, predict the risks that this or that step of the specialist may lead to, automatically determine the dose of the drug for anesthesia or pain relief can be very useful in the work doctors [41].

It is worth noting the view of modern medicine as being under the influence of many political and economic factors, due to which attention is not always focused on the patient and his safety. Today, the primary medical sector is developing rapidly thanks to the development of technologies, in particular artificial intelligence. Many workers in the field of health care, namely primary care, today use artificial intelligence as an auxiliary tool. A three-stage Delphi study was conducted to investigate the beneficial role of artificial intelligence in primary care medicine [45]. The first stage involved conducting a survey among clinicians, as well as specialists in online informatics. It is important whether the representatives of this category are informed about the possibilities provided by artificial intelligence, because they are the main users. The questions related to employees' satisfaction with the use of artificial intelligence programs. An important issue was the prospects for the development of artificial intelligence for primary care medicine. The survey period lasted 2 weeks [46].

The second stage of the research consisted in organizing the information, and the third stage consisted in the discussion of the results by experts in the format of an online conference. According to the results of the study, artificial intelligence was recognized as a useful tool in the daily work of clinicians. As for the risks associated with the use of artificial intelligence in primary care medicine, the experts concluded that the risks are associated with preserving the confidentiality of patient data.

The researchers note that the data obtained with the help of artificial intelligence should be standardized. Standardization should take place in accordance with metadata standards, medical terminology, etc. A big role is also played by the issue of funds that may be required when implementing artificial intelligence programs in medical institutions. In addition, artificial intelligence must meet the needs of medical institutions and be as close as possible to their activities. The next issue discussed at the conference was legal aspects. Obtaining informed consent from patients for the processing of personal data by artificial intelligence programs was discussed [47].

The experience of using AI for the treatment of retinal diseases resulting from diabetic retinopathy, age-related retinal degeneration, hereditary retinal diseases and retinopathy of prematurity is described. Specialists are considering the possibilities of AI in preventing the development of retinal diseases, based on the analysis of information about a patient who suffers from diabetes and in the future may get complications in the form of retinopathy. It is preventive measures and timely treatment that can prevent the development of unwanted complications [48].

In recent years, AI has been used for surgical treatment of spine diseases. AI capabilities allow spinal surgeons to place equipment more precisely during treatment The advent of computer-aided imaging has allowed spinal surgeons to expand their capabilities to improve spine treatments. AI allows implementing minimally invasive methods with less blood loss and lower risks of complications, as well as a quick return to active life [49].

AI in children's cardiac surgery makes it possible to predict the course of the disease, selects drugs taking into account the patient's genetic characteristics, and can also offer the most optimal options for surgical interventions taking into account personal characteristics [50].

One of the AI tools, Chat GPT has demonstrated effectiveness in the treatment of obesity. The improved version of Chat GPT can offer a personalized diet, psychological support and develop a set of physical exercises [51].

Treatment of a large number of diseases requires the use of antiplatelet therapy with the use of antiplatelet agents. This creates risks for bleeding, and stopping such therapy creates risks for thrombosis. AI allows you to calculate risks and determine the level of P2Y12 reaction units (PRU) and analyse thromboelastography indicators. In this way, AI will be able to prevent bleeding and strokes [52].

In orthopedia, AI allows to calculate exact dimensions during hip joint replacement and creates a three-dimensional image, which allows for more successful operations [53]. In recent years, the emergence of new AI tools has made it possible to expand the scope of application in the medical field from diagnosis to treatment.

Discussion

Our literature search showed that the introduction of artificial intelligence into medicine helped solve many issues in the diagnosis of tumor processes, which allows doctors to quickly make a diagnosis and prescribe treatment using the data of a neural network that can take into account a large number of risks and calculate the result of treatment. AI can perform complex calculations and establish cause-and-effect relationships within a few hours [54].

AI enables personalized treatment of patients with the development of individual schemes taking into account the genetic characteristics of patients in the treatment of leukemia. Such patients require careful genome analysis to prescribe effective immunotherapy [55].

The use of AI was especially useful during the COVID-19 pandemic, when patients' lives depended on the speed of diagnosis and treatment, and minutes were counted. In 2023, a study was conducted on the use of artificial intelligence in medical practice [56]. The purpose of the study was to establish the degree of effectiveness of using artificial intelligence in the CT study of covid pneumonia caused by the Omicron strain. Even at the beginning of covid pneumonia in 2020, the CT method was recognized as the main research method [57]. In the conditions of a pandemic, it is necessary to quickly process patient data, as soon as possible to determine the drugs that are the drugs of choice for this disease, etc. To form a single base of CT images, which are required for systematic analysis of pathology, determination of the most frequent localization of lesions, etc., regular statistical reporting is required, which can be supported by algorithms of artificial intelligence [58].

A similar study using artificial intelligence was conducted in Korea to determine the outcome of tuberculosis treatment, as this disease is still considered unpredictable [44].The application of a neural network for the identification of digitized images is extremely important today, which helps the doctor make a diagnosis with minimal risk of error. Now, the neural network has accumulated such a number of digitized images with established diagnoses that it makes it possible to quickly diagnose and prescribe treatment. This is important, especially in urgent situations [59].

AI opens wide possibilities for application in surgery with the introduction of the da Vinci system, which can monitor the manipulations conducted by the surgeon during operations. The implementation of this system allows to avoid mistakes during operations and is also important for implementation in medical education to practice the surgeon's skills [60].

The use of AI in anaesthesiology helps to calculate the time of onset of anaesthesia, the time of exit, allows to calculate the risks of anesthesia [41].

It is worth noting that the flexibility of such systems also belongs to the advantages of using artificial intelligence, because they can adapt to new indicators, for example, the bispectral index indicator in anaesthesiology. The accuracy of prediction by artificial intelligence of the accumulation of the necessary concentration of the drug is also a significant advantage. This property can be helpful in planning an operation, calculating time, etc. A positive characteristic is also the ability of artificial intelligence to indicate the potentially best puncture site during spinal anesthesia [61]. Disadvantages may be mistakes made during the emergency care algorithm. As for the implementation of artificial intelligence methods in the primary healthcare sector, according to the results of certain studies, it can be stated that a large number of medical workers are sufficiently informed about the possibilities of artificial intelligence. The legal aspect remains problematic, as well as the feasibility of obtaining the patient's informed consent for the processing of personal data [62]. An absolute advantage of artificial intelligence from a scientific point of view can be considered its use during statistical research, as it performs the function of organizing data. AI allows scientists to look at the development of medicine in the perspective of future scientific research and identify key development strategies [40].

According to experts, the possibility of using AI in personalized medicine, i.e. treatment of a specific patient taking into account his genetic and individual characteristics, is currently being considered which is important for the treatment of cytogenetic diseases and the implementation of AI in genetic and molecular biology. [49].

The use of AI has also raised many questions, namely the question of ethics, which is connected with the possible publication of personal data of patients. It can also be noted that the neural network reproduces the information that was embedded regardless of whether it was erroneous or not, which can cause unwanted errors. The shortcomings of the use of artificial intelligence in ultrasound practice include the imperfection of the system when comparing the data obtained as a result of the ultrasound examination with those available in the database.

In recent years, AI has been expanding its scope and is widely used in all fields of medicine: diagnostics and treatment.

Conclusions and Implications

In view of all the above-mentioned studies, it can be concluded that artificial intelligence confidently occupies its niche in the field of health care. The advantages of using artificial intelligence are the high accuracy of diagnostic data, in particular in ultrasound studies. Due to the use of the capabilities of artificial intelligence, the performance of duties by ultrasound specialists is facilitated. The generated database of ultrasound images can be used by artificial intelligence programs as diagnostic standards. In addition, the ability of artificial intelligence to statistically calculate data is also an advantage, which is a key point in the diagnosis of emergency conditions in cardiology, since the prognosis for the patient depends on the accuracy of the diagnosis.

Declarations

Author Contributions

Conceptualization, Bashkirova, L. and Krasnova, A.; methodology, Kit, I. and Vasylyuk-Zaitseva, S.; software, Havryshchuk, Y.; validation, Krasnova, A., Vasylyuk-Zaitseva, S. and Bashkirova, L.; formal analysis, Krasnova, A. and Havryshchuk, Y.; investigation, Kit, I.; resources, Bashkirova, L. and Havryshchuk, Y.; data curation, Kit, I.; writing–original draft preparation, Vasylyuk-Zaitseva and Krasnova, A., S.; writing–review and editing, Kit, I.; visualization, Bashkirova, L.; supervision, Krasnova, A.; project administration, Kit, I., Havryshchuk, Y. and Vasylyuk-Zaitseva, S.; funding acquisition. All authors have read and agreed to the published version of the manuscript.

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