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Revolutionizing Health Care. The Impact of Emerging Technologies

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Abstract

Background and purpose. Medicine and health care sphere become more and more important due to quickness of life and getting older populacy. It cause the need of contact with medicine but as it is presented not only with medical staff. The purpose of this review article was to review and analyze the improvement and possibilities of Artificial Intelligence and offered tools in medical sphere.

Materials and methods. Data bases like gogle scholar, PubMed, Scopus and Web of Science were searched to find out possibly latest publications and examples of use of AI in medicine market. The research presented wide range of using AI tools, in some cases being substitute of human work.

Results. The research included over 50 world wide publication what showed the way of use AI in medicine industry and presented many innovative tools from artificial intelligence and robotics to telemedicine and wearable devices, the landscape of health care is being reshaped by cutting-edge technologies. These innovations are enhancing the quality of patient care, improving operational efficiency, and enabling breakthroughs in medical research.

Conclusion. The AI technology in medicine and health care can make all industry more efficient and effective in relations to improve human health. In future the technology based on Artificial Intelligence will substitute human in many tasks and should increase the human knowledge about health and make contact with medical industry more available

Keywords: artificial intelligence, health care, medical development

Introduction

Artificial Intelligence refers to the development of computer systems and software capable of performing tasks that typically require human intelligence. These tasks include learning, reasoning, problem-solving, perception, and language understanding. AI can be categorized into several types and is applied across a wide range of industries and applications. All these products are used by the sector of medicine what make a small revolution in rate and possibility of contact between medical informations, service and patient. Artificial Intelligence (AI) and machine learning (ML) are at the forefront of health care innovation. AI algorithms can analyze vast amounts of medical data to identify patterns and predict outcomes with remarkable accuracy. [1,2] For instance, AI-driven diagnostic tools are now capable of detecting diseases such as cancer and diabetic retinopathy earlier and more reliably than traditional methods. These technologies assist radiologists by highlighting areas of concern in medical images, thereby speeding up the diagnostic process and reducing human error. Machine learning models are also being used to personalize treatment plans [3,4]. By analyzing a patient's genetic information, lifestyle, and other health data, these models can predict how an individual might respond to different treatments, allowing for more precise and effective interventions. This approach, known as precision medicine, promises to revolutionize the way we treat complex diseases like cancer, by tailoring therapies to the unique characteristics of each patient. Artificial Intelligence (AI) is poised to significantly impact health care, offering a range of benefits that enhance diagnostic accuracy, streamline administrative tasks, personalize treatment plans, and improve patient outcomes [5,6]. Here are several ways AI can help in health care: AI algorithms can analyze medical images with high accuracy, identifying abnormalities that might be missed by human eyes. AI is used in radiology to detect tumors, fractures, and other conditions in X-rays, CT scans, MRIs, and mammograms. For example, AI tools can highlight suspicious areas in mammograms, aiding in the early detection of breast cancer. AI also assists pathologists by analyzing biopsy samples and identifying cancerous cells more quickly and accurately than traditional methods. Digital pathology, powered by AI, can reduce diagnostic errors and improve the efficiency of the diagnostic process.

Research Problem: Artificial Intelligence and its tools are one of most improving way in many industry zones, so that in medicine there are also many solutions based on Artificial Intelligence what can make the general health care more comfortable and available for people.

Research questions:

1. What are tools help in health care based on AI?
2. What is the future role of AI in medicine development?
3. How AI can improve knowledge about health and make contact with medicine staff more available?

In article took into consideration possibilites of using AI tools in health care e.g. data analyze, integrating informations and building a diagnostic model, NLP algorithms, chatbots, telemedicine, robots, wearable health devices, health apps and blockchains. All perform different tasks and may complement traditional systems of health care. In some parts even replace a human. The aim is to present chosen solutions and consider its useful.

In global use Artificial Intelligence can analyze genetic data to identify mutations and variations associated with specific diseases. By integrating this information with patient records, AI helps in developing personalized treatment plans tailored to an individual's genetic makeup. Machine learning models can predict how patients will respond to various treatments based on their genetic information, medical history, and other factors. This allows doctors to choose the most effective therapies and reduce trial-and-error approaches [7,8,9].

Huge role AI can play in diagnostic analyze. AI can analyze patterns in large datasets to predict disease outbreaks and epidemics. This can help health authorities take preventive measures and allocate resources more effectively. Predictive models can forecast patient outcomes, such as the likelihood of readmission or the risk of complications. Hospitals can use this information to implement targeted interventions and improve patient care [10,11,12,13,14].

AI-powered systems can automate routine administrative tasks, such as scheduling appointments, billing, and managing medical records. This reduces the administrative burden on health care staff, allowing them to focus more on patient care. NLP algorithms can process and interpret unstructured data from medical records, research papers, and clinical notes. This enables health care providers to quickly access relevant information and improve decision-making processes [15,16,17].

Incredibly helpful in health care can be a system named health assistant. AI-driven chatbots can handle initial patient inquiries, provide medical information, and assist with symptom checking. These virtual assistants help in triaging patients and directing them to the appropriate care, reducing the load on human staff [18]. In this topic telemedicine is included. AI enhances telemedicine by facilitating remote monitoring and consultations. For example, AI algorithms can analyze data from wearable devices and alert doctors to any significant changes in a patient's condition, enabling timely interventions. Telemedicine has become an integral part of modern health care, offering numerous benefits that improve access, efficiency, and quality of care. Here are several ways telemedicine can help in health care. It enables patients to consult with health care providers from anywhere, eliminating the need for travel. This is particularly beneficial for individuals living in rural or underserved areas where access to health care facilities may be limited. Patients can easily connect with specialists who may not be available locally. This broadens the range of expertise available to patients, ensuring they receive the best possible care [19,20,21,22,23].

Telemedicine can reduce waiting times for appointments, allowing patients to receive timely care. Virtual consultations can often be scheduled more quickly than in-person visits. **Also**, offers more flexible scheduling options, making it easier for patients to fit medical appointments into their busy lives without the need to take time off work or arrange childcare. Telemedicine facilitates ongoing monitoring and management of chronic conditions, such as diabetes, hypertension, and asthma [24,25,26,27]. Patients can regularly check in with their health care providers and adjust their treatment plans as needed. Post-surgical follow-ups and routine check-ins can be conducted via telemedicine, reducing the need for patients to return to the clinic for every follow-up appointment. Telemedicine platforms can provide patients with educational resources and support tools, helping them to better understand their conditions and treatment plans. This enhances patient engagement

and encourages adherence to prescribed therapies. Teletherapy and counseling services are readily accessible through telemedicine, providing essential mental health support to patients who might otherwise face barriers to accessing care. By eliminating the need for travel, telemedicine reduces transportation costs for patients. This is particularly significant for those who need frequent medical appointments [28,29,30,31,32]. Telemedicine can lower overall health care costs by reducing the need for in-person visits, hospital admissions, and emergency room visits. Remote monitoring can catch potential issues early, preventing complications and expensive treatments. Telemedicine allows for early intervention and timely management of health issues. Remote monitoring devices can alert health care providers to potential problems before they escalate, improving patient outcomes. It promotes preventive care by making it easier for patients to access routine screenings and check-ups. This proactive approach helps in identifying health issues early and managing them effectively. During infectious disease outbreaks, such as the COVID-19 pandemic, telemedicine helps in reducing the spread of infections by minimizing the need for patients to visit crowded health care facilities. Telemedicine can support public health initiatives by facilitating remote consultations for vaccination and screening programs, improving overall community health [33,34,35].

Other part of medical market is analyze vast datasets to identify potential drug candidates and predict their effectiveness. This accelerates the drug discovery process and reduces the time and cost involved in bringing new drugs to market. AI can optimize the design and execution of clinical [36,37,38].

Robotic technologies are making significant inroads into the health care sector. Surgical robots, like the da Vinci Surgical System, are enhancing the precision and control surgeons have during complex procedures. These robots provide minimally invasive options for surgeries, resulting in smaller incisions, less pain, and faster recovery times for patients [39,40,41,42].

Beyond the operating room, robots are being used for a variety of tasks, including dispensing medications, disinfecting hospital rooms, and assisting in physical rehabilitation. For example, robotic exoskeletons are helping patients with mobility impairments regain their ability to walk. These devices support and enhance the user's movements, providing both physical assistance and the necessary therapy to stimulate recovery [43,44,45].

Wearable health devices and mobile health applications are empowering individuals to take control of their own health. Devices such as smartwatches can monitor heart rate, activity levels, sleep patterns, and even detect irregularities like atrial fibrillation. These wearables provide users with real-time health data, encouraging healthier lifestyle choices and early detection of potential health issues [46,47,48,49].

Health apps complement these devices by offering a range of services, from fitness tracking to medication reminders and virtual consultations. Some apps are designed to support mental health, providing tools for stress management, cognitive-behavioral therapy, and even AI-driven chatbots for emotional support. The integration of wearables and health apps is creating a more proactive approach to health care, where prevention and early intervention are prioritized [50,51,52].

Blockchain technology is being explored for its potential to improve data security and interoperability in health care. With the increasing amount of health data being generated, ensuring the

privacy and security of this information is paramount. Blockchain offers a decentralized and tamper-proof way to store and share medical records, ensuring that only authorized parties have access to sensitive information [53,54,55]. Moreover, blockchain can facilitate better collaboration among health care providers by providing a secure and transparent platform for sharing patient data. This can lead to more coordinated and efficient care, as all members of a patient's care team have access to the same comprehensive information [56,57].

Conclusion

The integration of these technologies into health care is creating a more efficient, effective, and patient-centered system. As AI and machine learning enhance diagnostic accuracy and personalize treatments, telemedicine expands access to care, robotics improve surgical outcomes, wearable devices promote proactive health management, and blockchain secures patient data, the future of health care looks promising.

However, the successful implementation of these technologies requires addressing challenges such as data privacy, cybersecurity, and the need for robust regulatory frameworks. As the industry navigates these hurdles, the continued collaboration between technology developers, health care providers, and policymakers will be crucial in realizing the full potential of these innovations.

The ongoing revolution in health care technologies not only promises to improve patient outcomes but also to transform the very fabric of health care delivery, making it more accessible, personalized, and efficient than ever before.

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