The Impact of Artificial Intelligence on Healthcare

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Abstract

With the development of modern technology, artificial intelligence technology has made significant breakthroughs, bringing great impact to people's daily lives, including in the medical field. Meanwhile, with the continuous improvement of modern people's quality of life, health issues have become a major problem. Bad living habits such as overeating and staying up late have brought many health risks to our bodies. At the same time, heart disease, cancer, diabetes and other diseases have also deeply affected people's lives. Artificial intelligence technology can effectively treat and prevent diseases. Artificial intelligence technology can help doctors better analyze and treat patients' physical conditions, as well as help people better prevent diseases, reduce the likelihood of disease occurrence, and bring better quality of life to people, impact the healthcare. Therefore, the development of artificial intelligence technology has brought great help to human physical health. So we should constantly develop and improve AI technology. This study investigated the impact of artificial intelligence technology on healthcare quality, the impact on healthcare economy, and patients' concerns about the application of artificial intelligence technology in healthcare.

Keywords

Artificial intelligence, healthcare, impact.

1. Introduction

Artificial Intelligence (AI) refers to the design of computer programs and systems capable of performing tasks that require intelligence to participate, such as perceiving things, reasoning about situations, and making corresponding decisions. In the healthcare field, artificial intelligence can be used to analyze patient related data and generate results, such as generating medical records, conducting imaging studies, and producing laboratory results, to support clinical decision-making and improve patient prognosis. [1] This article will analyse the specific impact of artificial intelligence technology on the medical field. Because the healthcare era is value based and the healthcare industry holds a high share in the overall economy, evaluating and exploring its economic impact has become increasingly important. For example, the United States has a gross domestic product of $19.4 trillion (18%), of which approximately $3.5 trillion is healthcare spending, while Germany's gross domestic product is $3.7 trillion (11.5%), of which approximately $0.4 trillion is healthcare spending. Therefore, several studies have also analyzed the impact and changes in costs brought about by digital health applications. [2] The application of artificial intelligence technology in medicine first appeared in 1976, when algorithms were used to search for the cause of acute abdominal pain. Since then, diverse and multifaceted trends have emerged in the application of artificial intelligence technology in medicine. Including help in detecting diseases, such as diabetes retinopathy or skin cancer; Better classification of pathology, such as depicting electrocardiogram features or classifying scans; Predicting disease patterns and applying them in epidemiology, such as algorithms developed based on ML during COVID-19. [3] Although people are very excited and hopeful

about the emergence and development of these emerging technologies, the analysis of how artificial intelligence technology can be reliably applied in clinical practice is still immature. Importantly, so far there has been little exposure to and understanding of patients who will be impacted by the application of artificial intelligence in healthcare. This is not good news, as reducing patients' concerns about artificial intelligence technology is necessary to promote the promotion, dissemination, and application of these tools. Research on the application of non-medical artificial intelligence indicates that people tend to view non-medical AI technology in highly variable ways, which is closely related to public opinion, media promotion, and early experimental experience. The above viewpoint emphasizes the importance of patient involvement to better integrate these technologies into healthcare in a way that enhances people's trust and reduces concerns among some patients who believe this could lead to another 'AI winter'. [4] This study investigated the impact of artificial intelligence technology on healthcare quality, the impact on healthcare economy, and patients' concerns about the application of artificial intelligence technology in healthcare.

2. Literature Review

2.1. The impact of artificial intelligence technology on healthcare quality

Technologies related to artificial intelligence, such as magnetic resonance imaging (MRI), computed tomography (CT), and ultrasound, can accurately perform and complete repetitive, complex, and simple tasks compared to traditional methods, reducing medical errors in various aspects, lowering medical costs, and early diagnosis and intervention of serious situations. For example, an Israeli startup has designed algorithms related to artificial intelligence technology for diagnosing diseases such as osteoporosis, symptoms of cerebral hemorrhage, malignant tissue in mammography, and coronary artery aneurysms. The accuracy of these algorithms can be compared to or even more accurate than that of humans. These are examples of programs that reduce or even eliminate manual labor and time usage, and therefore also lower healthcare costs. According to a recent article in Newsweek, artificial intelligence technology has been proven to achieve 99% accuracy and is much faster than humans in analyzing and evaluating mammography images. Through this, we may be able to diagnose cancer faster and increase the cost of diagnosis. In today's era, most enterprises can make better decisions based on the ability to accurately and successfully utilize the potential of data itself. Many data collections in healthcare can be used for AI supported algorithms, and pattern based results can be checked through these algorithms to improve the time analysis of relevant decisions. Healthcare professionals are beginning to use artificial intelligence technology to propose solutions to corresponding conditions and predict related outcomes, which helps improve drug use based on patients' different situations at different times, thereby reducing long-term medical costs. Artificial intelligence can ensure tailored and appropriate treatment plans for each patient to enhance clinical decision-making and provide customized services. This move will bring significant improvements to the results and reduce the related costs of post-treatment issues, which is an important factor in the cost of most healthcare systems worldwide. [8] Artificial intelligence technology can improve healthcare efficiency, enhance patient diagnosis efficiency, and enhance healthcare personnel experience and patient safety through relevant channels; For example, artificial intelligence can be applied to remote monitoring to safeguard patients (such as remote medical care through devices), in order to provide timely and better treatment for patients at risk of deterioration. In the long run, we expect that clinics, hospitals, patients, and doctors will all be connected to a common digital infrastructure platform through corresponding devices for real-time diagnosis and treatment. An important AI application is to assist clinicians for image preparation and planning tasks for radiotherapy cancer treatment. [6] The study evaluated the predictive performance of a convolutional neural network (CNN)

in identifying diabetic retinopathy from fundus images. A dataset of 10,000 fundus images was utilized, consisting of 7,000 images for training, 1,500 for validation, and 1,500 for testing. The accuracy of the CNN model is 87%, precision is 84%, recall is 81%, and F1-score is 82% on the test set, demonstrating excellent performance in detecting diabetic retinopathy. The calculation of the area under the receiver operating characteristic curve (AUC-ROC) was at 0.92, indicating good discriminatory ability. [7] The development of artificial intelligence technology will drive the optimization of clinical testing and drug manufacturing. In summary, any combination of optimization processes in healthcare can be replaced by artificial intelligence. The recent announcements from DeepMind and AlphaFold have laid the foundation for better understanding the overall process of diseases, inferring protein structures, and developing more adaptive treatment methods. Medical personnel will use artificial intelligence technology to enhance their diagnostic and treatment services, enabling them to provide safer and more effective treatments at the top of their licenses; For example, clinical doctors can use technologies related to "artificial intelligence digital consultation" to examine patients' "digital twin" models (the true "digital and biomedical" versions of patients), allowing them to pre test the effectiveness of relevant drugs and develop the best treatment plan before treating real-life patients. Image segmentation is a very time-consuming task, and oncologists use relevant software to draw images in areas of interest. InnerEye open-source technology is based on artificial intelligence technology, which can shorten the preparation time for head and neck cancer and prostate cancer by 90%, representing a significant reduction in waiting time for life-saving radiation therapy. [6] In the health sector, technology plays an important role in minimizing errors caused by human negligence. [9] AI can reduce administrative burdens by automatically populating structured data areas from therapeutic notes, retrieving key data from past medical records, and collecting documented patient encounters. [10]

2.2. The impact of artificial intelligence technology on the healthcare economy

The United States is a leading country in cutting-edge medical technology and research, especially in the healthcare related industry. However, compared to the top ten countries, the United States has the highest healthcare expenditure (Canada, Germany, the United Kingdom, Australia, Japan, Denmark, France, the Netherlands, Switzerland, and Sweden). From 1960 to 2022, healthcare related expenditures in the United States increased from 5.0% of GDP to 17.9% ($3.5 trillion), with an average increase of $146 per person to $10739. About a quarter of healthcare related expenditures in the United States are wasted. The main reasons for healthcare expenditure errors include systemic deficiencies that can be corrected and eliminated, such as insufficient warning measures, inappropriate medical services, and overtreatment. This situation is more serious than imagined. Compared to this, systems based on artificial intelligence technology (AI) will greatly improve the efficiency of related aspects, thereby forming a more efficient and effective healthy ecosystem. The integration of artificial intelligence technology into healthcare has changed our perception of patient safety, hospital management, and the development and production of better drugs, allowing us to make corresponding medical decisions based solely on relevant data. Artificial intelligence technology can bring benefits to healthcare, especially in disease diagnosis and treatment of patients. [5]

2.3. Patients' concerns about the application of artificial intelligence technology in healthcare

The process of maintaining the security and confidentiality of patient related information is called medical privacy. It includes the security of medical situations and the confidentiality of communication between medical personnel. These can also refer to the privacy of patients with other patients and related providers in medical institutions. Including the degree of disclosure to insurance companies, employers, and other third parties. The Patient Care Management

System (PCMS) and Electronic Health Records (EHR) have privacy issues that should be balanced with medical errors and other aspects. [19] Consumer health education programs at all levels are needed to help patients gain a certain understanding of artificial intelligence technology and its privacy access. [11] Further upgrades and enhancements should be made to the information security system to prevent the leakage of patient data due to network intrusion or operational errors by medical institutions. [12] More accurate and secure models produce better outcomes while maintaining privacy. [13] Using diverse and representative datasets in the development and adjustment process is one of the most effective ways to mitigate bias in artificial intelligence. [14] With the continuous development of artificial intelligence research and the support and resources of the government, the application of artificial intelligence technology in healthcare is likely to grow greatly, and it has enormous potential in saving costs and improving medical quality. [15] More interdisciplinary research is needed to strengthen the connection between artificial intelligence and data quality management, as well as between artificial intelligence and ethical privacy in healthcare. [16]

3. Discussion

This argument explains how solutions can be proposed using artificial intelligence technology to save time and healthcare costs. In this task, we analyzed the cost and time of diagnosing and treating diseases. And our research explains the reasons and motivations why products related to artificial intelligence technology can obtain market regulatory approval. We have demonstrated that the addition of artificial intelligence technology reduces costs compared to some traditional methods. The cost reduction effect of artificial intelligence related technologies in treatment is more effective than the cost saving effect in diagnosis. The addition of artificial intelligence technology has reduced the time required for diagnosing and treating related illnesses compared to traditional methods. Higher precision diagnosis and treatment of diseases can be achieved in a shorter period of time. The use of artificial intelligence technology in disease diagnosis reduces subjectivity and bias, and lowers the likelihood of diagnostic errors. At the same time, patients have reduced their nervousness when seeing a doctor. Artificial intelligence technology will determine the most effective treatment plan for patients by retrieving data. Artificial intelligence technology can bring higher investment returns to enterprises and reduce implementation costs. The biggest challenge for artificial intelligence technology in healthcare is whether it can be recognized in clinical practice rather than the level of advancement of the technology itself. Artificial intelligence technology must be certified by relevant regulatory agencies, connected to EHR systems, standardized to similar product performance, taught to doctors how to use it, provided and paid for by public or commercial organizations, and continuously maintained and upgraded to gain more use and application. [8] The patients we asked expressed various concerns about this technology, which will have a certain impact on their views on the application of artificial intelligence technology in healthcare. Although they have also considered the positive impact of artificial intelligence technology on healthcare, to achieve this, it is necessary to strengthen supervision of the use of this technology to reduce its negative effects. Although participants understand that artificial intelligence technology can have a significant impact on healthcare, they are concerned about whether this technology will have negative effects on themselves or others. This survey has revealed a new aspect beyond time costs, which is the concerns of patients and their families about the implementation of this technology in healthcare. Participants hope to avoid negative impacts and request that doctors strengthen their supervision of the technology. Researchers and healthcare professionals must take this into consideration if they want to add artificial intelligence technology to healthcare. [4]

4. Conclusion

This study describes the impact of artificial intelligence technology in various aspects, providing us with a deeper understanding of AI technology. Artificial intelligence technology can bring better analysis and treatment to many diseases, help patients with better rehabilitation assistance, and solve many technical problems in the past. At the same time, many patients have doubts and anxieties about the application of this technology in healthcare. For example, they believe that this technology violates their privacy, doubt the authenticity of the results produced with the help of this technology, and are concerned about the ethical issues it may bring. Moreover, the development of this technology has also had a significant impact on the medical economy, which is reflected in medical costs and expenses. The development of artificial intelligence technology has to some extent reduced medical costs, but it has also brought greater challenges, such as how to correctly apply this technology in healthcare and how to maximize its effectiveness. Therefore, we should continue to develop and continuously improve this technology, so that it can play a role that better meets our requirements and make up for the shortcomings in today's medical field, bringing greater help to the rehabilitation of patients and the reduction of medical costs and expenses.

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