

Analysis of the Effects of Artificial Intelligence (AI) Technology on the Healthcare Sector: A Critical Examination of Both Perspectives

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ABSTRACT

In recent years, AI's impact has grown substantially, particularly in the medical industry. Its impact has been so far-reaching that it intends to establish itself as a cornerstone of the healthcare system of the future. We searched the PubMed database extensively for articles about artificial intelligence (AI) in healthcare and extracted the most pertinent data from those that met our criteria. Artificial intelligence (AI) is great at managing data, making accurate diagnoses quickly, and adapting to new situations, all of which may increase worker productivity. The Food and Drug Administration has steadily authorised more machine learning (ML) programs for usage by scientists and medical professionals in anticipation of this possibility. There are, however, a handful of contentious issues, including worries about clinical implementation, possible healthcare problems, and the likelihood of data breaches. This article explores the pros and cons of using AI in healthcare, and offers some suggestions on how to address the problems that may arise.

Keywords: Artificial Intelligence, Machine Learning, Healthcare, Health Services, Drug Design, Public Health

INTRODUCTION

Computer systems programmed with artificial intelligence (AI) can mimic human intelligence in many ways, including analysis, problem solving, and decision-making [1]. AI has come a long way from its 1950s introduction, when it had many limitations that prevented its widespread use in healthcare, to the state-of-the-art systems used in modern medicine the "rules" employed generally to progress into algorithms that are customised for each individual [2].

From the 1950s through the 1970s, when AI was still in its infancy in the medical field, the capacity to digitally record all patient information in EMRs and clinical informatics databases was the primary emphasis [2-5]. During this time, the field mostly ignored AI and its potential applications in medicine. In addition to contributing to the creation of modern search engines like PubMed, the mid-1970s saw the rise of biomedical search engines, which spread to schools like Rutgers and Stanford. This led to a better system of networking between universities for research collaboration, which in turn led to the first National Institutes of Health (NIH) workshop, marking the beginning of future collaboration events [6-9].

The first of many prototypes of how AI in medicine could positively impact the future started in the late 70s with the introduction of the consultation program Causal- Associational Network (CASNET). The program could use disease data, apply it to an individual, and give advice to the physician on how to help the patient manage the disease. Later, a bacterial pathogen and antibiotic treatment diagnostic AI developed from MYCIN to EMYCIN to INTERNIST-1 in just a few years [10-15]. The evolution of this system elaborated on the already extensive AI medical knowledge to help assist primary care physicians (PCPs). The AI program that prompted the most influence of AI in medicine was introduced in 1986-DXplain. PCPs were able to input their patient's symptoms, and the program responded with a diagnosis, along with a description of the disease and additional references for the physicians. The program started with 500 diseases and has now expanded to over 2400. The early 2000s introduced Watson, an open-domain question-answering system [16-19]. This system used the electronic medical record with other electronic resources to provide physicians with evidence-based solutions to their patients' questions. Watson was later expanded upon for the exploration of medical research into new areas. As a result, AI is starting to spread to other fields, such primary care clinics' patient intake and pharmacy.

Since its introduction in the 1950s, artificial intelligence (AI) systems have been advancing. Their usage has improved the quality of medicine by increasing efficiency, consistency, and accuracy. Artificial intelligence (AI) in healthcare has progressed over the past 50 years to provide individualised treatment, diagnosis, and prevention. This article explores the potential benefits and drawbacks of artificial intelligence as it pertains to the future of medicine [20-22].

METHODOLOGY

In order to gather relevant information, we conducted a thorough literature search in the PubMed database pertaining to artificial intelligence (AI) in healthcare. This search included topics such as AI history, its effects on healthcare settings (both positive and negative), drug development, screening for diseases, and treatment. This review focusses solely on literature produced in English [23-26]. We did not include articles that addressed the effects of AI on other sectors, such as the automobile, robotics, business, finance, etc.

APPLICATION OF AI TO MEDICAL CARE

The most well-known and widely accepted forms of evidence-based medicine utilised today are flowcharts and data-base research; however, artificial intelligence is also present in many other areas of contemporary healthcare, such as the online appointment scheduling service, drug interaction warnings when doctors prescribe multiple medications, and research development. In order to diagnose a patient and prescribe the best course of therapy, a doctor will review the patient's medical history, current symptoms, and test findings. Using its ability to access numerous databases simultaneously, an AI system can complete the same task much more quickly and accurately. This is just one example of how AI is revolutionising current medicine [27-29].

Online consultations and therapy, surgery, medical imaging, and gastroenterology are among the other medical fields that have adopted AI [30]. Radiology has taken the largest leap into AI technology with its first use in

image acquisition and storage, to now the use of computer-assisted diagnosis (CAD). AI is on its way to helping to decrease the workload on radiologists with quick identification of negative exams and heightened turn around time for abnormal ones. In 2017, Arterys was the first FDA-approved deep learning application of AI in healthcare [31]. Deep learning (DL) can be used to detect lesions, compose reports, and create differential diagnoses. The first product could analyse cardiac magnetic resonance images in seconds to measure ejection fraction, and since has evolved to liver, lung, chest, and musculoskeletal imaging, and noncontrast CAT scans. DL has since expanded more, with the ability to screen [32].

Additionally, CAD in gastroenterology has benefited from AI progress. Colonoscopies can benefit from AI by better identifying benign versus malignant polyps. Also, endoscopies have greatly benefited from AI's ability to differentiate between pancreatitis and pancreatic cancer, two conditions that were previously difficult to diagnose. The AI CAD system has been found to be useful for adenomas and polyps discrimination, imaging improvement, and creating prognosis and treatment prediction models for patients. Artificial intelligence has progressed from its initial usage in diagnostic procedures to its current use in assisting surgical operations. Urology and gynecology are pioneering the use of robotic arms as surgical instruments of the future. The surgeon's hands are replaced with robotic arms that can move more precisely and magnify more thoroughly [33].

More and more, primary care physicians are using AI into their patient care practices to facilitate online consultations, advising visits, medication renewals, test kit requests, and much more [34-39]. The use of artificial intelligence (AI) in primary care physician (PCP) visits is gradually making its way into therapy facilities, where patients can request to see a particular doctor based on their answers to a pre-visit questionnaire that covers basic questions about their health history and present symptoms [40]. AI therapy provides a patient-accessible online course to aid in the management of their

diagnosis. While AI has made great strides in the medical field, there is always potential for further development and application [41].

USING AI FOR PHARMACEUTICAL PRODUCT DEVELOPMENT

Artificial intelligence (AI) has recently shown promise in the pharmaceutical industry, particularly in the areas of drug delivery design and machine learning (ML) for drug absorption, distribution, metabolism, and excretion forecasting and deep learning (DL) for pharmacokinetic parameter prediction (e.g., drug absorption, bioavailability, clearance, volume of distribution, and half-life) algorithms can predict the toxicity and pharmacokinetics of potential drug candidates while simultaneously saving time and money. Pharmaceutical giants like Pfizer, Bayer, and Roche have hinted that AI could speed up decision-making and help them develop treatments for diseases like cardiovascular disease and immune-oncology [41-47]. AI could also aid in deciding which medications not to pursue, lowering the risk of bad decisions and research and development costs. In a related development, pharmacometrics is using AI to describe non-linear relationships using ML-based techniques. While this is still in its early stages, experimental results show that the trained network "was able to correctly predict the treatment effects across a certain range of dose levels." Put simply, the ML system can prescribe correct treatments up to a certain dosage. Artificial intelligence has the ability to revolutionise several areas of medicine, not only clinical instances [48].

THE POTENTIAL BENEFITS OF AI IN MEDICINE

When it comes to healthcare, AI offers a lot of good qualities. Cancer, neurological disorders, and cardiovascular illnesses are its main areas of use at the moment [49].

Furthermore, in the diagnosis of vraf murine sarcoma viral oncogene homolog B1 (BRAF) V600E mutation in colorectal carcinomas, the AI model used demonstrated a 93.8% diagnostic accuracy [50]. These results suggest that AI

models could provide doctors with the confidence they need to confidently move forward with a treatment plan, as early detection of NCP is crucial for transmission prevention and positive treatment outcomes. Similarly, the volume of information that doctors can process would be substantially enhanced by AI models. This accelerated process would shorten the time it takes to diagnose a patient and get them started on therapy sooner. Aside from helping doctors out, AI can also save nurses a tonne of time by handling paperwork and regulations. Nurses spend about a quarter of their shift on these tasks, which is time they could be spending with patients instead. Another benefit of AI in healthcare is its ability to adapt quickly to new situations [51]. The CDC reports that it takes around three to four weeks for a new case of food poisoning to be reported. However, an AI system may detect rare symptoms or bacterial strains far more quickly than a doctor or lab. This might be the difference between a manageable epidemic and a completely uncontrolled pandemic in the case of newly emerging diseases or outbreaks [52]. An Oxford University research found that AI could detect viruses by examining their fluorescent markers, demonstrating this kind of promise. This becomes clear in view of the SARS-CoV-2 pandemic, as a team of researchers created an AI system that correctly identified novel coronavirus pneumonia (NCP) with 92.49% accuracy, 94.93% sensitivity, and 91.13% specificity. Within 5 minutes, strains of respiratory viruses like the flu and COVID-19 were identified with >97% accuracy. If this technique had been available and used during the COVID-19 pandemic, maybe the damage would have been less severe [53-58].

POTENTIAL HARMFUL EFFECTS OF AI ON MEDICAL TREATMENT

Workplace tensions have been stoked by the discussion of using AI in healthcare. The goal of making AI a cornerstone of healthcare has prompted careful study of many challenges and downsides. Challenging issues include

patients' access to pertinent data, worries about clinical application, and ethical challenges involving AI [59-63].

It is arguable that the drawbacks of present AI capabilities exceed their advantages. The most widely used AI platform, ChatGPT, has been shown to be unreliable when it comes to the references used in medical articles. ChatGPT produced 30 brief medical papers, each with three references, and even worse results were discovered. Out of 115 references in those medical journals, 47% were false, 46% were real but wrong, and 7% were real but misinterpreted the data [60]

Electronic health records are widely used and have been the target of data breaches. If a thorough AI were to fill out these records, they could contain more sensitive patient information than if a healthcare professional had filled them out. This is the main ethical concern with AI in health services. There are legitimate privacy worries that this all-encompassing AI may be using quantitative data to predict health risks and concerns, which would provide bad actors with more knowledge about a patient's medical history [64-68].

Accountability for an AI's incorrect diagnosis is a concern beyond privacy. AIs are said to be more accurate than doctors when it comes to diagnosing arrhythmias. However, a study revealed that AIs involved in this process had an average F1 score of 0.84, which is much higher than the average cardiologist's 0.78.22 So, if a cardiologist were to rely on AI for a diagnosis when uncertain, they would be making the best decision they could at the moment. The problem is that if the AI makes a worse diagnosis and the patient gets worse, it will be difficult to hold the cardiologist accountable [69]. Furthermore, legal action regarding the error will be very difficult to implement because AIs cannot be held accountable in the same way that humans are. Prior to the effective use of AI in the diagnosis of critical health conditions, these concerns must be resolved. Possible solutions to these problems that aim to maximise justice, accountability, and openness include

building ethical governance, making models explainable and interpretable, and conducting ethical audits [70].

If healthcare providers wanted AI to learn relevant patient data and how to manage healthcare databases, the AI would naturally need relevant data accessibility. Since ML, a process that allows AI to learn without direct instruction, requires a large quantity of data sets to work efficiently, AI needs both large quantities of data and relevant data accessibility to operate its functions. Availability of sensitive patient data that companies are reluctant to provide because of privacy concerns. This is particularly important in the event of a data breach, when hackers may attempt to access sensitive patient information. Studies have demonstrated that even a little leak of information may threaten the privacy of patients, leading to significant security issues for both the organisation and the patient [71].

There are a lot of questions regarding the practical application of AI in healthcare. As seen in movies and science fiction, people are worried that artificial intelligence and robots would take their employment. This happened during the Industrial Revolution and might happen again. Even while this makes human office employment obsolete in terms of efficiency, computers and AI will always be ahead of the curve because of how fast they analyse data. On top of that, mistakes won't happen since humans can't make them. While this may not always be the case owing to inflated expectations, it's still a stigma that might stir up trouble at work [72].

Massive human and social biases may exist, according to the available information. While the algorithm itself was not at fault, social disparities in the underlying data [73-80]. This might result in the selection of one race or kind of person over another based on superficial characteristics like skin colour or country of birth. Such bias is not completely out of the question given that AI will be acquiring new skills by analysing historical data and systems [81].

METHODS TO ESTABLISH AI AS A FOUNDATIONAL ELEMENTS OF MEDICAL CARE

Unfortunately, AI has run into a number of problems that are preventing it from becoming a solid foundation in the healthcare system. In the future, we will face challenges like relevant data accessibility, clinical implementation concerns, and ethical dilemmas [82]. One solution to these issues is to limit AI implementation to participants who are willing to share their health information with ML systems, which could keep data privacy intact. More strict data security regulations are also needed to keep data private, such as by improving client-side data encryption and using federated learning to train models without sharing data. This will help alleviate ethical concerns about AI in healthcare and provide AI with experience processing healthcare data. There are a number of other ethical considerations in regard to AI. Poor decision-making makes it hard to hold anybody responsible. To improve AI systems that are designed with humans in mind, it is recommended that regulations be strictly enforced, audits be conducted on a regular basis, and that systems be validated. Patients must be informed when AI is processing their information and must give their full consent for their information to be used for machine learning [83]. Over time, as AI enhances healthcare data processing, it's possible that fewer mistakes will be made than by humans. Another concern is the possibility of bias towards AI systems, where individuals may start to rely too much on machines and stop making personal decisions [84]. To address this, it is important to train healthcare professionals and other associated staff to properly handle AI equipment for accurate disease screening and treatment. AI education should be designed in a way that healthcare workers can understand, while still leaving room for personal decisions. AI has the potential to increase workforce efficiency by processing information, freeing up healthcare professionals to focus on vital tasks [85-90].

CONCLUSION

It appears that AI does have an effect on healthcare settings based on what is known so far. Some potential applications of AI in healthcare include assisting doctors with rapid and accurate diagnosis and the development of appropriate treatment plans; decreasing patient wait times; streamlining administrative tasks for nurses; and guaranteeing compliance with regulatory standards. When considering AI for employment, it is important to weigh the potential advantages against any potential drawbacks, especially in the healthcare industry. In order to address the drawbacks of AI, it is necessary to resolve issues related to data accessibility, data privacy, ChatGPT authenticity, accountability, and health associate training.

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