



## Role of Artificial Intelligence in Health Care: Are We Ready?

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Roomba. Self-driving cars. Spotify. Although these are all seemingly different entities from one another, they all have at least one thing in common. They use artificial intelligence (AI) and related technologies to complete tasks and simplify the user experience. As AI continues to gain prominence in modern-day computing systems, companies that offer consumer products or services have started to implement these technologies into their final products and workflows. The healthcare industry is also beginning to adopt these technologies as they offer improvements to aspects of patient care, research applications, and administrative processes. So, what exactly is artificial intelligence and what benefits does it confer to healthcare?

Oxford defines "AI as the theory and development of computer systems able to perform tasks that normally require human intelligence, such as visual perception, speech recognition, decision-making, and translation between languages". In other words, computers can conclude and adjust actions from data sets without user input. Currently, AI is composed of many different technologies that vary in the processes and tasks they support, such as machine learning, natural language processing, rule-based systems, physical robots, and robotic process automation [1]. However, as time progresses, these technologies are increasingly being combined and integrated.

One of the earliest focuses of AI technology in the healthcare industry is the diagnosis and treatment of disease. In fact, in the 1970s and early backward chaining system that used AI, in the form of a rule-based system, expert systems based on collections of 'if-then' rules, was developed to identify bacteria causing severe infections [2]. Rule-based systems are still widely used in current EHR (electronic health record) systems, however, EHR vendors

are slowly adding more AI capabilities [3,4]. Through the use of machine learning, a form of robotic learning in which models are trained with data, many tech firms and startups are creating systems that are claimed to have the accuracy that rivals a human clinician. Machine learning models have been designed for cancer diagnosis and treatment [5], systems to warn clinicians of high-risk conditions, predicting population health metrics, and treatment recommendations based on individual genetic profiles [6]. However, integrating these systems into clinical workflows presents various challenges including medical ethics and patient/provider relationships.

AI systems can help improve patient engagement and adherence to treatment plans by personalizing and contextualizing care. Research has shown that patients that proactively participate in their care are more likely to have good health outcomes [7]. AI systems have the potential to encourage participation, through the use of targeted content, and reduce patient non-compliance - when a patient does not follow a treatment plan as recommended. This will further enable care to be continuous even when the patient has left the doctor's office.

Administrative processes can be made vastly efficient through the use of AI, allowing healthcare workers to spend more time with their patients and maximizing workflows [8]. RPA (robotic process automation), can be used to automate functions such as admissions and billings, thereby eliminating repetitive tasks [9]. Natural language processing can automate administrative documentation workflows, by creating transcripts and patient-case summaries. Additionally, machine learning can be used for matching data across different databases to increase the efficiency and accuracy of processing claims. The center for American Progress reported

that 13% of physician-care spending and 8.5% of hospital-care spending are comprised of billing and insurance-related costs [10]. RPA can reduce the turnaround time for routine claims and eliminate a substantial amount of repetitive tasks, while also reducing these costs [9].

The use of AI in healthcare presents several unique challenges. Healthcare decisions have been made exclusively by humans in the history of medicine. The use of smart machines in healthcare to make critical decisions raises issues of accountability, transparency, permission, and privacy [11]. In the event of an error made by an AI system inpatient diagnosis and treatment, it may be difficult to establish accountability for them. This is further complicated by algorithmic bias that some machine learning models are subject to and may predict a greater likelihood of disease based on noncausal factors. Transparency is a challenge because many AI algorithms are very difficult to interpret or explain. Other ethical issues will likely arise when this technology is further implemented in the field. Therefore, it is imperative that healthcare institutions, government, and regulatory bodies effectively monitor issues to address them on time and reduce negative implications.

It is almost certain that AI and related systems will have an important role to play in healthcare. Not only does it offer efficiency in completing tasks, but it also offers predictive models, automation and other functions to benefit all parties involved in healthcare, from patients/providers to administration/insurers. The greatest challenge this new technology faces its integration into clinical practice. Although the technology may be capable enough to be useful, it also needs to be intuitive enough so that it does not hinder workflow or patient/provider interactions. Widespread adoption necessitates AI systems to be standardized, appropriately regulated, integrated with EHR systems, taught to clinicians, updated over time, and secure from hacking and other outside influence. Strides have already been made in the area of retinal scan, scoring of polysomnographic data, radiological image interpretation to name a few. The challenges as it pertains to AI will eventually be overcome and the technology will only improve as implementation efforts are completed. AI is a revolutionary step in the future of medicine if we like it or not. AI is here to stay. It is up to physicians how it embraces AI and works in conjunction to find a happy medium where the AI algorithm can serve the patients and the healthcare industry, rather than in confrontation with them.

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