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## **Artificial intelligence in Healthcare**

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# INTRODUCTION

## **What Is AI in Healthcare?**

AI in healthcare is an umbrella term to describe the application of machine learning (ML) algorithms and other cognitive technologies in medical settings. In the simplest sense, AI is when computers and other machines mimic human cognition, and are capable of learning, thinking, and making decisions or taking actions. AI in healthcare, then, is the use of machines to analyze and act on medical data, usually to predict a particular outcome.

A significant AI use case in healthcare is the use of ML and other cognitive disciplines for medical diagnosis purposes. Using patient data and other information, AI can help doctors and medical providers deliver more accurate diagnoses and treatment plans. Also, AI can help make healthcare more predictive and proactive by analyzing big data to develop improved preventive care recommendations for patients.

Artificial intelligence (AI) technologies becoming ever-present in modern business and everyday life and are also steadily being applied to healthcare. The use of artificial intelligence in healthcare has the potential to assist healthcare providers in many aspects of patient care and administrative processes, helping them improve upon existing solutions and overcome challenges faster. Most AI and healthcare technologies have strong relevance to the healthcare field, but the tactics they support can vary significantly between hospitals and other healthcare organizations. And while some articles on artificial intelligence in healthcare suggest that the use of artificial intelligence in healthcare can

perform just as well or better than humans at certain procedures, such as diagnosing disease, it will be a significant number of years before AI in healthcare replaces humans for a broad range of medical tasks. But for many, it is still unclear. Starting from its benefit and what it will look like in the future.

These are a few of the different types of artificial intelligence and healthcare industry benefits that can be derived from their use.

## **Machine Learning**

Machine learning is one of the most common forms of artificial intelligence in healthcare. It is a broad technique at the core of many approaches to AI and healthcare technology and there are many versions of it.

Using artificial intelligence in healthcare, the most widespread utilization of traditional machine learning is precision medicine. Being able to predict what treatment procedures are likely to be successful with patients based on their make-up and the treatment framework is a huge leap forward for many healthcare organizations. The majority of AI technology in healthcare that uses machine learning and precision medicine applications requires data for training, for which the result is known. This is known as supervised learning.

## **Natural Language Processing**

Artificial intelligence in healthcare that uses deep learning is also used for speech recognition in the form of natural language processing (NLP). Making sense of human language has been a goal of artificial intelligence and healthcare technology for over 50

years. Most NLP systems include forms of speech recognition or text analysis and then translation. A common use of artificial intelligence in healthcare involves NLP applications that can understand and classify clinical documentation. NLP systems can analyze unstructured clinical notes on patients, giving incredible insight into understanding quality, improving methods, and better results for patients.

### **Rule-based Expert Systems**

Expert systems based on variations of ‘if-then’ rules were the prevalent technology for AI in healthcare in the 80s and later periods. The use of artificial intelligence in healthcare is widely used for clinical decision support to this day. Many electronic health record systems (EHRs) currently make available a set of rules with their software offerings.

Expert systems usually entail human experts and engineers to build an extensive series of rules in a certain knowledge area. They function well up to a point and are easy to follow and process. But as the number of rules grows too large, usually exceeding several thousand, the rules can begin to conflict with each other and fall apart. Also, if the knowledge area changes in a significant way, changing the rules can be burdensome and laborious. Machine learning in healthcare is slowly replacing rule-based systems with approaches based on interpreting data using proprietary medical algorithms.

### **Diagnosis and Treatment Applications**

Diagnosis and treatment of disease have been at the core of artificial intelligence AI in healthcare for the last 50 years. Early rule-based systems had the potential to accurately diagnose and treat disease but were not accepted for clinical practice. They were not

significantly better at diagnosing than humans, and the integration was less than ideal with clinician workflows and health record systems.

But whether rules-based or algorithmic, using artificial intelligence in healthcare for diagnosis and treatment plans can often be difficult to marry with clinical workflows and EHR systems. Integration issues have been a greater barrier to the widespread adoption of AI in healthcare when compared to the accuracy of suggestions. Much of the AI and healthcare capabilities for diagnosis and treatment from medical software vendors are standalone and address only a certain area of care. Some EHR software vendors are beginning to build limited healthcare analytics functions with AI into their product offerings, but are in the elementary stages. To take full advantage of the use of artificial intelligence in healthcare using a stand-alone EHR system providers will either have to undertake substantial integration projects themselves or leverage the capabilities of third-party vendors that have AI capabilities and can integrate with their HER.

### **Administrative Applications**

There are several administrative applications for artificial intelligence in healthcare. The use of artificial intelligence in hospital settings is somewhat less game-changing in this area as compared to patient care. But artificial intelligence in hospital administrative areas can provide substantial efficiencies. AI in healthcare can be used for a variety of applications, including claims processing, clinical documentation, revenue cycle management, and medical records management.

Another use of artificial intelligence in healthcare applicable to claims and payment administration is machine learning, which can be used for pairing data across different

databases. Insurers and providers must verify whether the millions of claims submitted daily are correct. Identifying and correcting coding issues and incorrect claims saves all parties time, money, and resources.

### **Why Does AI in Healthcare Matter?**

Healthcare is one of the most critical sectors in the broader landscape of big data because of its fundamental role in a productive, thriving society. The application of AI to healthcare data can be a matter of life and death. AI can assist doctors, nurses, and other healthcare workers in their daily work. AI in healthcare can enhance preventive care and quality of life, produce more accurate diagnoses and treatment plans and lead to better patient outcomes overall. AI can also predict and track the spread of infectious diseases by analyzing data from government, healthcare, and other sources. As a result, AI can play a crucial role in global public health as a tool for combatting epidemics and pandemics.

## **Advantages and Disadvantages**

### **What are the pros of AI use?**

Due to the advent of AI in medicine, there has been quite a list of benefits that this has garnered both professionals, businesses, and patients. AI has created a vastly easier environment for healthcare professionals to get things done.

### ***Real-Time Access to Information***

One of the strongest suits of AI in healthcare is its ability to deliver data in real-time. This allows faster diagnosis based on results, which ultimately contributes greatly towards the recovery or treatment plan of patients. By lowering patient waiting time, clinical decisions are better made. Additionally, with the integration of mobile apps, patient-doctor relationships become better as well. Through mobile alerts, medical professionals can also get real-time updates on the status, emergencies, and changes that might have been encountered by the patient.

### ***Streamlining Tasks***

From setting appointments, translating clinical information, and transferring and tracking patient records and medical histories, AI in healthcare has greatly aided in streamlining tasks. With advanced algorithms, some can even spot important markers visually in radiation technology, which speeds up the process of immense analysis.

### ***Cost-Efficient and Resourceful***

As AI replaces tedious human tasks with advanced algorithms, the expenses of hospitals can be reduced by a big fraction. Some AI can also assist in reviewing cases to help in analyzing what is necessary for the hospital.

### ***Research Ability***

More than just providing real-time data, AI can also integrate other sources of information based on research that can be of great use for analyzing diseases. More so, information gathered within the hospital also becomes part of the bigger pool of advanced research for further studies on the disease.

## **What are the Cons of AI use?**

AI in healthcare has marked how technology can also give back to those in the hard sciences, such as medicine. However, it is not a perfect algorithm or system, especially when the entire humanity in healthcare is being considered. Here are some of the down sides of AI in healthcare:

### ***Requires Human Oversight***

Because AI is not perfect, running them will still require human oversight and surveillance. Robotic technologies that aid in surgeries, for example, have no sense of empathy and will operate merely on their program. Data suggested and presented by AI will still need a human doctor who still has the final decision to make whether to dismiss it or to follow through with it, depending on the case of each specific patient he/she has.

### ***Might Create Social Biases***

AI in healthcare functions on algorithms that may find it most convenient to the majority (i.e. nearest possible clinic or hospital for a patient). However, this doesn't take into account any socioeconomic background of a patient and whether the patient feels comfortable going to the said suggested facility produced by AI. Certain compatibility issues also arise when it comes to specific mobile platforms and devices, which doesn't take into account what all are capable of having. More so, AI makes use of available data to help in diagnosis. When this data isn't available, it can create a faulty diagnosis.



### ***Might Replace Human Employees***

As mentioned before, because AI can do most of the menial and tedious human labor in healthcare, there is a risk of possibly no longer needing specific employees within the hospital as their jobs can be replaced by AI. This presents an ethical issue that is still being discussed today. Indeed, there are redundant jobs within healthcare that can already be fixed by AI; however, this doesn't seem to be the end-all and be-all of human progress and development.

### ***Possible Security Risks***

The other most obvious and direct weakness of AI in healthcare is that it can bring about a security breach with data privacy. Because it grows and is developed based on information gathered, it also is susceptible to data collected being abused and taken by the wrong hands. What might originally be cost-efficient might just take up added costs to increase data security for the hospitals invested in AI. Cyber-attacks can also be a greater threat in manipulating and possibly giving an erroneous diagnosis.

## **Challenges to implementing AI in healthcare**

**The key challenges to successful AI implementation in the healthcare practice are as follows:**

- 1- Ethical & Legal Issues for Data Sharing
- 2- Training Healthcare Practitioners and Patients to Operate Complex AI Models
- 3- Managing Strategic Change to Put AI Innovations into Practice

## **1- Ethical & legal Issues Hindering Access to High-Quality Datasets for AI Developers**

Whether integrating **artificial intelligence in medical imaging** or employing deep learning technology to maneuver clinical diagnostic procedures, high-quality healthcare datasets are the key to success. As we tend to figure out the critical roadblocks to developing AI models for healthcare, it's been found that ethical and legal issues have so far been the biggest hurdle to developing AI-powered machine learning models.

Since patients' health information is protected by law as private and confidential, healthcare providers must comply with strict privacy and data security policies. However, it keeps healthcare practitioners under the ethical & legal obligation not to provide their data to any third party. Consequently, it hinders AI developers from accessing high-quality datasets to develop AI training data for healthcare machine learning models.

In addition to ambiguities in existing laws and challenges associated with sharing data between organizations, healthcare leaders also identified external conditions and circumstances as challenges. As a result of these challenges, uncertainties arose concerning responsibilities concerning the design and implementation of AI systems and what is permissible, resulting in legal and ethical concerns.

## **2- Training Healthcare Practitioners and Patients to Use Complex AI Models**

Incorporating AI systems could improve healthcare efficiency without compromising quality, and this way, patients could receive better and more personalized care. Investigations, assessments, and treatments can be simplified and improved by using AI systems that are smart and efficient. However, implementing AI in healthcare is challenging because it needs to be user-friendly and procure value for patients and healthcare professionals.

AI systems are expected to be easy to use and user-friendly, self-instructing, and not require extensive prior knowledge or training. Besides being simple to use, AI systems should also be time-saving and never demand different digital operative systems to function. For healthcare practitioners to efficiently operate AI-powered machines and applications, AI models must be simple in terms of their features and functionality.

## **The future outlook for AI**

The best opportunities for AI in healthcare over the next few years are hybrid models, where clinicians are supported in diagnosis, treatment planning, and identifying risk factors, but retain ultimate responsibility for the patient's care. This will result in faster adoption by healthcare providers by mitigating perceived risk and starting to deliver measurable improvements in patient outcomes and operational efficiency at scale.

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