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WHITE PAPER

AI, But Make It Clinical: The Perils and the Promise of Machine Learning in Healthcare

Enthusiasm about the value of AI is tempered by concerns about safety, but the industry is moving forward with guardrails and a concentration on narrowly focused clinical applications.

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Introduction

Artificial intelligence (AI) is the hot new thing, but it's not actually new at all.

Alan Turing coined the term "artificial intelligence" in 1950 in his groundbreaking paper, "Computing Machinery and Intelligence." This work introduced the Turing Test, a benchmark for evaluating a machine's ability to exhibit intelligent behavior equivalent to or indistinguishable from that of a human.

In simple terms, AI refers to a computer performing tasks that typically require human intelligence. This can range from basic arithmetic to geometry, algebra, number theory, and calculus.

Using these kinds of complex mathematical formulas, AI excels at making assumptions based on the data it has. Until recently, one of the most well-known applications of AI in everyday life was the recommendation algorithm. For instance, Netflix could suggest movies based on your viewing history, or Spotify could create playlists based on your listening habits. In simple mathematical terms, if you like X and Y, then you'll probably also like Z.

The AI landscape changed dramatically in November 2022 when OpenAI crashed the party with its introduction of ChatGPT. Almost overnight, AI went from being a background function to a front-and-center phenomenon, with industries across the board rushing to leverage its potential. Algorithms that previously gave recommendations were now being used to generate volumes of text. Since then, large language models (LLMs) have been enhancing efficiency and accessibility in various fields, including commerce, academia, the legal sector, and finance.

The outcomes have been exciting and sometimes perplexing—even occasionally alarming. ChatGPT works best in applications where precision is less critical, such as in customer service. Chatbots can generate responses to questions, and the answers even sound like something a human would say. When it is wrong, a customer might get frustrated, but the consequences are amorphous and hard to measure.

However, in high-stakes situations, such as healthcare—where the difference between right and wrong can be a matter of life and death—AI's unpredictability poses real challenges. In these contexts, AI's reliability and accuracy are paramount. The ability of an LLM to understand natural language when interpreting a patient's chart is valuable, but if it is not closely managed, AI can give answers that are partially or even wholly fabricated—and that is extremely dangerous.

The Perils

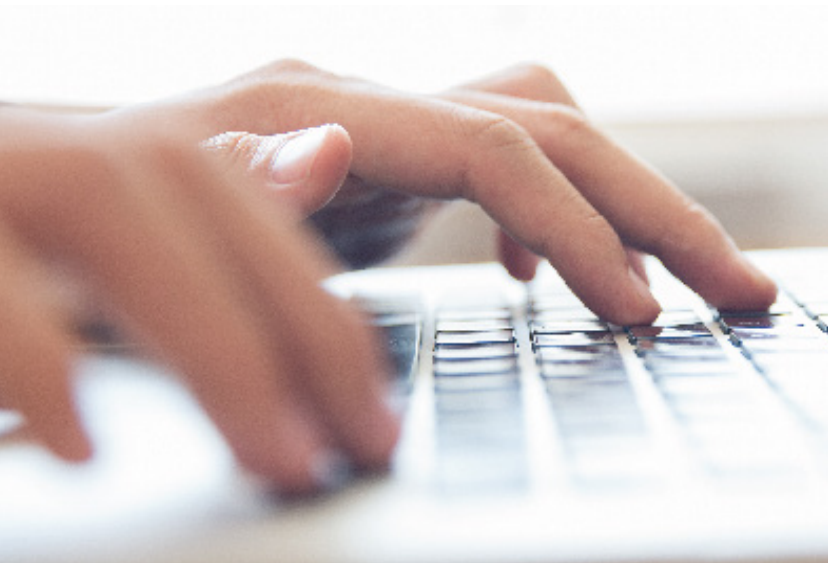
The risks of using AI without appropriate oversight are highlighted by a study in Cryptopolitan that found limitations in the accuracy of drug information provided by generative AI models, which often produce plausible-sounding but incorrect information, threatening patient safety.[1]

Another study, published in the British Journal of Clinical Pharmacology, evaluated ChatGPT's performance in various domains of clinical pharmacy practice. While ChatGPT was pretty good in drug counseling (scoring 8.77 vs. pharmacists' 9.50), it was notably weaker in prescription review, patient medication education, adverse drug reaction (ADR) recognition, and ADR causality assessment.[2]

Colin Banas, M.D., M.H.A., Chief Medical Officer at DrFirst, says without medicine-specific datasets and the ability to handle advanced reasoning and complex instructions, ChatGPT can only serve as a supplementary tool in clinical pharmacy settings.

But the AI tools being used with great success for medication management are very different from OpenAI, he added.

"It's important to remember that not all AI is ChatGPT," says Dr. Banas, who served as the Chief Information Officer at Virginia Commonwealth University Health System before joining DrFirst. "AI comes in many flavors."



"It's important to remember that not all AI is ChatGPT."

In healthcare, AI trained on a curated set of data is going to be safer and more useful than an off-the-shelf large language model. "It's broad- versus narrow-focus AI," Dr. Banas said. "The current effective models of AI applied in patient care are laser-focused on a particular problem and trained specifically to solve that problem."

Concerns about generalized AI are stoked by stories about hallucinations, which happen when an LLM perceives nonexistent patterns or objects, resulting in nonsensical, inaccurate, and humorous outputs. A Microsoft travel article once listed a local food bank in Ottawa, Canada, as a "tourist hot spot" and encouraged people to show up with an "empty stomach."[3] The consequences for this and other similar mistakes were weakened trust and embarrassment, which is not great but also not serious.

In healthcare, and particularly when it comes to accurate drug information, the stakes are significantly higher. Prescription drug interactions or allergic reactions to certain medications can be very serious.

The Promise

So why is the healthcare industry embracing AI instead of running from it? Because it has the potential to solve a few very big problems:

Accelerated Spending

Worsening Outcomes

Provider Burnout

The United States spends nearly 18% of its GDP on healthcare but has the lowest life expectancy among high-income countries and the highest rates of avoidable deaths. Plus, Americans die younger and are less healthy than residents of other high-income countries.[4]

So healthcare, which has been struggling financially for some time and is now dealing with the after-effects of the COVID-19 pandemic, is particularly ripe for an "AI assist." And by all accounts, that's what it is—an assist. While robot doctors in white coats would make an interesting visual, nobody's suggesting that AI replace healthcare providers.

Doctors, nurses, pharmacists, and other clinicians are burning out at unprecedented rates. The pandemic obviously had a big effect on this, too, but the expanded adoption of electronic health record (EHR) systems and other health technologies for patient charting was when burnout really started to become a problem. In 2017, the Meaningful Use program from the Centers for Medicare & Medicaid Services (CMS) put financial pressure on provider organizations to use EHRs, levying fines if these stringent requirements were not followed:[5]

- Health information had to be electronically captured in a structured format.
- The information had to keep track of key clinical conditions and be communicated for care coordination purposes.
- Clinical decision support tools had to be implemented to facilitate disease and medication management.
- EHRs had to be leveraged to engage patients and families.
- Clinical quality measures and public health information had to be reported.

EHR systems were intended to streamline patient data management for improved care coordination and make it easier for providers to do their jobs, but they brought unintended consequences.

First, they paradoxically increased workload due to data entry requirements and diverted physician focus away from patients and toward IT. When providers are looking at the keyboard and computer screen instead of the person sitting in front of them during appointment, it disrupts the doctor-patient relationship. It can make the practice of medicine feel impersonal and leave providers and patients alike disenchanted.

There is also the issue of "pajama time," a term that signifies the fact that providers spend as much as 15 hours a week working on administrative tasks after normal business hours, according to a study commissioned by athenahealth.[6]

Second, because there is little regulation regarding the structure and nomenclature of the created data, EHRs generally struggle to intelligently import and understand data generated by a different system. This wouldn't matter if people didn't move across town or across the country, get injured while traveling, change insurance providers, or see various specialists. But they do, and so the chances that your medical record is going to arrive wherever you happen to be are very small.

Although interoperability between systems has improved, and retrieving a patient's medical history and list of medications is getting easier, it still poses some challenges due to proprietary health technologies that are not connected. Healthcare is still lacking in semantic interoperability—the ability of computer systems to exchange data with unambiguous, shared meaning.

AI to the Rescue

With 90% of doctors in the U.S. struggling with overwhelming administrative workloads, burnout, and staffing shortages, 83% said they believe AI could eventually help alleviate some of these problems.[7]

"In order for physicians to fully benefit from technology as a care enhancement tool, they need to experience more advantages and fewer added complexities or burdens," said Dr. Nele Jessel, Chief Medical Officer of athenahealth. "If we get this right, we'll be using the technology to reduce administrative work and increase efficiencies in ways that allow physicians to refocus on their patients."[7]

A study published in the National Library of Medicine revealed that while 60% of clinicians are optimistic about AI's potential, 70% think strict regulations are necessary to ensure safety and effectiveness.[8] Recommendations include calls for transparency as to how the AI was trained, and what datasets and patient populations were used, to help clinicians understand whether the model is appropriate for the patient in front of them.

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With guidelines in place, physicians can worry less and instead concentrate on the potential upsides of AI. Physicians are getting there, according to the American Medical Association (AMA), which found:[9]

69%

of physicians think AI would enhance workflow efficiency on busy days

72%

believe AI could aid in better diagnosing

61%

hope AI might help improve clinical outcomes

AI is already making inroads in healthcare, with 38% of physicians reporting that they are already employing AI. Enthusiasm is high for administrative tasks such as documentation of billing codes, medical charts, or visit notes (54%); automation of insurance prior authorization (48%); and creation of discharge instructions, care plans, or progress notes (43%).[9]

"Physicians are optimistic about the advantages that properly designed AI-enabled tools can have for patient care, and nearly two-thirds of physicians see an advantage to AI if key requirements are met," AMA President Dr. Jesse Ehrenfeld said. "The AMA survey illustrates that physicians' greatest hope for AI rests in reducing the crushing administrative burdens that plague modern medicine, which drain healthcare resources and pull physicians away from patient care."[9]

Patient perspectives on AI in healthcare present a more varied picture.

A survey by Yale Medicine found that while some patients appreciate the potential for better diagnostic accuracy and personalized treatment plans, many express concerns about data privacy and the loss of human touch in their care.[6] Most respondents said they were very concerned or somewhat concerned about AI's unintended consequences, including misdiagnosis (92%), privacy breaches (71%), less time with clinicians (70%), and higher costs (68%).[10]

Pew Research reports that 60% of Americans would feel uncomfortable with their healthcare provider relying on AI for their care, highlighting the need for transparent communication and reassurance about AI's role and safety.[11]

Cost Savings and ROI

Whatever qualms physicians and patients alike may have about AI, in a country where healthcare costs are a recognized problem, the industry can't ignore the fact that its use promises to bring efficiency gains and cost savings.

A comprehensive analysis by Accenture estimated that key clinical AI applications could create $150 billion in annual savings for the U.S. healthcare economy by 2026.[12] These savings come from various sources, including better clinical outcomes, fewer medication errors, and more efficient management of chronic diseases.

By reducing manual data entry and minimizing errors, healthcare organizations can lower operational costs and redirect resources to more critical areas of patient care. In medication management, enhanced processes and safety checks can reduce adverse drug events and lower healthcare costs associated with complications and extended hospital stays.

The return on investment for AI in healthcare can be substantial. According to CIO.com, while the initial implementation costs of AI are sometimes high, the long-term savings from improved efficiency, reduced errors, and better patient outcomes can more than offset these expenses.[13]

Successful AI integration can result in operational savings, increased patient throughput, and reduced readmission rates, contributing to a positive ROI. In addition, health systems using AI to optimize medication management report reductions in the time clinicians spend on administrative tasks, including prior authorization. This allows them to focus more on direct patient care, which can lessen burnout and reduce expensive staff turnover.

The use of AI in medication management also helps with better resource allocation. By automating routine tasks and ensuring accurate medication histories, healthcare providers can streamline workflows and reduce the need for additional staff to handle these processes. This cuts labor costs and helps manage workloads more effectively, leading to better staff utilization and less burnout. Additionally, this can lead to better inventory management and reduced waste.

Real-World Examples of AI in Healthcare

AI-Powered Med History System Improves Care, Reduces Work at Carle Health

Carle Health is reporting significantly less manual entry by its staff after integrating medication history from DrFirst into its Epic EHR, making more data available and translating prescription sigs such as dose and frequency into the system's standard terminology.

Success Stories: How AI Is Improving Medication Management for 3 Healthcare Providers

McLean Hospital, Baptist Health, and Emory Healthcare are powering their medication management workflows with AI to avoid errors, save time, and meet key quality initiatives.

Separating the Hype From the Hope in Healthcare AI Trends for 2024

Baptist Memorial in Tennessee and Baptist Health in Jacksonville, Florida, discuss AI's role in solving the in-basket problem and simplifying medication reconciliation.

A Healthcare Executive's Guide to AI Success: Enhancing Medication Management at Emory Healthcare

The Chief Information and Digital Officer sheds light on how clinical-grade AI is enhancing medication history records and improving efficiency at the 11-hospital system based in Atlanta.

Reducing Epic Clinician Burnout One Base Hit at a Time

Leaders from Ochsner Health and Emory Healthcare talk about using clinical-grade AI for medication management within their EHRs to reduce clicks, improve efficiency, and boost provider satisfaction.

Medication adherence is another area where cost savings can be realized.

According to the Centers for Disease Control (CDC), nearly 50% of adults suffer from chronic diseases, such as diabetes and hypertension—and nearly half don't adhere to prescribed medication regimens.[14] This failure to adhere contributes to at least 100,000 preventable deaths and $100 billion in preventable medical costs annually.[15]

AI can predict medication adherence for various conditions, including diabetes and hypertension, and can achieve 70% to 80% accuracy in identifying those who are struggling to adhere to their medications.[16]

The potential for cost savings from integrating AI into medication management is consequential. From reducing manual errors and enhancing efficiency to better resource allocation and improved patient outcomes, the financial benefits are substantial and can justify the initial investment in AI technology. See the sidebar for links to some success stories.

Clinical-Grade AI

At Baptist Health in Jacksonville, Florida, AI is being used to map prescription instructions, known as sigs—something that previously had to be done manually.[17] This was no easy feat because there are literally hundreds of ways to say, "take one tablet by mouth daily."

"As part of our migration from legacy EHRs to Epic, DrFirst solutions converted more than 9 million sigs without clinician intervention. A subset of these conversions had no sig provided in third-party data, and the sig was inferred by the AI technology," said Stacey Johnston, M.D., M.H.A., CHCIO, VP, Chief Applications Officer of Baptist Health.[17] "By avoiding manual conversion of this data, we saved critical time (estimated at more than 19,000 hours) for our clinicians and reduced the likelihood of transcription errors."

This is an excellent example of AI that is explicitly designed to solve for a particular pain point, Dr. Banas said.

The primary danger of generative AI lies in its lack of specificity and contextual understanding. While it can produce responses based on patterns in data, it needs to inherently understand the nuances and critical details necessary for safe healthcare applications. Left unchecked, generative AI could produce dangerous, sometimes deadly, hallucinations on behalf of the clinician, warns Dr. Banas.

Clinical-grade AI, on the other hand, is trained on vast amounts of healthcare-specific data and is designed to operate within the strict parameters required in clinical settings. This makes it far more reliable and safer for use in critical areas such as medication management.

Conclusion: Guardrails for the Future

The dual perspectives of optimism and caution among healthcare professionals and patients highlight the need to balance innovation with rigorous standards and frameworks to ensure AI's safe, ethical, and effective use in healthcare. But how do you regulate something that is changing so quickly, and how do you do it without impeding progress?

The recently released Coalition for Health AI (CHAI) Standards Framework represents an important step toward achieving this balance.[18] By establishing clear guidelines and best practices for the development and implementation of AI in healthcare, the CHAI framework aims to address critical issues such as transparency and interoperability. It also underscores the importance of data security and privacy, with guidelines for maintaining the highest standards to foster trust among healthcare providers and patients.

CHAI is one of many groups looking to develop guidelines for responsible AI use in healthcare. More than 200 sets of guidelines have been issued worldwide by governments and other organizations, according to CHAI.[19]

Another organization working toward this goal is a healthcare consortium called Trustworthy & Responsible AI Network (TRAIN). Members include heavy hitters like Cleveland Clinic, Duke Health, Johns Hopkins Medicine, Mass General Brigham, Mount Sinai Health System, Northwestern Medicine, and Vanderbilt University Medical Center.[20]

"AI has the potential to transform how healthcare is delivered and received."

It's not just about how good the AI is—it is also about what the AI was trained to do. "We are not just scouring the entirety of the internet," Dr. Banas said. "This is a honed data set that was created specifically for these use cases."

"AI has the potential to transform how healthcare is delivered and received. However, we must embark on this journey with responsibility to our patients, our care teams, and the public," said Dr. Rebecca G. Mishuris, Chief Medical Information Officer and Vice President, Mass General Brigham.[20]

Providers wouldn't give patients a new drug or medical device without first ensuring its efficacy and safety—and AI should be no different, said Dr. Peter J. Embí, Professor and Chairman of the Department of Biomedical Informatics (DBMI) and Senior Vice President for Research and Innovation at Vanderbilt University Medical Center.

"We must test and monitor AI-derived models and algorithms before and after they are deployed," he added. "It is imperative that we work together and share tools and capabilities that enable systematic AI evaluation, surveillance, and algorithm vigilance for the safe, effective, and equitable use of AI in healthcare."[20]

As AI continues to reshape healthcare, the focus must remain on implementing these technologies with precision and care. By embracing AI's potential while adhering to rigorous standards and frameworks, the healthcare industry can ensure that innovation serves its highest purpose: Improving patient outcomes safely and effectively.

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About DrFirst

Since 2000, healthcare IT pioneer DrFirst has empowered providers and patients to achieve better health through intelligent medication management. We improve healthcare efficiency and effectiveness by enhancing e-prescribing workflows, improving medication history, optimizing clinical data usability, and helping patients start and stay on therapy.

DrFirst has won over 25 awards for excellence and innovation, including winning Gold in the prestigious Edison Awards in 2023, recognizing our game-changing use of clinical-grade AI to streamline time-consuming healthcare workflows and prevent medication errors. Our solutions are used by more than 350,000 prescribers, 71,000 pharmacies, 270 EHRs and health information systems, and over 2,000 hospitals in the U.S. and Canada. To learn more, visit DrFirst.com, and follow us on LinkedIn or @DrFirst on X.

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