

REVIEW ARTICLE

PANDORA BOX OF POSSIBILITIES AND LIMITATIONS: UNLEASHING THE POWER OF CHATGPT IN HEALTHCARE

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A lot of hype has been sparked by the words Chat, GPT (Generative Pretrained Transformer), and AI (artificial intelligence). The principle that nothing is truly free has perfectly aligned with the introduction of ChatGPT. Since its debut, so what is the penalty we are paying with the rising interchange of ideas with AI as the spontaneity and originality of human radiance are at risk? But it is important at the same time to adapt to the evolving world and smartly use these brilliant technologies to minimize and simplify workload with limitations. There are several uses of ChatGPT in every field including medical education, scientific research, public health, and medical assistance but with restricted ethical considerations. This comprehensive review represents the utilization of ChatGPT in the healthcare sector using data collected from the latest relevant articles, peer-reviewed research, and published reports.

Keyword: AI, ChatGPT, Dentistry, Healthcare system, Medical education, Research

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INTRODUCTION

What was once confined to science fiction is now a frequent element of our everyday lives, effortlessly merging without our conscious awareness. There has been a lot of hype sparked by the words Generative Pre-trained Transformer (GPT) and Artificial Intelligence (AI) since its release in the latter year 2022. After its launch people from all occupations are inquiring what it has for them. The story will not stop here, there will be a similar erratic cascade of artificial intelligence innovations that could be anticipated in the ensuing decade as this is just the beginning.¹

Not long ago, although AI could read and write, it was incapable of comprehending the content, as it lacked the next degree of intellect that comes from comprehension. That succeeding level has finally been unlocked with the ChatGPT.² It is based on the GPT, a machine learning algorithm trained on vast amount of text data from the multiple internet resources.³ ChatGPT aims to produce text that mimics real human conversation and can be applied to various processing tasks, including dialogue systems, language translation, and text summarization. It can be used to answer queries, write imaginative stories, and produce responses for chatbots. The text-generated tool has a quality close to that of real human language because it was trained using large volumes of internet-based text.⁴ Due to GPT's ability to analyze sequential data, including natural language, ChatGPT is better able to comprehend the context of phrases and related text that came before it and produce coherent script as a result.

Interpretation is diverse on this topic while usage in certain aspects remains ambiguous in its application, accompanied by numerous unaddressed questions concerning privacy and ethical considerations. Nevertheless, these models pose concerns regarding

deception, privacy, biases in training data, and misuse.^{5,6} Given their ability to comprehend complicated concepts as well as responses to a variety of requests and queries (prompts), ChatGPT could potentially help in a variety of areas of medicine^{7,8} (Figure-1). This manuscripts reviews how ChatGPT can potentially impact patient care, medical and dental diagnostics, medical research, and medical education, while also highlighting its limitations and ethical considerations.

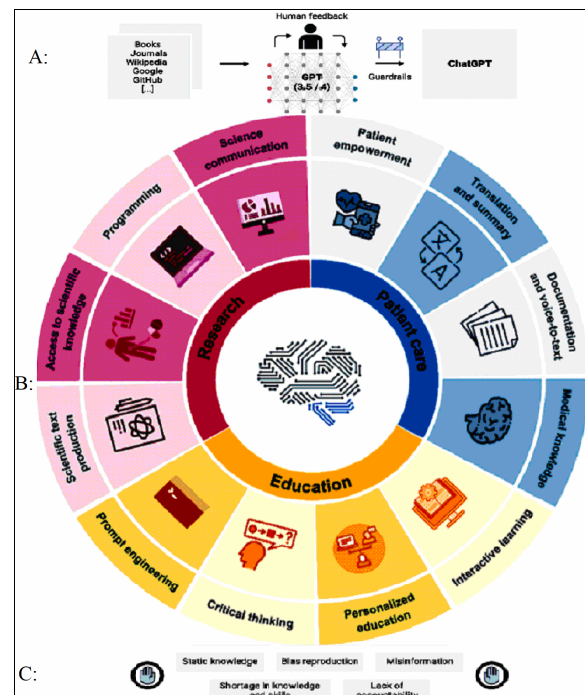


Figure 1: A: ChatGPT's architecture including training, iterations of reinforcement learning with human feedback, model selection, and the addition of guardrails for increased safety. B: Overview of patient treatment, research, and educational opportunities for large language models (LLMs) in medicine. C: Limitations of LLMs as they stand right now.⁹

METHODOLOGY

A thorough search of pertinent literature across many databases and sources was done using PubMed, Google Scholar, and specialized websites for peer-reviewed research, reports, and articles about the use of ChatGPT and related AI tools and their effects on healthcare quality. Studies and publications written in English, published in 2022 and 2023, using keywords, ChatGPT, AI, dentistry, medical education, research, and healthcare system. All the manuscripts concentrating on AI on healthcare quality met the inclusion criteria. Studies that did not assess the influence on healthcare outcomes, old literature, or did not focus on recent advances of AI in health systems were excluded.

DISCUSSION

Optimizing health administration and medical record keeping

Administrative documentation remains one of the most time-consuming tasks for clinicians. According to American Medical Association research, for every hour spent on patient visits, physicians devote roughly two additional hours to electronic medical records and desk work.¹⁰ About 25% of clinicians' workdays is consumed by documentation and administrative responsibilities.¹¹

AI-powered tools such as ChatGPT have the potential to alleviate this burden by generating structured clinical notes, patient summaries, and discharge instructions. This can optimize physicians time, reduce clerical workload, and minimize the risk of human error. For example, a large scale deployment of ambient AI scribes by the Permanente medical group in 2023 recorded over 2.5 million patient encounters in its first year, saving more than 15,000 hours of documentation time for physicians and contributing to lower burnout rates.^{1,2}

More recently, Boston health AI launched Hami, describes as the worlds first AI-powered physicians assistant. Designed as an ambient scribing and clinical intelligence tool, Hami converts patient's provider conversations into structured SOAP notes and generates after visit summaries early developments across hospitals in Pakistan demonstrates how such innovations can enhance workflow efficiency while complying with global privacy standards like HIPAA and GDPR.³

Applications in public health and disease surveillance

ChatGPT can also be used by medical professionals and ordinary citizens to monitor global health statistics, providing real-time insights into potential outbreaks and facilitating early response efforts. ChatGPT can detect trends and abnormalities that may suggest the emergence of new diseases or the spread of an existing one by analyzing vast volumes of data from multiple sources such as news stories and public health databases. The

model can also send automated alerts to public health officials, healthcare professionals, and the general population, allowing them to implement necessary disease-prevention measures.¹² Furthermore, by discovering patterns and connections in huge amounts of data, it has the potential to reveal new insights and breakthroughs in medicine.¹³

ChatGPT can also support health promotion by delivering multilingual educational content and reminders on areas such as nutrition, exercise, and lifestyle improvements. It can surely provide individualized guidance based on an individual's health profile and aspirations.⁴

Patient communication and remote monitoring

GPT-3 and its derivatives are capable of interpreting and creating text in several languages, facilitating communication between healthcare personnel and patients from various linguistic backgrounds.

ChatGPT can also be used to produce automatic responses to patients' questions about appointment scheduling and medication management as well as for patient triage, in which it asks patients about their symptoms and medical history, assisting in determining the severity and urgency of their condition. In near future, AI will most likely aid medical practice by assisting physicians in using technology to better clinical care and basic public health issues. Hopefully, human intelligence will be supplemented by technology rather than replaced.

Remote patient monitoring (RPM) is an increasingly popular technique to enhance patient outcomes while lowering healthcare expenditures. ChatGPT can remotely monitor patients by analysing data from wearables, sensors, and other monitoring equipment, allowing for real-time insights into a patient's health status. ChatGPT can analyze this data and notify healthcare practitioners if a patient's condition worsens or other problematic tendencies emerge. This allows healthcare providers to intervene sooner and prevent hospitalizations or other consequences.¹²

To eliminate possible hazards such as mistakes or misinterpretations that might hurt patients, the use of AI in healthcare communication must be controlled and supervised. To implement ChatGPT responsibly, one feasible technique may be to combine voice-to-text identification software with quick clinician editing of the letter and little human participation. This would enable the technology's potential applications to be investigated while reducing any possible risks.¹⁴

Assistance in medical and dental diagnosis

Diagnosis is the most fundamental and important part of medicine, acting as the cornerstone of patient care and the platform upon which effective treatment strategies are created a medical diagnosis is based on three factors: The patient's medical history, performing a physical

examination, and interpreting diagnostic testing and imaging investigations to accurately determine the underlying cause of a patient's symptoms or illness.¹⁵ Keeping these three factors in mind there is no way that ChatGPT can diagnose medical or dental conditions all on its own but it can surely be used as a tool to assist but it can't replace a medical practitioner as they are trained to extract history from patients by their communication, interpersonal skills and by observing expression and doing cross-questioning.¹⁶ ChatGPT's only job in medical or dental diagnosis is to assist in the generation of clinical notes, summaries, and other documentation, which would help optimize time and reduce the danger of human error. It may also be used to provide assistance and therapy recommendations based on the patient's symptoms and medical history.¹⁷ We can't ignore the fact that with technological advancements patients no longer solely depend on physicians for medical information. Instead, patients are increasingly turning to search engines and, more recently, artificial intelligence chatbots as convenient and accessible sources of medical information. ChatGPT and other recently announced chatbots participate in conversational conversations and respond authoritatively to complex medical questions. Despite its potential, ChatGPT frequently delivers seemingly believable but inaccurate results, necessitating caution when evaluating its uses in medical practice and research.¹⁸⁻²⁰ These engines' dependability and correctness have not been evaluated, particularly in the context of open-ended medical queries that clinicians and patients are likely to ask. The most important factor of physician patient relationship of sympathy and kind words which give mental and psychological peace of mind to the patient is a big lacking factor with these artificial technologies.

Role in medical and dental education

ChatGPT's educational value is promising, and its implementation in medical education can provide an individualized learning experience to support the diverse learning needs of medical students. Assessments conducted in person are unlikely to be influenced directly by ChatGPT and do not necessitate any changes at this time. However, there is a danger of dishonesty in academic tasks undertaken by students off-campus, and medical educators must adopt suitable protocols to prevent such risks.²¹ Most medical and dental institutions, particularly in developing countries, employ open-source online technologies such as Zoom and Webex to deliver exams remotely, allowing students to be watched on camera during the examinations. These platforms, however, did not allow candidates to limit internet access to assessment content during tests. This was somewhat countered by creating 'non-searchable' questions, which stopped students from quickly discovering solutions by searching the internet. With the

availability of bots like ChatGPT, however, this method may be rendered ineffectual if remote evaluations are used without proctoring.²²

While researching there was enough evidence of ChatGPT performance in medical education coming from different countries across the globe. Kung²² and Gilson²³ in two separate studies, used the United States Medical Licensing Examination to assess ChatGPT's performance. Their findings indicated that ChatGPT might produce moderate accuracy and consequently a passing score. However, Fijačko discovered that ChatGPT failed the American Heart Association examinations.²⁴ According to Han, ChatGPT offered erroneous and insufficient information about cardiovascular illnesses.²⁵ Nisar and Aslam discovered that while ChatGPT could deliver relevant and correct replies, these answers lacked references and sources in the context of pharmacology education in Malaysia.²⁶ Wang used the Chinese National Medical Licensing Examination to testify about ChatGPT in China.²⁷ They reported that ChatGPT's performance was lower than the average score of medical students. Researchers in Korea²⁸, India²⁹, and Singapore³⁰ confirmed similar findings. According to the outcomes of these investigations, ChatGPT's performance in the sphere of medical education was not sufficient (Tabel-1).

Table-1: Ethical and legal questions regarding the use of ChatGPT-generated content including plagiarism, AI authorship, copyright issues of AI-generated content, and the detection of fake research and fraudulent papers

Plagiarism	How much help from AI is too much help?
AI authorship	Is AI eligible to appear as a co-author? If not how can its contributions be appropriately documented and acknowledged?
Copyright of AI-generated content	Does the AI generated content belong to the prompt creator, the AI tool, the tool creator, or the owners of the training data?
Fake research and fraudulent papers	How to detect AI-generated content effectively?

Contributions to medical research and scientific writing

The artificial intelligence language model ChatGPT may help medical researchers and scientists with writing, literature research, data summarization, structure, references, and title suggestions, and even developing an initial paper draft.

However, this is only the starting point for humans to further improve the text. ChatGPT can help to identify scholarly publications, summarize their results, and indicate areas of doubt, although the summary presented may lack critical examination of variations across research.

ChatGPT's key benefit is its capacity to swiftly analyse information and correlate evidence to make conclusions faster than humans, who have difficulties in

completely reading a wide range of literature and combining seemingly unconnected bits of information. Nonetheless, due to ethical concerns, its use in scientific writing should be regulated. Authors may produce several versions of their material in only a few seconds using AI-powered content generation tools like ChatGPT, which might potentially help them overcome writer's block.³¹ ChatGPT may be an effective tool for expanding on an existing text, refining information, and rewording content as needed. However, as medical research evolves, there is rising concern that ChatGPT may be abused to create articles devoid of clinical reasoning and critical thinking.³² Certain scientific journals now require that authors of works containing ChatGPT-generated content list ChatGPT as an author. Nature, a renowned medical journal with highest impact factor, on the other hand, has rejected to recognize ChatGPT as an author since it cannot bear responsibility for anything published by it.³³ Whereas some other researchers suggest that the fact that AI cannot be a copyright holder does not preclude it from being registered as an author. If the writing was not done by a person, attributing it to a human author may not make sense.³⁴ Considering the constraints highlighted, the World Association of Medical Editors (WAME) has suggested that ChatGPT not be featured alongside the authors.³⁵

An increasing number of researchers undertake plagiarism checks on articles and research manuscripts using relevant software applications such as iThenticate (Turnitin LLC).³⁶ However, plagiarism detection software primarily calculates the similarity index with published works available online and identifies the source.³⁷ Given ChatGPT's ability to generate fresh text, standard software systems used to detect plagiarism may not be reliable in recognizing ChatGPT results. Khalil further added that ChatGPT has the ability to create 50 essays based on several open-ended topics.³⁸ Turnitin was used to check half of the essays, yielding an average similarity score of 13.72%. The remaining half were tested using iThenticate, another plagiarism detection technology, which returned an 8.76% similarity score. The ChatGPT materials were deemed highly original with these scores.

A growing number of AI-based solutions, such as OpenAI's AI Text Classifier, Detect GPT, and GPT Zero, are newer software being developed to address this issue.³⁹ As language processing expands and becomes more sophisticated, such detection may become much more difficult in the future.⁴⁰ However, these tools are not always accurate and misclassification can happen. As a result, more study is needed to improve the precision of these technologies. When it comes to writing, however, ChatGPT has been demonstrated in generating incorrect or fake information.⁴¹ Thus, the accuracy and reliability of ChatGPT have been called into doubt.⁴² To overcome

this situation researchers have emphasized the need to develop anti-plagiarism policies and educate students about academic integrity.⁴³

One more important issue is the list of references, as most provided cited data by AI tool is fabricated. Once these references are chased in reality, they do not exist finally making the work unreliable!

Limitations and ethical considerations

ChatGPT's expertise is limited by its training data, which only extends up to 2021. This limitation stops it from providing real-time information, cross-referencing facts with recent events, or generating truly creative and fully unique responses. As a result, when confronted with post-2021 facts or modifications, this constraint may result in possibly incorrect or misleading replies.⁴⁴

However, it has its own set of drawbacks and restrictions, use of ChatGPT for healthcare purposes may raise privacy problems, owing to the need for access to and analysis of patient data and medical history acquired from various internet sources, which may jeopardize patient privacy. This practice raises serious concerns regarding patient privacy and the handling of sensitive medical information.^{45,46} Security flaws are also a legitimate source of worry, as a software system, it is vulnerable to hacking and other security risks. Misuse of ChatGPT has the potential to cause security breaches, resulting in unauthorized access, exchange, or theft of personal or sensitive information.

Another major limitation relates to accuracy and reliability. While ChatGPT can generate references and citations, studies show that most are fabricated or erroneous. For example in an evaluation of 115 references generated by ChatGPT, only 7% were authentic, while nearly half were fabricated and the rest contained significant errors. Such findings highlight the risk of relying on ChatGPT for scientific or clinical writing without rigorous human verification.

Furthermore, it may face difficulties in ethical and moral thinking. It has the potential to generate morally ambiguous or ethically dubious content that may not comply with recognized ethical norms, making it unsuitable for certain applications in the absence of sufficient human oversight.

The lack of emotional intelligence in ChatGPT is a key disadvantage that renders it unsuitable for conversations that need emotional sensitivity, empathy, or comprehension of complicated emotional states (Figure-2). When employing AI models like ChatGPT in emotionally charged or sensitive settings, users should exercise caution and consider the possibility of misinterpretation and insensitivity. ChatGPT, being a text-based AI language model, is unable to create visual material such as photos, videos, or graphs, restricting its application in multimedia content production and visual communication jobs.⁴⁷

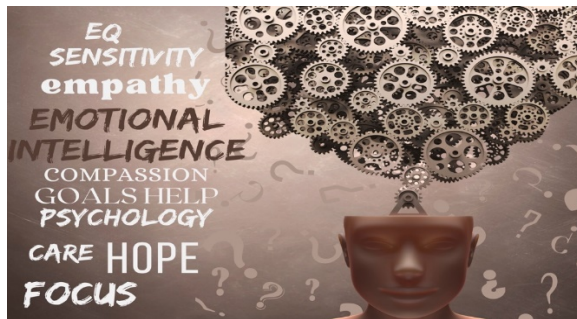


Figure-2: Lack of Emotional Intelligence in AI

This illustration highlights the essential components of emotional intelligence, the gears represent the intricacy and interdependence of these characteristics, highlighting the significant gap in AI's ability to comprehend and exhibit emotional intelligence.

CONCLUSION

ChatGPT's potential is analogous to opening a Pandora's box of ideas-vast promising, yet bounded by inherent restrictions and limitations. It's interpretation and impact often depend on how it is applied and understood. While AI-driven tools may appear rival to human intelligence, it is important to remember that at the helm of these technologies must remain the human minds, with its unique capacity for judgment, empathy and emotional awareness.

In healthcare, ChatGPT has already shown promise in easing administrative burdens, supporting diagnostics, enabling pandemic alerts and improving communication across linguistic barriers it also holds potential in medical education and research, though its impact in these areas remains ambiguous and requires further validation, implementation, and careful oversight. Ethical safeguards, policies and regulatory frameworks will be essential to ensure that these tools are integrated responsibly and do not compromise privacy accuracy or academic integrity.

Ultimately ChatGPT should not be seen as a replacement for human intelligence but rather as a supportive tool one that can augment healthcare professionals by streamlining workflows, reducing burnout, and expanding access to knowledge. If embraced responsibly, with well-defined ethical guidance and critical human oversight, ChatGPT may help reshape the future of medicine, education and research while preserving the irreplaceable role of human compassion at the core of healthcare.

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