

Empowering Healthcare Professionals and Patients with ChatGPT: Applications and Challenges

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Abstract—ChatGPT is a recently developed Large Language Model (LLM) and an effective tool to produce human-like dialogue with users and answering to questions. It is trained on a massive amount of online content and can provide textual answers to questions from several domains, such as healthcare. In this paper, we investigate the application of ChatGPT in the healthcare domain and provide an analysis on its limitations and challenges. While ChatGPT can offer valuable support and information, it is crucial to recognize that it should not be seen as a replacement for the expertise and personalized care provided by healthcare professionals. Instead, its purpose lies in augmenting healthcare services and enhancing access to information. It can be a useful tool for providing general guidelines and educational resources. However, when it comes to medical advice or diagnosis, it is essential to consult qualified healthcare professionals who can consider individual factors, interpret complex medical information, and provide tailored recommendations based on a comprehensive understanding of the patient's situation.

Index Terms—ChatGPT, Healthcare, Applications, Challenges, Artificial intelligence

I. INTRODUCTION

ChatGPT, also known as Chat Generative Pre-Trained Transformer, is an advanced artificial intelligence (AI) system that utilizes Natural Language Processing (NLP) to simulate human-like conversation and generate easily understandable text. The Generative Pre-trained Transformer (GPT) is a state-of-the-art Large Language Model (LLM), developed by OpenAI. In 2019, GPT-2 was developed and trained on a dataset of approximately 40GB of text data. It is estimated that GPT-2 has a model size of 1.5 billion parameters [1]. ChatGPT is the last version of GPT-3, which was released in 2020 and uses

175 billion parameters [2]. It is trained on Microsoft Azure's AI supercomputer and massive datasets such as Wikipedia, books, articles, and other websites [3].

ChatGPT is capable of responding to inquiries and also possesses the ability to perform translation between different languages. ChatGPT can leverage the existing knowledge to provide suitable responses to future questions, continuously improving its effectiveness as a chatbot [4]. It can be used for a variety of purposes in different domains, such as education [5], academics [6], finance [7], and the healthcare industry. In the healthcare domain, it can assist healthcare professionals and patients in streamlining healthcare operations [8], giving patients helpful information about their health conditions [9], and supporting patients in managing their medications [10]. Also, a healthy lifestyle can be achieved through utilization of ChatGPT by ensuring regular physical activity [11] and following a nutritious diet [12].

Even though ChatGPT frequently generates outstanding results, it is uncertain how efficiently it will perform in the presence of real-world and sophisticated problems and circumstances. ChatGPT is developed on top of the web-based data and the reinforcement learning method with human feedback [13]. There is a possibility that ChatGPT may give incorrect information about the diseases and inaccurate advice to individuals if it is not prepared from reliable sources [14].

ChatGPT is still in its early stages, and has a long way to go before it can be considered a reliable solution in sensitive and high-risk domains such as healthcare [15]. For instance, in a recent study [16], different healthcare scenarios were examined, and it was discovered that while ChatGPT can show promising results in some healthcare scenarios, it won't be able to present a well-grounded solution in mental health

counseling. Additionally, according to the study, using ChatGPT for mental health therapy and sharing sensitive personal information poses a threat to patient privacy and confidentiality [17].

This paper aims to briefly investigate the application and pitfalls of ChatGPT in the healthcare industry. Our goal is to explore how reliable ChatGPT is in the healthcare domain, and how healthcare professionals and patients can benefit from this technology. At the same time, we investigate the current challenges and pitfalls down the road for both healthcare professionals and patients. The rest of this paper is organized as follows: related work in Section II, in Section III, we present the application of ChatGPT in the healthcare domain, Section IV provides the possible negative aspects of ChatGPT in healthcare, in Section V we provide some future applications of the ChatGPT and the conclusion is presented in Section VI.

II. RELATED WORK

ChatGPT is a revolutionary AI tool that is utilized in various sectors, including healthcare, to improve patients' quality of life, support doctors during surgery, and assist researchers in academic endeavours. We summarize some of the related research findings on ChatGPT in the current section.

He et al. [18] investigate ChatGPT's potential applications in the field of spinal surgery. They discuss, particularly, how ChatGPT can help spinal surgeons diagnose disease. This study also discusses the perioperative care of patients undergoing endoscopic spinal surgery for lumbar disc herniation. Moreover, the authors explore the role of ChatGPT in helping experts do scientific research about spinal surgery. Nonetheless, there are no discussions about any potential limitations for ChatGPT in spinal surgeries and the healthcare domain.

Sharma et al. [19] examine ChatGPT's effects on the marine industry by enabling virtual consultations with medical experts for the evaluation of seafarers' health information. The research focuses on how ChatGPT can support a telemedicine-based solution to allow mariners access to remote medical counseling, which can be highly beneficial for seafarers working in distant places with little medical support. The authors, however, do not assess ChatGPT's advantages for medical personnel employed in the marine sector.

In [20], the authors describe ChatGPT's potential for use in medical research. They examine ChatGPT's effectiveness in analyzing enormous volumes of data and extracting pertinent information to obtain novel insights into the causes, symptoms, and available treatments for orthopedic and sports medicine conditions. In addition, they raised several concerns, including a lack of context, inaccuracy, and inadequate ChatGPT knowledge to understand medical sciences. However, the authors do not discuss the advantages and limitations of ChatGPT for patients.

Kumar et al. [21] evaluated the efficacy of ChatGPT in producing academic writing in the biomedical sciences. They evaluated ChatGPT based on its response time, content quality, and reliability by responding to random questions. Despite ChatGPT's precise responses to questions, the responses did

not meet scientific writing standards. Similarly to [20], The authors do not assess ChatGPT's advantages for patients.

Aside from the other works discussed in this section, our work is the only one that focuses on the benefits and limitations of ChatGPT from the perspective of both medical experts and patients. An overview of the literature review is provided in Table I.

III. CHATGPT APPLICATIONS IN HEALTHCARE

In recent years, there has been significant interest in the use of AI in healthcare applications. A range of language-specific applications are of interest in the healthcare domain, such as enhancing the efficiency of clinical documentation [22], alleviating administrative workloads [23], simplifying the comprehension of complex test result reports [24], and addressing EHR (Electronic Healthcare Record) messages within the system [25]. Recently, the latest version of ChatGPT has gained significant attention in many sectors, including the healthcare industry. ChatGPT, as a conversational AI tool, can be applied in various ways within the healthcare domain. It can possibly revolutionize the healthcare domain by providing significant benefits to both healthcare professionals and patients. In this section, we highlight the most common advantages of using ChatGPT from different perspectives, including patient assistance, health education, drug and medication information and management, patient appointment and follow-up patient health monitoring, and patients' language barriers.

Table II summarizes the main benefits and applications of ChatGPT in the healthcare domain.

- **Patient Assistance and Triage.** ChatGPT can act as a preliminary symptom checker, where patients can describe their symptoms and receive potential explanations or suggestions for further actions. For instance, by asking patients a series of questions about their symptoms, medical history, and present state, ChatGPT can be used to offer preliminary aid and triage patients. Then, depending on the responses, ChatGPT can help assess the severity of the problem and make the proper recommendations, such as contacting emergency services immediately [26].
- **Health Education and Information.** ChatGPT can serve as an interactive platform for providing health education and information to patients. It can answer questions about specific medical conditions, medications, treatment options, lifestyle changes, and preventive measures. ChatGPT can also provide general wellness tips and advice on maintaining a healthy lifestyle. For example, it can aid in health promotion efforts by distributing accurate information on public health initiatives, increasing awareness of common diseases or conditions, and encouraging healthy habits and preventive measures [27].
- **Drug Information and Interactions.** ChatGPT can assist healthcare professionals and patients in understanding drug information, including indications, dosages, potential side effects, and conflict with other medications. For instance, users can utilize ChatGPT to clarify their questions or concerns about medications and interactions

TABLE I
COMPARISON TO THE RELATED WORKS

References	Description	Benefits	Limitations	Point of view	
				Medical experts	Patients
<i>He et al.</i> [18]	Examining ChatGPT's potential applications for spinal surgery	✓	×	✓	×
<i>Sharma et al.</i> [19]	Investigating ChatGPT's impact on seafarers' quality of life	✓	✓	×	✓
<i>Dahmen et al.</i> [20]	Investigating ChatGPT's ability to treat orthopedic and sports medicine condition	✓	✓	✓	×
<i>Kumar et al.</i> [21]	Evaluation of the accuracy and innovation of the ChatGPT's responses in academic writing	✓	✓	✓	×
Our work	Examining ChatGPT's benefits and limitations in the healthcare industry	✓	✓	✓	✓

before discussing them with healthcare professionals. This can facilitate more productive conversations during appointments and enable patients to ask informed questions. ChatGPT can also provide information on over-the-counter drugs and help identify potential allergic reactions [28].

- **Medication Management.** ChatGPT can be integrated with IoT devices, such as voice assistant platforms, and help patients manage their medications by providing reminders for dosage timing and helping users stay on track with their prescribed medication schedule [33]. For instance, regular reminders can improve medication adherence, especially for individuals who may have difficulty remembering or organizing their medication regimen. It can also provide guidance on proper storage and general guidance on medication administration, such as whether to take the medication with or without food [29].
- **Appointment Scheduling and Reminders.** ChatGPT can assist in scheduling appointments with healthcare providers based on the availability of both the patient and the provider [30]. It can also send reminders and notifications to patients about upcoming appointments, tests, or medication refills. It can use automated appointment reminders to reduce the risk of missed appointments. Reminders can be delivered through various channels, such as text messages, emails, or in-app notifications, ensuring patients are well-informed and prepared for their appointments. ChatGPT offers a user-friendly interface that can improve accessibility. This accessibility can help patients, including those with disabilities or limited mobility, easily schedule and manage their healthcare appointments.
- **Health Monitoring and Tracking.** ChatGPT can be integrated with wearable devices and health applications to provide personalized health monitoring and tracking services [19]. This integration allows for a comprehensive view of health information and facilitates more accurate monitoring and tracking. It can help users interpret and understand their health data by providing general insights

and explanations and offering context to various health metrics, such as steps taken, heart rate trends, or sleep patterns, enabling them to gain a better understanding of their overall health.

- **Follow-up Care and Post-Discharge Support.** ChatGPT can assist with post-discharge care by following up with patients after they leave the hospital. It can provide guidance on self-care, answer questions about medications or treatments, and monitor patients' progress. ChatGPT can help bridge the gap between hospital visits and ensure patients are supported during their recovery process. It can offer general advice on managing common post-discharge symptoms, such as pain, discomfort, or potential complications [31].
- **Language Translation and Interpretation.** ChatGPT can assist in language translation tasks, enabling healthcare professionals to communicate with patients who speak different languages. It can also aid in interpreting medical terminology, ensuring accurate and effective communication in multilingual healthcare settings. Also, ChatGPT can help make healthcare information more accessible to individuals who may face language barriers [32].

ChatGPT can be a significant contributor to the healthcare domain for both healthcare professionals and patients. Through ChatGPT, patients will be able to improve their health information, manage their medications, schedule appointments with their doctors, and receive guidance on the recovery process after their surgery. ChatGPT can be used by experts to check patient symptoms and triage them, monitor patient health conditions, provide doctors with drug information and interactions, and assist doctors in communicating with their patients in different languages as well.

IV. LIMITATIONS OF CHATGPT IN HEALTHCARE

Although ChatGPT has shown its great potential to provide a variety of benefits to healthcare entities, similar to other technologies, it comes with certain limitations and challenges that need to be considered [34]. The healthcare domain is considered a dynamic field with complex medical cases regularly, and solving those complex issues by relying on the ability

TABLE II
APPLICATION OF CHATGPT IN HEALTHCARE

Reference	Applications	Description
<i>Cheng et al.</i> [26]	Patient Assistance and Triage	ChatGPT act as a preliminary symptom checker, where patients can describe their symptoms and receive potential explanations or suggestions for further actions
<i>Bahrinin et al.</i> [27]	Health Education and Information	ChatGPT provides information to patients about specific medical conditions, medications, treatment options, lifestyle changes, and preventive measures
<i>Juhi et al.</i> [28]	Drug Information and Interactions	ChatGPT helps medical staff and patients in understanding drug information, including indications, dosages, potential side effects, and interactions with other medications
<i>Hariri et al.</i> [29]	Medication Management	ChatGPT can be integrated with IoT devices, such as voice assistant platforms, and help patients manage their medications by providing reminders for dosage timing
<i>Khan et al.</i> [30]	Appointment Scheduling and Reminders	ChatGPT helps patients in scheduling appointments with healthcare providers and sends reminders and notifications to patients about upcoming appointments
<i>Sharma et al.</i> [19]	Health Monitoring and Tracking	ChatGPT can be integrated with wearable devices and health applications to provide personalized health monitoring and tracking services
<i>Fraiwan et al.</i> [31]	Follow-up Care and Post-Discharge Support	ChatGPT provides guidance on self-care and monitoring patients' progress. It supports patients during their recovery process and offers general advice on managing common post-discharge symptoms
<i>Sajjad et al.</i> [32]	Language Translation and Interpretation	ChatGPT enables healthcare staff to interact with patients who speak different languages and make healthcare information more accessible to individuals with language problems

of ChatGPT is an unrealistic solution. To address, or at least approach, those complex and specific medical cases, ChatGPT needs access to specific, authentic, and high-quality data in the first place, which should also be continuously updated and trained [35]. Currently, the knowledge base of ChatGPT is developed based on the textual data available until September 2021 [36]. Thus, ChatGPT is not updated on the latest medical research, breakthroughs, and healthcare developments [37]. In this section, we discuss The most common and important limitations of ChatGPT in the healthcare domain.

Table III summarizes all the limitations listed in this section (Each limitation is related to a reference for more information).

- Lack of Contextual Understanding.** There is a lack of deep contextual understanding in ChatGPT, and sometimes the engine will produce a response that appears sensible but is factually incorrect or contextually inappropriate. In some cases, it may have difficulty interpreting complex medical questions or grasping the nuances of specific medical situations [38].
- False information and fake news.** ChatGPT, as well as similar AI-based models, has the potential to propagate false information in healthcare or produce fake news. This is a severe limitation of ChatGPT. Since these models generate responses based on patterns learned from training data, they may inadvertently produce inaccurate or misleading information if the training data contains such content [39].
- Inability to Diagnose.** ChatGPT is not designed to provide diagnoses or replace the expertise of healthcare professionals. It should not be solely relied upon for making critical medical decisions. A proper diagnosis requires a comprehensive evaluation by qualified healthcare providers [40].
- Lack of psychological support.** Healthcare involves not only the physical aspects but also the psychological well-being of patients. While ChatGPT can engage in conversations, it does not possess emotional intelligence or the ability to provide empathetic support like a human

TABLE III
LIMITATIONS OF CHATGPT IN HEALTHCARE

Reference	Limitations	Description
<i>Biswas et al.</i> [38]	Lack of Contextual Understanding	ChatGPT produces an incorrect response and has difficulty interpreting complex medical questions or specific medical situations
<i>Kleesiek et al.</i> [39]	False information and fake news	Depending on the training data, ChatGPT may inadvertently provide inaccurate or misleading responses
<i>Temsah et al.</i> [40]	Inability to Diagnose	Making critical medical decisions should not be based solely on ChatGPT. Healthcare providers must evaluate patients comprehensively to determine a diagnosis
<i>Parray et al.</i> [41]	Lack of psychological support	ChatGPT cannot provide empathetic support like a human healthcare professional. The psychological aspects of healthcare require human expertise and understanding.
<i>Arslan et al.</i> [42]	Legal and Ethical Considerations	ChatGPT may provide advice or information that contradicts ethical guidelines and can result in harm or adverse outcomes for patients, and determining responsibility can become challenging
<i>Mijwil et al.</i> [43]	Data Privacy and Security	Inadequate security measures in ChatGPT lead to data breaches. Unauthorized access to patient information causes privacy violations, identity theft, or other malicious activities

healthcare professional [41]. Psychological aspects of healthcare require human expertise and understanding.

- **Legal and Ethical Considerations.** In healthcare, decisions often involve ethical considerations and legal implications. ChatGPT lacks the ability to navigate these complex aspects and may inadvertently provide advice or information that contradicts ethical guidelines or legal requirements. For instance, following ChatGPT’s advice can result in harm or adverse outcomes for patients, and determining responsibility can become challenging. Unlike human healthcare providers, who can be held accountable for their actions, ChatGPT’s developers and operators are responsible for the decisions they make [42].
- **Data Privacy and Security.** Protected health information and sensitive patient data are shared with ChatGPT, raising security and privacy concerns. When using AI tools like ChatGPT, it is important to handle patient information responsibly and comply with applicable privacy laws (e.g., GDPR). For instance, when there are vulnerabilities in the system or inadequate security measures in place, data breaches are possible. Unauthorized access to patient information can lead to privacy violations, identity theft, or other malicious activities [43].

Despite the fact that ChatGPT has shown a great deal of promise in providing a wide range of benefits to healthcare organizations, it faces a variety of challenges and limitations that should be considered before implementing it. ChatGPT’s engine can produce a false response because it lacks contextual

understanding. Therefore, it cannot provide patients with emotional support or effectively replace the medical professionals’ knowledge in diagnosing diseases. Because ChatGPT’s recommendations may injure patients and have unfavorable effects, legal and ethical considerations must also be taken into account. Concerns about privacy are also raised by the fact that ChatGPT obtains sensitive patient data as well as protected health information.

V. FUTURE SCOPE

ChatGPT’s technology is still being developed and improved, and OpenAI has already released several versions with better speed and functionality. The latest version of ChatGPT, ChatGPT-4, has been released. The development of GPT-4 can lead to an even more accurate analysis of the X-ray images. As an example, a recent article noted that questions answered incorrectly by ChatGPT in December 2022 were accurate when they were asked on GPT-4 in March 2023 . Therefore, healthcare will greatly benefit from this technology in the future. A precise outcome will be obtained in healthcare by using ChatGPT. There is no comparison of ChatGPT AI findings with real-world data yet, but integration with real-world data is expected in the future. Telemedicine can benefit from ChatGPT. As telemedicine and remote healthcare continue to expand, ChatGPT can be integrated into telehealth platforms to provide remote consultations, assist in remote diagnosis, and facilitate remote monitoring of patients. Also, There is the possibility of integrating ChatGPT with surgical robots to provide them with the autonomy they need in

order to function as a true partner for the surgeon. This ChatGPT-enabled surgical robot can listen to the operator speak and, through the ChatGPT-enabled interface, translate the sentence and context to execute specific commands to alter the robot's behavior or activate certain features. In the future, this combination of AI tools such as ChatGPT and surgical robots can reduce errors, increase surgical efficiency, and even make it possible to ask for help during surgery. In addition, by combining medical-image CAD (computer-aided diagnosis) networks with ChatGPT, it is possible to enhance the output of multiple CAD networks, such as diagnosis networks and lesion segmentation networks. In addition, this integration can generate a medical report by summarizing and reorganizing the information that is presented in a natural-language text format. In fact, ChatGPT can bridge the gap between patients and healthcare providers, especially in underserved or remote areas. In addition, ChatGPT can evolve to become more sophisticated in providing real-time, evidence-based clinical decision support to healthcare professionals. By analyzing patient data, medical literature, and guidelines, it can offer personalized treatment recommendations, suggest diagnostic tests, and assist in complex medical decision-making. As research and development in AI progresses, we can anticipate more innovative uses of AI models to enhance patient care, improve healthcare delivery, and facilitate medical breakthroughs.

VI. CONCLUSION

Integrating ChatGPT, an AI-based Language Model, into healthcare provides numerous benefits, such as patient assistance and triage, access to comprehensive drug information and interactions, and effective monitoring and tracking of health conditions. However, it is crucial to acknowledge the potential limitations associated with this innovative technology. While ChatGPT is an effective tool with various applications in healthcare to enhance patient care, it is important to address concerns regarding data privacy and the potential generation of inaccurate or biased information. However, ChatGPT's technology is currently undergoing continuous development and improvement, and using ChatGPT in telemedicine could be beneficial in the future. Furthermore, ChatGPT may evolve to provide healthcare professionals with real-time, evidence-based clinical decision support.

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