



Review article

ChatGPT in medicine: CAM, challenges & applications

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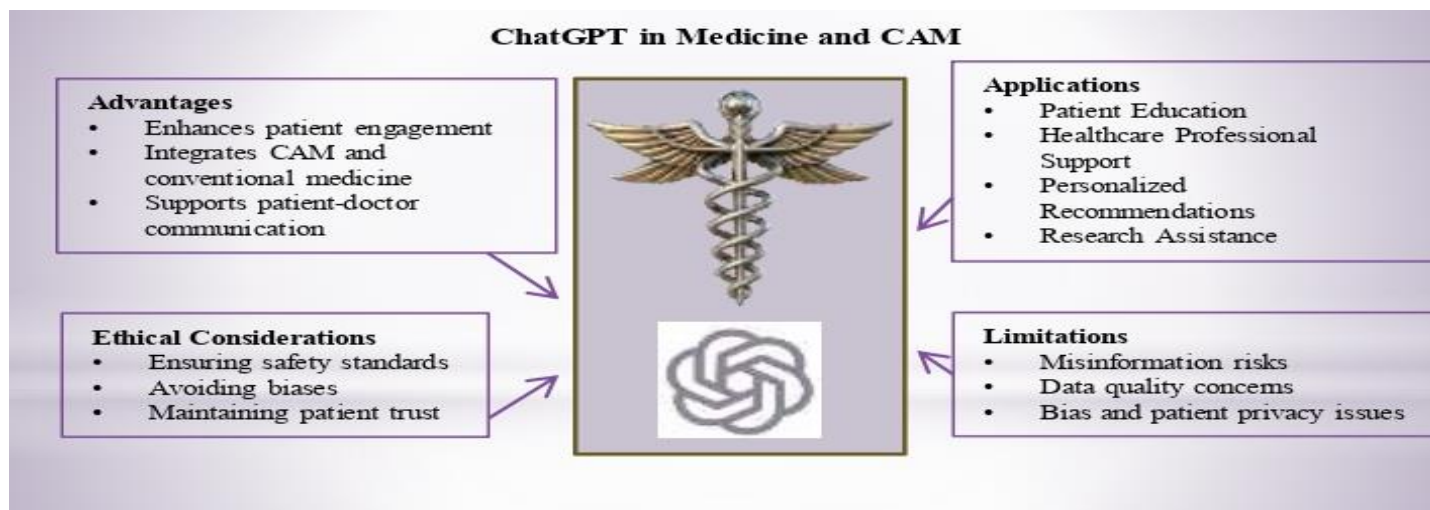
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ABSTRACT

ChatGPT, an advanced AI language model, has emerged as a versatile tool with promising applications in medicine, particularly in the Complementary and Alternative Medicine [CAM]. This review provides ChatGPT's overview on applications, limitations, advantages, and ethical considerations in medicine, with a specific focus on its role in CAM. By synthesizing insights from existing literature, this review highlights the opportunities and challenges associated with leveraging ChatGPT in CAM practices. ChatGPT enhances patient education, supports healthcare professionals, offers personalized recommendations, and assists researchers by summarizing and interpreting scientific literature. It also facilitates patient engagement and community building, promotes the integration of CAM along with conventional medicine, and ensures adherence to ethical guidelines and safety standards. However, limitations and ethical concerns, such as data quality, misinformation risks, patient privacy, and potential biases, must be addressed. Future research should focus on overcoming these limitations, ensuring ethical use, and exploring innovative applications to fully realize ChatGPT's potential in the evolving field of CAM.

ChatGPT in Medicine and CAM



Keywords: ChatGPT, versatile tool, CAM, Ethical considerations
Abbreviations: Artificial intelligence (AI), Generative pre-training transformer (GPT), Complementary and Alternative Medicine (CAM), Korean Clinical Practice Guideline (CPG), systemic reviews (SRs).

INTRODUCTION

Artificial Intelligence (AI) has made significant strides in recent years for revolutionizing various sectors, including healthcare. Among the myriad of AI technologies, ChatGPT stands out as a powerful tool capable of understanding and generating human-like text responses ^[1]. Developed by OpenAI, ChatGPT is a model of the generative pre-training transformer (GPT) and is built upon a large number of language models. Its vast potential applications in medicine range from aiding in diagnosis and treatment to enhancing patient education and support.

This review provides a comprehensive examination of ChatGPT's role in medicine, with a particular emphasis on its implications for Complementary and Alternative Medicine (CAM). The medical field could harness ChatGPT for various purposes, such as pinpointing potential research areas and supporting healthcare professionals in clinical and laboratory diagnostics ^[2]. Despite its promising applications, ChatGPT is used in medicine is not without challenges. Issues related to credibility ^[3] and plagiarism ^[4, 5] present significant ethical concerns that should be addressed to ensure responsible deployment.

Based on clinical evidence from the Korean Clinical Practice Guideline (CPG) and recent systematic reviews (SRs), an evaluation of information obtained from ChatGPT-4 has been performed concerning cancer-related fatigue. This assessment aims to elucidate ChatGPT's potential role and its limitations in CAM practice ^[18,19]. By synthesizing insights from existing literature, this review highlights the opportunities and the challenges connected with leveraging ChatGPT in CAM, exploring future directions for this evolving field.

Applications of ChatGPT in Medicine

Patient Education and Support

ChatGPT can provide patients with accurate, easy-to-understand information about their conditions, treatment options, and medications ^[6]. It can answer common questions and clarify medical terminology, by making informed decisions helping patients about their health.

Clinical Decision Support

ChatGPT would assist healthcare professionals by offering evidence-based recommendations for diagnosis and treatment. It might analyze patient's data and medical literature to provide insights that support clinical decision-making ^[2].

Research and Literature Review

Researchers can use ChatGPT to efficiently summarize large volumes of scientific literature, identify key findings, and suggest areas for further investigation. This capability helps streamline the research process and aids in development of new hypotheses ^[7].

Administrative Support

ChatGPT can automate periodic administrative tasks such as scheduling appointments, handling billing inquiries and managing all

patient records. This reduces the administrative burden on staff of the healthcare and allows them to focus much on the patient care ^[8].

Symptom Checker and Preliminary Diagnosis

ChatGPT can function as a symptom checker, helping patients understand potential causes of their symptoms and advising when to seek medical attention. While not a replacement for professional diagnosis, it can provide initial guidance and reduce unnecessary visits to healthcare facilities ^[9].

Mental Health Support

ChatGPT can offer support for mental health by giving information on coping strategies, answering questions about mental health conditions, and suggesting resources for further help. It may also give immediate, although limited, support in times of crisis ^[10].

Telemedicine and Virtual Health Assistance

In the realm of telemedicine, ChatGPT will in assisting virtual consultations by gathering preliminary patient information, documenting symptoms, and providing follow-up care instructions. This enhances the efficiency and effectiveness of telehealth services ^[11].

Integration with Electronic Health Records (EHR)

ChatGPT can be integrated with EHR systems to provide real-time support to healthcare providers. It can help with the retrieval of patient data, suggest potential diagnoses based on medical records, and assist in documenting patient encounters ^[12].

Ethical Considerations and Patient Safety

ChatGPT ensures that recommendations adhere to ethical guidelines and safety standards, minimizing the severity of the adverse effects. It helps patients understand the benefits and risks of therapies, promoting informed consent and shared decision-making ^[13].

Education and Training

Medical students and healthcare professionals can use ChatGPT as a learning tool. It can provide explanations of complex medical concepts, quiz users on their knowledge, and simulate patient interactions to enhance training ^[14].

By leveraging these applications, ChatGPT has the potential to significantly increase various aspects of medical practice, improving patient care, supporting healthcare professionals, and advancing medical research.

Challenges of ChatGPT

Credibility and Accuracy

Ensuring the accuracy of the information obtained by ChatGPT is crucial. AI models are only as good as the data they are trained on. If the training data contains errors or biases, the model may perpetuate misinformation, which can be particularly harmful in healthcare contexts ^[3].

Data Privacy & Security

Handling sensitive patient data with AI systems raises significant privacy and security concerns. Ensuring that patient information is protected from breaches and misuse is paramount, and

compliance with the regulations like as HIPAA in the United States is essential ^[11].

Integration with Existing Systems

Integrating ChatGPT with existing electronic health records (EHR) and other medical systems can be technically challenging. Compatibility issues and the need for seamless data flow between systems must be addressed to maximize the utility of AI in clinical settings ^[12].

Ethical Considerations

The deployment of AI in the medicine must navigate various ethical challenges, including the risk of bias in AI recommendations and ensuring informed consent. Plagiarism and the potential of Artificial intelligence to be used inappropriately or without proper oversight also present ethical dilemmas ^[4, 5].

Regulatory and Legal Challenges

The regulatory landscape for AI in healthcare is still evolving. Clear guidelines and standards for the development and use of Artificial intelligence tools like ChatGPT are needed to ensure they meet safety and efficacy standards ^[14].

Areas of Future Exploration for ChatGPT in Medicine: **Personalized Medicine**

Future research has to focus on leveraging ChatGPT to deliver personalized medical advice and treatment plans. This includes integrating genetic, lifestyle, and environmental data to tailor healthcare recommendations to individual patients, thereby enhancing the precision and effectiveness of medical interventions ^[6].

Integration with Electronic Health Records (EHR)

Exploring the ChatGPT's integration with EHR systems can streamline data retrieval and entry processes, assist in real-time decision-making, and provide comprehensive patient histories to support clinical diagnostics and treatment plans ^[13].

Telemedicine Support

Developing ChatGPT's capabilities to support telemedicine by providing preliminary consultations, triage services, and continuous patient monitoring. This might improve access for healthcare, especially in remote and underserved areas ^[11-12].

Mental Health Applications

Enhancing ChatGPT to provide mental health support through virtual counselling, cognitive behavioural therapy (CBT) guidance, and crisis intervention. This could offer scalable solutions for mental health care, reducing the burden on healthcare providers ^[10].

Clinical Decision Support

Utilizing ChatGPT for assisting healthcare professionals by providing evidence-based recommendations, diagnostic support, and treatment options. This includes integrating the latest clinical guidelines and research findings to ensure up-to-date information ^[7].

Patient Education and Engagement

Enhancing ChatGPT's ability to educate patients about their conditions, preventive measures and treatment options. This can

improve patient engaging of patient, adherence to the treatment plans, and overall health literacy ^[3].

Drug Interaction and Adverse Effect Monitoring

Developing tools within ChatGPT to monitor potential drug interaction and adverse effect, providing alerts and recommendation to both patients & healthcare provider to enhance medication safety ^[14].

Clinical Research and Trial Recruitment

Leveraging ChatGPT to identify suitable candidates for clinical trials, facilitate patient recruitment, and manage participant communications. This can accelerate the research process and improve trial efficiency ^[9].

Future Directions

Improving Data Quality

An effort has to be made to ensure high-quality, diverse, and unbiased datasets for training AI models. Continuous updating of the training data with the research findings which has been found recent and clinical guidelines will enhance the reliability of ChatGPT's recommendations ^[7].

Enhancing Interpretability and Transparency

Developing methods to make AI models more interpretable and transparent which will help users understand how decisions are made. This can build trust and allow for better validation of AI-generated recommendations ^[6].

Strengthening Privacy Protections

Implementing robust data encryption and anonymization techniques will help protect patient data. Additionally, developing clear policies and protocols for data handling will ensure compliance with privacy regulations ^[11].

Integration with Clinical Workflows

Developing user-friendly interfaces and ensuring seamless ChatGPT's integration with existing healthcare systems will improve its usability and adoption. Training healthcare professionals to effectively use AI tools will also be important ^[12].

Ethical AI Practices

Establishing ethical guidelines for the AI use in healthcare, including mechanisms for accountability and oversight, will help address ethical concerns. Ongoing ethical training for AI developers and users is also crucial ^[13].

Promoting Interdisciplinary Collaboration

Collaboration between AI developers, ethicists, healthcare professionals and policymakers will be important to address the multifaceted challenges of integrating AI into healthcare. Such collaboration can foster innovation and ensures that the AI tools are developed to use responsibly ^[9].

Areas of future exploration include

Enhanced Personalization

Leveraging ChatGPT to deliver personalized healthcare experiences tailored to individual patient needs and preferences.

Integration with Wearable Devices

Integrating ChatGPT with wearable health monitoring devices to provide real-time health insights and interventions.

Collaborative Decision Making

Facilitating collaboration between ChatGPT & the human healthcare providers to augment clinical decision-making processes.

ChatGPT in Complementary and Alternative Medicine (CAM)

ChatGPT holds significant potential in the field of Complementary and Alternative Medicine (CAM), offering numerous benefits across various aspects of patient care, research, and education. By providing accurate, evidence-based information, about CAM therapies ChatGPT helps patients to make informed decisions [6] and serves as a valuable resource for healthcare professionals to be stay updated with the latest research and clinical guidelines [15]. It offers personalized CAM recommendations based on individual health profiles, aids in the creating of customized treatment plans [9], and assists in managing symptoms by suggesting appropriate CAM interventions such as herbal remedies, acupuncture, or yoga [8]. ChatGPT also supports researchers by summarizing scientific literature in large volumes, identifying key findings, and suggesting areas for further investigation [7].

while helping to interpret clinical data and patient outcomes, thereby supporting the development of evidence-based CAM practices [16]. Additionally, ChatGPT enhances patient engagement by providing continuous support, answering questions, offering reminders for therapies, and motivating adherence to CAM treatments [17], as well as facilitating the creation of online communities where patients can share experiences and support each other [10].

It promotes the integration of CAM by providing balanced information with conventional medicine, encouraging holistic patient care [11], and fostering collaboration between conventional healthcare providers and CAM practitioners for a coordinated and comprehensive treatment plan [12]. Furthermore, ChatGPT ensures that CAM recommendations adhere to ethical guidelines and safety standards, minimizing the risk of adverse effects [13], and helps patients understand the benefits along with risks of CAM therapies, promoting informed consent and shared decision-making [14]. In summary, ChatGPT can significantly advance CAM by enhancing education, providing personalized care, supporting research, engaging patients, integrating with conventional medicine, and ensuring ethical practices.

Table 1: A comparison of responses from ChatGPT-4 with conclusions drawn from recent systematic reviews regarding the effectiveness of complementary and alternative medicine (CAM) interventions, using a specific case as an example.

Comparison study between the ChatGPT-4's responses & conclusions on the evidence of CAM interventions from the latest systematic reviews: an example case	
A question (an input prompt): Can you summarize the clinical evidence for manual acupuncture, moxibustion electro acupuncture and herbal medicine in the treatment of cancer -related fatigue? Would you suggest these interventions? How strong the recommendations, and what are is the level of evidence for each intervention?	
ChatGPT-4's response	Latest systematic review
As an AI language model, I can provide a general overview of the evidence regarding complementary and alternative medicine (CAM) interventions for cancer-related fatigue. However, my knowledge is current only till 2021 September, so it's essential to consult the guidelines and latest research for the high accurate information. Manual Acupuncture: Few studies indicate that manual acupuncture may help decrease cancer-related fatigue. However, the evidence quality is often low because of small sample sizes, potential bias, and inconsistencies in findings across studies. Electroacupuncture There is some promise in using electroacupuncture to reduce cancer-related fatigue. Positive outcomes have reported from several trials, the overall evidence remains insufficient for definitive conclusions. Moxibustion There are few studies on moxibustion's effectiveness for cancer-related fatigue, & the existing evidence is generally weak. More rigorous research is necessary to assess its potential benefits. Herbal Medicine Some evidence suggests that specific herbal medicines might support to reduce cancer-related fatigue. However, the quality of studies varies, and further research is required to confirm their effectiveness. It's important to note that I am not a medical professional. Before guiding any intervention, it's necessary to consult a healthcare provider who may assess the patient's individual situation and weigh potential risks as well as benefits. The recommendations and the level of evidence obtained from the strength for each intervention can vary based on sources such as clinical practice guidelines / systematic reviews. For the most accurate information always refer to the latest and most relevant guidelines or research for the most accurate information.	"Both manual and electroacupuncture has found to be effective and safer to treat cancer-related fatigue. Nevertheless, further research is needed, specifically larger-scale and higher-quality randomized controlled trials" [32]. "Due to the high risk of bias & poor reporting quality among the studies reviewed, it is challenging to conclude that moxibustion is an safer and effective treatment for cancer-related fatigue." [31]. "When compared with conventional medicine alone, the combination of herbal medicine and conventional treatment significantly enhanced fatigue levels, quality of life and daily functioning. As a standalone treatment, herbal medicine also notably improved daily functioning compared to megestrol, with no serious adverse events linked to herbal medicine reported. The suggestion obtained from the limited evidence that herbal medicine may be both effective as well as safe for managing cancer-related fatigue in the lung cancer patients." [29-30].

CONCLUSION

ChatGPT holds immense potential in transforming various facets of medicine, including CAM, by facilitating access to healthcare information, supporting clinical decision-making, and improving in outcomes of the patient. However, realizing this potential requires addressing ethical concerns inherent limitations and ensuring responsible deployment in healthcare settings from ChatGPT. Moving forward, collaborative efforts between the AI developers, healthcare professionals, and the regulatory bodies are important to harnessing the complete benefits of ChatGPT while safeguarding patient welfare and privacy in the rapidly evolving landscape of medicine.

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