

AI-ChatGPT/GPT4: Shaping the Future of Pain Medicine

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Abstract

Artificial intelligence (AI) development holds tremendous potential for transforming the healthcare industry, with ChatGPT/GPT-4 being a multimodal language model released by Open AI. This study aims to explore the potential impact of the AI model ChatGPT/GPT-4 in the field of Pain Medicine. ChatGPT/GPT-4 is shaping the future of Pain Medicine.

Keywords: Artificial intelligence; ChatGPT; GPT-4; Pain Medicine.

Introduction

The development of AI has been closely intertwined with the healthcare industry. In medicine, AI applications encompass a wide range of areas, including image analysis, detection of drug interactions, identification of high-risk patients, and medical record coding [1]. Recently, the ChatGPT/GPT-4 release by OPENAI has garnered widespread attention in the academic community [2,3]. It has garnered considerable attention from several top-tier journals, including Nature, Science, and The New England Journal of Medicine [4-7]. ChatGPT/GPT-4 is a language model based on the transformer architecture [4]. After extensive training on a large amount of text data, it has successfully generated text resembling human language, enabling users to access information more intuitively [8]. In addition to its exceptional chat capabilities, it is noteworthy for its powerful search capabilities, professional answers, reasonable suggestions, and efficient data processing and integration [5,9].

Notably, it has excelled in the mock bar exam, surpassing the scores of 90% of test takers, and has achieved commendable results on the US medical licensing exam [10]. Studies have explored the role of ChatGPT/GPT-4 in various medical disciplines, including radiology, sports medicine, obstetrics and gynecology, infectious diseases, neurosurgery, spinal surgery, physical medicine and rehabilitation, and other diverse medical fields [11-17]. However, to date, no research has analyzed the potential applications of ChatGPT/GPT-4 in various aspects of Pain Medicine.

The International Association for the Study of Pain (IASP) defines pain as 'an unpleasant sensory and emotional experience, associated with actual or potential tissue damage, or

described in terms of such damage' and nociception as 'the neural process of encoding noxious stimuli' [18].

Painful diseases constitute a prevalent category of disorders closely associated with individual lifestyles. Back pain stands as a leading cause of global disability-adjusted life years, followed by headaches (surpassing diabetes and chronic obstructive pulmonary disease) [19]. This does not fully account for the pain burden concealed in other chronic conditions (such as diabetes and rheumatoid arthritis).

With the advent of ChatGPT/GPT-4, a revolution in the medical field has begun. In light of this, our research group conducted an online survey, primarily focusing on describing the three potentially significant roles of ChatGPT/GPT-4 in Pain Medicine.

Medical History Taking and Triage

ChatGPT/GPT-4 significantly supports medical history taking and triage in Pain Medicine. Its advanced natural language processing capabilities enable interactive and thorough medical history collection, enhancing the accuracy and completeness of patient information. Additionally, ChatGPT/GPT-4 excels in semantic understanding, interpreting critical information in pain descriptions provided by patients, including location, intensity, and nature. This facilitates more precise communication, driving accurate diagnoses and personalized treatment.

In triage, ChatGPT/GPT-4 rapidly assesses the urgency and severity of pain cases, enabling healthcare professionals to allocate resources more effectively and prioritize issues. By identifying high-risk factors, the model aids in the early detection of critical topics. Furthermore, ChatGPT/GPT-4 provides patients with informative content, promoting patient

education and self-management. Combining its ability to generate structured medical records, ChatGPT/GPT-4 offers a comprehensive and efficient tool for medical teams, advancing innovation and delivering excellent services in Pain Medicine.

Scientific Research

ChatGPT/GPT-4 demonstrates significant potential in scientific research, offering comprehensive support to researchers^[20,21]. Its ability to rapidly scan published literature lets researchers stay informed about the latest research directions and hot topics. In single-cell analysis, ChatGPT/GPT-4 has been validated for automatic cell-type annotation^[22]. For non-English native scientists, ChatGPT/GPT-4 provides crucial assistance in translation and polishing, even offering detailed refinement according to the requirements of different journals. However, it is essential to note that the data collection process of ChatGPT/GPT-4 may inadvertently increase the risk of plagiarism. ChatGPT/GPT-4 is a valuable auxiliary tool in Pain Medicine research, providing researchers with holistic support and guidance.

Pain Education

Pain education is a critical component in medicine, aiding patients in understanding the nature and causes of pain, providing effective management strategies, and improving the quality of life, particularly for individuals with chronic pain. It contributes to enhancing self-management capabilities and promoting rehabilitation. The potential value of ChatGPT/GPT-4 in pain education is primarily manifested in the following aspects: Personalized Information Delivery: ChatGPT/GPT-4 generates personalized educational materials based on the patient's condition and requirements, enhancing their understanding of treatment; Real-time Question Answering: ChatGPT/GPT-4 provides real-time answers to questions, offering reliable information on treatment methods, medication side effects, and other relevant aspects; Promoting Latest Research and Treatment Advances: ChatGPT/GPT-4 updates its database, incorporating the latest research in pain management, aiding healthcare professionals and patients in staying informed about the most recent scientific knowledge; Patient Engagement and Communication: ChatGPT/GPT-4 engages with patients by answering questions and explaining medical terms, fostering patient participation and strengthening their understanding and confidence in the treatment process.

ChatGPT/GPT-4 is an intelligent and personalized educational assistant in pain education, providing comprehensive pain management information to patients. It enhances doctor-patient communication, improves patient understanding of the disease and treatment, and promotes more effective treatment and active patient engagement.

Limitations

Despite the numerous potential impacts of ChatGPT/GPT-4 in the field of Pain Medicine, it still faces several limitations. Firstly, the information it outputs may be constrained by the rules of the training data, resulting in inaccurate or incomplete answers in specific contexts. Secondly, ChatGPT/GPT-4 may need more specialized medical knowledge when dealing with clinical and complex cases, leading to less comprehensive or suitable recommendations. Additionally, ChatGPT/GPT-4 may be less influenced by the constantly evolving knowledge and guidelines in the medical field, as its training data might not include the latest medical advancements. Furthermore, privacy

and security considerations could be drawbacks when dealing with susceptible and urgent medical information. In conclusion, while ChatGPT/GPT-4 provides valuable support in Pain Medicine, its limitations should be carefully considered in its application.

Conclusion

This study explores various ChatGPT/GPT-4 applications in Pain Medicine, including medical history collection and triage, scientific research, and pain education. The widespread implementation of these applications is expected to advance and innovate the field of Pain Medicine significantly. We anticipate that the future of Pain Medicine will extensively involve research related to AI, with AI-based tools such as ChatGPT/GPT-4 playing crucial roles. However, the evolution of AI is an ongoing process. While we benefit from AI's advantages, attention must be directed toward data security and privacy, ethical and moral considerations, and the risks of misuse and improper use. Actively addressing these concerns and establishing prudent regulations and guidelines will guide the continued development of AI. By tackling these issues, Pain Medicine can fully harness the potential of AI and progress continually.

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Author Contributions

Lei Liu and Shengxin Peng conceived this study. Bin Shi, Gongchang Yu, Yuanhao Liang, Wenshan Xiao and Yixiang Zhang contributed to the methodology, data curation, formal analysis, resources, and investigation. Lei Liu and Shengxin Peng wrote the manuscript. Rui Xu critically reviewed the manuscript. All authors discussed and approved the final manuscript for submission.

Data Availability

Not applicable.

Declarations

Conflict Interest

All authors declare no conflict of interest. No benefits in any form have been or will be received from a commercial party related directly or indirectly to the subject of this manuscript.

Ethical Approval

This study does not include any individual-level data and thus does not require any ethical approval.

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