Perspective

INTERNATIONAL JOURNAL OF SURGERY

OPEN

Auxiliary use of ChatGPT in surgical diagnosis and treatment

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Abstract

ChatGPT can be used as an auxiliary tool in surgical diagnosis and treatment in several ways. One of the most incredible values of using ChatGPT is its ability to quickly process and handle large amounts of data and provide relatively accurate information to healthcare workers. Due to its high accuracy and ability to process big data, ChatGPT has been widely used in the healthcare industry for tasks such as assisting medical diagnosis, giving predictions of some diseases, and analyzing some medical cases. Surgical diagnosis and treatment can serve as an auxiliary tool to help healthcare professionals. Process large amounts of medical data, provide real-time guidance and feedback, and increase healthcare's overall speed and quality. Although it has great acceptance, it still faces issues such as ethics, patient privacy, data security, law, trustworthiness, and accuracy. This study aimed to explore the auxiliary use of ChatGPT in surgical diagnosis and treatment.

Introduction

Artificial intelligence (AI) technology development has been rapid in recent years. Applying natural language processing technology in the medical field has gradually received much attention and expectation. Nowadays, ChatGPT is one of the best models that can understand the semantics and logic of natural language by learning from a large amount of text data from humans and generating natural language responses similar to human conversations. Due to its excellent performance in processing natural language, the auxiliary use of ChatGPT in surgical diagnosis and treatment has also gradually been recognized.

ChatGPT can be crucial in surgical diagnosis and treatment but needs human supervision and ethical norms. It is important to note that the responses are purely informational. It must not be used as a substitute for professional medical advice. It is also crucial to have human supervision when using it in the medical field. It is essential to have an operator who can interpret and handle the results generated, make informed decisions based on their clinical judgment, and check the authenticity of that information.

Furthermore, when using ChatGPT in any part of the medical field must focus on ethical norms, such as data security and informed consent. Algorithms must be transparent, explainable, and reliable. Regulatory bodies must govern the use to prevent biases and ensure fairness. ChatGPT should be used under the supervision of human medical professionals and with adherence to ethical norms and laws.

HIGHLIGHTS

- ChatGPT can be crucial in auxiliary use in surgical diagnosis and treatment.
- The application of ChatGPT is widespread but needs lots of research to optimize.
- The use of ChatGPT needs adherence to ethical norms and laws.
- The potential and accuracy of ChatGPT are increasing with training from humans.
- The public's trust is essential to make ChatGPT's application acceptable.

Rookie star: ChatGPT

ChatGPT has attracted worldwide attention. ChatGPT is an AI chatbot developed by OpenAI. It is trained to follow instructions and provide a detailed response using Reinforcement Learning from Human Feedback (RLHF) https://openai.com/blog/chatgpt. Statistics from 'similarweb' (2023/07/13) show that the United States has the largest proportion of ChatGPT users (9.61%). India ranked second (8.33%). The third place is Japan (7.27%). In fourth place is Indonesia (4.70%). Brazil ranked fifth (3.55%). The top five countries account take almost a third (33.46%) of all ChatGPT users https://pro.similarweb.com/#/digitalsuite/websi

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Sponsorships or competing interests that may be relevant to content are disclosed at the end of this article.

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International Journal of Surgery (2023) 109:3940–3943

Received 24 May 2023; Accepted 9 August 2023

Published online 2 September 2023

http://dx.doi.org/10.1097/JS9.0000000000000686

teanalysis/audience-geography/*/999/3m?key=chat.openai.com&webSource=Total.

As an AI-based natural language processing model, ChatGPT is gaining more attention and research in its application in surgical diagnosis and treatment. Through learning from large amounts of text data, it can automatically learn and understand the semantics and logic of human language. It can provide doctors and patients with more personalized, accurate, efficient diagnosis, and treatment services. Recently, research has discovered medical chatbots' impact as a disruptive technology and gives out potential solutions for it[1]. Also, a present study shed light on the development of chatbots in mental health, particularly for a stressed target group[2]. Nowadays, many people may compare ChatGPT with Google. ChatGPT's answers are generated by AI algorithms, but Google's search results are based on page ranking and keyword matching. ChatGPT can provide more personal and in-depth answers while Google is better for finding broad information. In the new era of digital life, its development space and potential for auxiliary use in surgical diagnosis and treatment are huge but require a lot of research and training to adapt it to work. At the same time, we need to deepen social trust in it to maximize its effect.

The potential of ChatGPT in surgery

The potential of ChatGPT is huge and much discussed. In certain situations, it may provide helpful assistance. A recent study has shown that ChatGPT can analyze patient data. It included vital signs, imaging findings, and making decisions in real-time during surgery. It can then advise the surgeon on the action. As the rapid evolution, the procedure will be more effective in the following days and complications may be less likely[3]. When doctors need to look up the latest research or treatment options for a particular disease, ChatGPT can provide relevant literature and information. Additionally, it can serve as a tool to help doctors and patients solve fundamental problems, such as describing symptoms and understanding certain medications. It can provide information on diseases and treatments, thus providing more convenient and faster support for the medical industry. It can also aid in planning by providing information on optimal surgical approaches and techniques based on patient-specific data, such as anatomical variations and medical history. Moreover, ChatGPT can assist in postoperative care by monitoring patient progress and alerting healthcare providers to any signs of complications. On the other hand, there have been study exploring the potential of ChatGPT in being an interactive medical education tool to support learning, with promising results[4]. In addition to being used in the education of human medicine, it can also be used in the education of veterinary medicine. Chatbots such as ChatGPT can provide valuable supplemental resources and support for veterinary education[5]. However, further improvement is still needed before it can be widely used. Moreover, as the world becomes increasingly connected, ChatGPT has the potential to revolutionize travel medicine[6]. Make it easier to prepare for travel and avoid potential health risks. For better use, lots of research and investigation are needed to prove the effectiveness and reliability of ChatGPT in medical status. The most important is finding the best ways to use it in the medical field and surgical practice.

Application of ChatGPT in surgery

The application of ChatGPT in surgery is multifaceted. With its high potential, ChatGPT can play a role in some surgical diagnosis and treatment cases. It can be used to diagnose some cases of the disease, plan some surgical action, plan a treatment schedule after the operation, follow the patient's health condition after treatment and make a prognostic evaluation. Regarding disease diagnosis, ChatGPT can assist doctors in making rapid and accurate diagnoses by analyzing patient data based on the patient's medical records, condition descriptions, laboratory results, and imaging studies. In research, clinical AI has proven to improve clinical decision-making and reduce the risk of patient harm[7]. ChatGPT can also suggest potential diagnoses based on the patient's various disease symptoms and records of medical action. For surgical planning, ChatGPT can assist doctors in developing an optimal surgical plan based on patient data and medical knowledge, including analyzing patient data and generating surgical options. The treatment plan after the operation can provide personalized suggestions for various patients based on their medical history, individual characteristics and conditions. It can improve the accuracy of using it in diagnosis and treatment. Additionally, it can help doctors personalize the treatment plans for patients based on their specific conditions, such as sex, age, lifestyle, and environment. It can also assist in follow-tracking and prognostic evaluation to solve health problems. Its applications may play a role in surgical diagnosis and treatment in the future with lots of practice using huge amounts of data and cases by a human. Ethical and law problems are also present in the application in various fields. Problems such as the privacy of patients and the security of data, informed consent from patients, and potential harm are also severe. Patient privacy and data security must also be seriously considered to protect the right of patients. While there is promising research on the use of ChatGPT in surgical diagnosis and treatment, there is still a need for rigorous clinical validation to demonstrate its safety and effectiveness in healthcare settings.

Accuracy in surgical diagnosis and treatment

The accuracy of ChatGPT is high but still not as good as a professional doctor in some respects. To confirm and increase the reliability and accuracy of ChatGPT application in surgical diagnosis and treatment, further research and development of the model are necessary with a focus on data quality and diversity. Its application in diagnosing has been explored in some literature. In research, ChatGPT-3 can generate differential-diagnosis lists for everyday clinical vignettes with good diagnostic accuracy. The total rate of correct diagnosis was more than 90% for the 10 differential-diagnosis lists generated by ChatGPT-3 but still lower than physicians in some situations[8], demonstrating the potential and limitation for ChatGPT to be used to diagnose diseases. GPT-3 is a large-scale language model trained by OpenAI. GPT-3 is OpenAI's third-generation GPT language model. ChatGPT is an AI chatbot that uses GPT's language model. It is a variant of the GPT-3 model explicitly designed for chatbot applications. It is trained on large datasets of conversational text to generate responses more suitable for use in a chatbot context. Regarding performance and accuracy, ChatGPT is less powerful than GPT-3 but is ideal for chatbot applications. Although its accuracy is not as good as humans for the time being, it will improve increasingly with continuous training. In a study, ChatGPT recapitulated extensive knowledge about cirrhosis (79.1% correct) and Hepatocellular carcinoma (HCC) (74.0% correct), but

only a small fraction (cirrhosis 47.3%, HCC 41.1%) was marked as comprehensive. It answered 76.9% of the questions correctly but failed to specify decision cutoffs and treatment durations[9]. Although its accuracy is high, it still faces various limitations. It can be used as a tool for adjuvant treatment, but it cannot completely replace the diagnosis of medical staff. Although it has been demonstrated to have high accuracy and precision in surgical diagnosis and treatment, its reliability and accuracy still need further verification and evaluation. An evaluation system needs to be established. Ensure the application of ChatGPT in surgical diagnosis and treatment can meet clinical requirements and provides accurate diagnostic and treatment recommendations for doctors and patients. While these results are promising, it is essential to note that further research is needed to evaluate the accuracy and generalizability of ChatGPT in surgical diagnosis and treatment across various conditions and healthcare settings.

Ethical and legal issues

The use of AI in healthcare faces ethical and legal issues. The most prevalent ethical concerns are patient safety, algorithmic transparency, lack of proper regulation, responsibility and accountability, impact on doctor-patient relationship, and governance of AI healthcare. The shortcomings of its implementation are related to complex ELSI (ethical, legal, and social implications) that still need to be resolved[10]. The application of ChatGPT also involves ethical and legal issues. While using ChatGPT, handling and keeping patients' medical data or identity information is essential, which may involve patient privacy and data protection issues. Therefore, perfect data and privacy protection systems must be established to protect patient's privacy and their data's security. Using ChatGPT in the medical field should not completely replace the decision-making of doctors or other professionals. Adhering to ethical concepts is very important for using ChatGPT correctly, especially fairness, transparency, and privacy protection. During the diagnosis and treatment process, doctors can make preliminary decisions based on the recommendations but final decisions based on the specific situation and experience. On the other hand, in using it for diagnosis and treatment, patient-informed rights must be confirmed. Patients need to be informed of its function, value, risks, and benefits. Also, make their own decisions in use or not. In using it in the field of surgical diagnosis and treatment, medical ethical issues are very important. The application must obey ethical principles, respect patient rights and avoid unnecessary risks. While using ChatGPT to help patients with diseases, we must pay attention to the privacy of patients and the protection of data, accuracy and informed consent. The ethical issues and the problems of the law are also important. Careful consideration and handling of these issues can ensure the application of ChatGPT in the medical field. Especially the safety, reliability, and legality of surgical diagnosis and treatment.

Patient privacy

In using big data in the medical field, patient privacy is important. Protecting patient privacy requires multiple technology tools. It addresses regulations for sharing, de-identifying, securing storage, transmitting, and processing protected health information. De-identification is an indispensable tool in this suite of privacy tools[11]. ChatGPT is designed to process and generate text based on its input. It is essential to ensure patient privacy and rights when using it in the medical field. To confirm patient privacy in surgical applications, several methods can be used. Accessing the ChatGPT system should be restricted to authorized personnel only. A log of all interactions with the system should be kept. On the other hand, communication between doctors and ChatGPT should be encrypted to protect the patient's health information. To further protect patient privacy, any data sent to ChatGPT should be de-identified or anonymized to remove personal information. At last, every use of ChatGPT in medical or surgical applications should comply with applicable rules. The operator needs to take all necessary steps to protect patient privacy when using ChatGPT in applications.

Data security

Data security is important in using data science in digital health. Ensuring the security of patient data is critical when using ChatGPT for medical purposes. Data should be 100% encrypted at all times. This means all data should be encrypted as it is being transmitted across networks and also when it is stored on servers or other devices. The legal use of electronic health records is permitted only in clinical care. Any other use of the data will require careful consideration of the patient's legal context and direct consent. Personally identifiable and sensitive information must be fully anonymized[12]. Also, the accessing controls should be implemented to confirm that only specific users exist. For example, only doctors and nurses can access patient data. Patients should be fully informed about how their data will be used and who can access it. They should be allowed to provide their consent to the use of their data for ChatGPT-based diagnosis and treatment. Any data from the patient in medical use should be regularly audited to detect and resolve any minor loopholes or security weaknesses in the system. This may involve performing tests and scanning for bugs. All personnel with access to patient data should be trained in data security. It includes training them on how to handle data. By taking these steps, we can make its use safer and confirm that data is used securely.

Social crowd's trust

The social crowd's trust is critical for their adoption of ChatGPT. In a study, 607 respondents completed the survey. Fewer people use it for health-related inquiries ($n = 44$, 7.2%)[13]. That means the population still has reservations about its application in medicine. The public has a relatively low level of trust in ChatGPT's application in medical uses, particularly in some actions related to human bodies. This may be related to public concerns about AI technology's safety and privacy protection issues in healthcare. To increase public trust, it is essential to strengthen the education and propaganda of the application transparency and privacy protection methods. Also, healthcare providers and developers should be transparent about how ChatGPT works and what data is used. Transparency can help patients and the public understand the technology better and increase their trust.

Limitations and challenges

Various limitations and challenges remain in the usage of ChatGPT. Since ChatGPT learns and progresses from existing language corpora, its performance and usage ceiling are influenced by the quality

and quantity of training data. It needs a lot of data to train and optimize its algorithm. However, in some cases, data may need to be more complete, making it difficult for ChatGPT to provide accurate predictions or recommendations. Additionally, due to the diversity and complexity of human language, it may not correctly understand and handle certain special situations. Also, bias and generalizability are significant challenges when using ChatGPT in healthcare. The data may be dominated by certain demographic characteristics or underrepresented by others[14]. Its algorithms may be biased or overfit to specific patient populations, limiting its ability to provide accurate predictions for other populations. Furthermore, explainability is one of the most discussed topics regarding the application of AI in healthcare. The lack of explainability in AI continues to draw criticism. However, explainability is not a purely technical problem but raises a series of medical, legal, ethical, and social issues that need to be solved[15]. More research exploration is needed. As long as a series of limitations and challenges can be addressed, it can be a socially acceptable and reliable surgical aid.

Conclusions

In summary, the application of ChatGPT in surgical diagnosis and treatment has good potential and advantages but faces certain limitations and challenges. In future research, it is necessary to improve and perfect the model while strengthening supervision and standardizing its application. Despite some limitations and challenges, ChatGPT shows great potential in disease diagnosis, surgery planning, treatment plan formulation, follow-up tracking, and prognosis assessment. With the further improvement of technology, the application of AI in the medical field will become more extensive. ChatGPT is a superior technology, especially in the auxiliary use in surgical diagnosis and treatment will produce huge medical value. Although ChatGPT has broad application prospects in surgical diagnosis and treatment, it still cannot have a subversive impact on the medical field. To make it go further in medical application, it needs to be trained, strengthened in research, enacted relevant laws, carried out in education, and publicity. It is also promoted to increase social acceptance and make it a medical device that can be used worldwide. It becomes an important tool for auxiliary use in surgical diagnosis and treatment through extensive research and training.

Ethical approval

Not required in this study.

Consent

Not required in this study.

Funding source

Not required in this study.

Author contributions

K.A. and W.Y.: conceptualization, methodology, data curation, and formal analysis; W.Y.: resources, supervision, and project administration; K.A.: writing – original draft preparation; K.A. and W.Y.: writing – review and editing.

Conflicts of interest disclosure

The authors declared no conflicts of interest.

Research registration unique identifying number (UIN)

Not required in this study.

Guarantor

Wah Yang.

Provenance and peer review

None.

Data availability statement

Not required in this study.

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