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Future of ChatGPT in reducing medical error: a narrative review

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Abstract

The need for technological advancements supporting medical professionals' decision-making processes has increased due to the rising need for effective healthcare delivery. ChatGPT (OpenAI Incorporated, Mission District, San Francisco, USA) is a state-of-the-art language model based on the Generative Pre-trained Transformers (GPT)-4 architecture. Given ChatGPT's potential, It was extensively tested as a helpful tool for aiding healthcare professionals in creating medical reports based on actual patient laboratory results. In this review, we explored the applications of ChatGPT in healthcare reporting. We investigated ChatGPT's applications in healthcare through an extensive analysis of academic literature, particularly its capacity to interpret test results, offer real-time clinical guidance, and improve medical reporting. The ability of ChatGPT to act as a search engine that provides answers to questions without referring users to other websites has the potential to streamline healthcare processes and free up valuable time for medical professionals to focus on their core responsibilities. Despite ChatGPT's revolutionary potential, ethical considerations regarding patient privacy, human oversight, and prejudice reduction must be carefully considered. ChatGPT has the potential to significantly improve patient care through enhanced accuracy, precision, and overall reporting procedures in the medical field. However, ethical considerations are needed for such tools to be implemented in healthcare.

Keywords: ChatGPT Applications; Medical Reporting; Healthcare Technology; Ethical Considerations; Clinical Decision Support

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1. Introduction

In the big data era, healthcare data evolved in a variety of formats (Huang et al., 2021). Personalized health monitoring devices, for example, allow for the collection of data specific to a person's everyday activities (Liu et al., 2023). Similarly, rapidly advancing laboratory techniques produce massive amounts of sequencing data (Cheng et al., 2020). These novel data formats, however, are more vulnerable to missing values than standard tabular clinical data from prospective observational or randomized trials (Huang et al., 2021). ChatGPT analyzes patient data by first collecting and organizing relevant information such as symptoms, medical history, test results, and treatment options. It then uses this data to generate insights and correlations that can guide specific treatment recommendations based on evidence-based guidelines and best practices in healthcare. By analyzing patterns in the data, ChatGPT can provide personalized and effective treatment suggestions tailored to each individual patient's needs and conditions.

Missing values pose a significant challenge in data analysis: they can diminish prediction power and lead to bias in downstream decision-making (Peralta et al., 2021), which is especially troublesome in high-fidelity decision-making settings such as those in healthcare. Missingness may be resolved by complete data analysis or simple imputation (mean, median, or mode) for tabular static data. However, such tactics may not be suitable for a wide range of data types and structures, from static to temporal, tabular to imaging and sequencing data (Rasmy et al., 2021). As a result, new methodologies are required to assure model quality and robustness (Cheng et al., 2020).

ChatGPT can potentially improve patient care and safety by allowing clinicians to obtain real-time support in identifying and treating patients. ChatGPT, a type of artificial intelligence (AI), uses natural language processing (NLP) to comprehend and respond to human language(Zhu et al., 2023). It has been trained to reply to a wide range of inquiries and requests in the same way that a human would. It can be used in various industries, including healthcare, to assist clinicians in the real-time diagnosis and treatment of patients (Cascella et al., 2023). This could improve the quality of care offered to patients(Gordijn & Have, 2023). It can also analyze patient data and make specific treatment suggestions to professionals based on the patient's medical history, symptoms, and other variables. ChatGPT can learn from previous interactions and utilize that knowledge to respond appropriately to future questions, gradually becoming a more successful chatbot (Cascella et al., 2023; Bal Ram & Pratima Verma, 2023). ChatGPT recognizes the overall context of a question or conversation and generates detailed responses pertinent to the topic (DiGiorgio & Ehrenfeld, 2023). ChatGPT can be used in healthcare for a variety of purposes, including improving patient experiences, supporting medical workers in optimizing healthcare procedures, and

disclosing vital information (Aydın & Karaarslan, 2022). It can provide a better healthcare solution that facilitates communication between medical care providers and patients (Patel & Lam, 2023; Shen et al., 2023). ChatGPT can enhance the quality of care provided to patients by assisting healthcare professionals quickly accessing information, providing personalized recommendations, offering emotional support through empathetic responses, and improving communication with patients through clear and concise explanations. Additionally, ChatGPT can help streamline administrative tasks, freeing up more time for healthcare providers to focus on direct patient care.

2. Methodology

This review study gathered information using keywords linked to ChatGPT's role in lowering medical reporting errors from academic databases, including PubMed and Google Scholar. Articles written between 2000 and 2023 that covered ChatGPT's applications in healthcare and its effects on medical reporting were considered. The publishing information, study goals, techniques, conclusions, and ethical issues were all retrieved from the chosen articles. The study organized this data topically, concentrating on ChatGPT's uses and moral ramifications in the medical field. This methodology sought to thoroughly review ChatGPT's contribution to improving medical reporting while taking ethical issues into account . Some ethical considerations when using AI like ChatGPT in healthcare include ensuring patient data privacy and security, maintaining transparency about the AI's capabilities and limitations, avoiding bias in decision-making processes, and upholding informed consent practices. It is important to prioritize the well-being and autonomy of patients when utilizing AI technologies in healthcare settings.

3. Results

ChatGPT, a sophisticated AI language model based on the Generative Pretrained Transformer (GPT) architecture, was created by OpenAI. ChatGPT is a robust communication tool that can perform a variety of tasks, including replying to questions, debugging ChatGPT-related network difficulties, creating unique content, and most importantly, translating between different languages (Temsah et al., 2023). ChatGPT's capacity to learn from prior discussions and apply that knowledge to produce more relevant and practical solutions in future interactions is one of its most notable characteristics(Gordijn & Have, 2023). This adaptive learning feature enables it to continuously improve its performance and evolve into a more capable chatbot over time (Ventayen, 2023).

Additionally, AI can act as a hub for healthcare practitioners to exchange patient data and insights, fostering improved communication and collaboration. This ensures that the entire healthcare team for a patient has access to the same detailed information, allowing them to decide together in an informed

manner. With the help of the history and development of AI, OpenAI's ChatGPT has made tremendous strides in artificial intelligence and developed a cutting-edge predictive generative model. ChatGPT, which was created in 2020 utilizing the "Generative Pre-trained Transformer 3.5" (GPT-3.5) architecture, excels at producing and understanding text fluently and like a human (Cascella et al., 2023).

ChatGPT is also adept at comprehending the context of a question or conversation, allowing it to provide extensive contextually appropriate responses on a wide range of topics.

ChatGPT can understand and respond to a wide range of conversational inputs , including questions, statements, and instructions in the context of healthcare. Its ability to interact with patients in a natural and human-like manner makes it essential for chatbots, customer service representatives, and digital assistants. ChatGPT learns to converse using cutting-edge Machine Learning (ML) algorithms and powerful Natural Language Processing (NLP) approaches. ChatGPT's ability to understand and generate human-like responses allows it to effectively communicate with patients, healthcare providers, and other stakeholders in a healthcare setting. By analyzing and interpreting natural language input, ChatGPT can provide relevant information, answer queries, and offer support to users, ultimately enhancing the overall patient experience and streamlining communication within healthcare organizations.

The capacity of the model to examine and predict word sequences is aided by advanced techniques such as word embedding and recurrent neural networks. It is critical to note that continual data infusion is a crucial prerequisite for improving AI efficacy, and this never-ending stream of data serves as the lifeblood of the neural networks that drive chatbot functioning (Rasmy et al., 2021). ChatGPT expands the potential of AI across a variety of applications, including customer service, content creation, healthcare, and education services, by showcasing its sophistication as a predictive generative model through its advanced contextual understanding, response generation, and capacity to mimic human language.

Even when the input is unorganized or contains obvious faults, ChatGPT has the capacity to tokenize input words and produce well-structured outputs. With this skill, it can read and interpret erroneous user inputs, producing more accurate and cogent responses. We initially provide a thorough description of the patient's symptoms and test results as input to start the construction of a case presentation utilizing ChatGPT.

3.1. ChatGPT for reducing errors in medical reporting

Through improved diagnostics, AI algorithms have the ability to transform data reporting completely. AI can assist individuals in the development of more precise diagnoses and efficient treatment

plans by carefully assessing patient symptoms , medical history, lab findings, and imaging tests (S et al., 2022; Zhang et al., 2020). Traditional methods of communication in healthcare often involve face-to-face interactions between patients and healthcare providers. However, with advancements in technology like ChatGPT and AI algorithms, communication can now be more efficient and accessible. These tools can help bridge language barriers, provide timely information, and improve the overall patient experience.AI algorithms also have the potential to revolutionize data reporting by offering more precise diagnoses and streamlining treatment plans, ultimately leading to better outcomes for patients. Some types of AI algorithms that are most beneficial in healthcare include machine learning algorithms for diagnosis and treatment planning, natural language processing algorithms for communication and language translation, and computer vision algorithms for medical imaging analysis. These technologies can greatly enhance the efficiency and accessibility of healthcare services, ultimately improving patient care and outcomes.

ChatGPT systems can offer in-the-moment recommendations based on patient data, empowering teleconsultants to choose the best course of therapy, leading to reduced errors (Zhou, 2023). However, challenges arise in ensuring the accuracy and reliability of the patient data being used by the ChatGPT system. Issues such as data security, patient privacy, and data quality must be carefully managed to maintain the effectiveness of the system. Additionally, there may be limitations in terms of the system's ability to handle complex medical cases or provide nuanced recommendations beyond basic therapy options. For instance, an AI system can use a patient's symptoms, medical history, and other relevant data to suggest the best treatments (Yang et al., 2019; Zhu et al., 2023).

Modern language models like ChatGPT have a lot of potential to cut down on medical reporting inaccuracies. This is accomplished by delivering precise and contextually appropriate medical reports based on patient information and lab results (Zhu et al., 2023). One of its key advantages is its ability to decipher complex test findings, ensuring that the information is correctly understood and put in the appropriate medical context. This lowers the possibility of misinterpretation and reporting errors, which are crucial components of medical documentation (DiGiorgio & Ehrenfeld, 2023).

Additionally, ChatGPT effortlessly incorporates the patient's medical history and symptoms into the report administration (Hansen et al., 2017). This thorough approach minimizes the omission of crucial data, hence lowering the possibility of mistakes in diagnosis and treatment planning (Dahmen et al., 2023). The program also upholds a regular and understandable structure in its reports, lessening the likelihood that medical personnel may overlook crucial information (Juhi et al., 2023; Zhu et al., 2023). This standardized format guarantees the report's accuracy and usability (Else, 2023).

Furthermore, based on the patient's health and accepted medical standards, ChatGPT produces

customized advice. These suggestions are founded in medical knowledge and follow established procedures, lowering the possibility of prescription errors and guaranteeing that patients receive the right advice (Zhou, 2023). Additionally, by enabling the interpretation of medical images alongside textual information, the model's potential to add multimodal capabilities, such as image analysis, holds the possibility of further improving the accuracy of medical reporting (Juhi et al., 2023; Zhu et al., 2023).

The ability of ChatGPT to cite clinical advice and the most recent medical literature assures that its recommendations align with the most recent medical understanding (DiGiorgio & Ehrenfeld, 2023). It further confirms the accuracy of the generated report by comparing its recommendations with actual doctor opinions from consultation sites (Stanfill & Marc, 2019). This validation method aids in making sure that the recommendations made to patients align with best practices and professional medical judgments (Else, 2023).

By utilizing its grasp of medical data, patient history, and recommendations to produce accurate, thorough reports, ChatGPT's capabilities significantly reduce errors in medical reporting (Hansen et al., 2017). The quality and reliability of medical reporting are enhanced by its consistent structure, adherence to best practices, and validation against actual medical recommendations, which eventually improve patient care and outcomes in the healthcare industry (S et al., 2022).

Examining vast volumes of available material beyond the purview of a single person's knowledge can also save the time, energy, and resources spent on trials with a higher risk of yielding fruitless results (Cahan & Treutlein, 2023). It has a "brain" like a person and remembers user remarks from the past as well as previous interactions with it, which is a skill that earlier AI language models have frequently struggled with (Chatterjee & Dethlefs, 2023).

4. Ethical Considerations

The EU's AI ethical guidelines emphasize the critical role of human oversight, technical robustness, safety, privacy, data governance, diversity, non-discrimination, societal and environmental well-being, and accountability during the development and deployment of AI systems. ChatGPT abides by these principles. (Ethics guidelines for trustworthy AI | Shaping Europe's digital future., 2019) These guidelines prioritize empowering humans, ensuring safety and accuracy, respecting privacy, preventing unfair bias, promoting sustainability, and establishing accountability mechanisms and remedies for unfavorable outcomes (van Dis et al., 2023).

While many publications in scientific literature primarily discuss the ethical issues surrounding ChatGPT's use in the medical area, its broader usage in literature has begun to raise concerns about authorship and accountability for created information. Although ChatGPT can create content with less

plagiarism, it is not totally devoid of it and frequently needs human editing. Furthermore, it is crucial to ensure that any underlying copyrights are not violated when AI-generated language is used for commercial purposes (Stokel-Walker, 2023). Publishers and preprint servers that the Nature's News team has contacted have stated that ChatGPT does not match the requirements for a research author since it is unable to take ownership of the accuracy and integrity of scientific studies (Biswas, 2023).

By reducing language barriers, ChatGPT may fulfill the social goal of enabling more people to create excellent medical literature. As with previous technologies, high-income countries and affluent academics may eventually find ways to use Large Language Models (LLMs) to further their own research while escalating inequality. As a result, in order to effectively use people's own experiences as a significant resource, discourses must include members of underrepresented groups in research as well as those from communities impacted by the study activity. Definitions of authorship need to be addressed and clarified (van Dis et al., 2023).

It is highly probable that algorithms like ChatGPT will be abused and manipulated as they develop into more complex and effective systems over time as they are updated with ever-increasing amounts of data from the internet and beyond (Dahmen et al., 2023). An instance of abuse can be seen when some users tried to rephrase their questions and ask the model how to shoplift without violating moral norms; instead, the model chose to cooperate and provided in-depth details on several shoplifting tactics (Chatterjee & Dethlefs, 2023). It is crucial that people check the content produced by it while keeping ethical considerations in mind and utilizing it as a supplement to other resources rather than entirely depending on it.

5. Future Potential and Challenges

ChatGPT will be widely adopted and incorporated into all text editing tools in the future (Kitamura, 2023). Advanced systems ought to be created that can pinpoint even the smallest data tampering carried out by the ChatGPT (Shen et al., 2023). Currently, editors must carefully scrutinize ChatGPT's output in order to identify it, and the tool's inability to correctly cite sources presents a problem. Nevertheless, current studies strive to address these problems and offer practical answers (Editorials, 2023). To prevent misuse of AI, publications should set strict standards for its use in academic papers (Liebrenz et al., 2023).

Teachers can change assignment questions to promote critical thinking abilities, restricting prospects for improper use of technology, as opposed to exclusively depending on ChatGPT's restrictions to identify potential academic misconduct (Graham, 2022). Due to its lack of internet access and limited understanding, ChatGPT might create biased or erroneous content. However, the "Thumbs Down" option

allows users to offer criticism, which helps ChatGPT develop and enhance its replies. In order to enhance the functionality of the system, AI trainers also examine the responses produced by ChatGPT. The acquired data is securely kept to protect user privacy and can be removed upon request (ChatGPT General FAQ, n.d.).

6. Declarations

6.1 Conflict of Interest Statement

The authors have no conflict of interests to declare.

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