Review Article

ChatGPT in medical writing: A game-changer or a gimmick?

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Abstract

OpenAI's ChatGPT (Generative Pre-trained Transformer) is a chatbot that answers questions and performs writing tasks in a conversational tone. Within months of release, multiple sectors are contemplating the varied applications of this chatbot, including medicine, education, and research, all of which are involved in medical communication and scientific publishing. Medical writers and academics use several artificial intelligence (AI) tools and software for research, literature survey, data analyses, referencing, and writing. There are benefits of using different AI tools in medical writing. However, using chatbots for medical communications pose some major concerns such as potential inaccuracies, data bias, security, and ethical issues. Perceived incorrect notions also limit their use. Moreover, ChatGPT can also be challenging if used incorrectly and for irrelevant tasks. If used appropriately, ChatGPT will not only upgrade the knowledge of the medical writer but also save time and energy that could be directed toward more creative and analytical areas requiring expert skill sets. This review introduces chatbots, outlines the progress in ChatGPT research, elaborates the potential uses of ChatGPT in medical communications along with its challenges and limitations, and proposes future research perspectives. It aims to provide guidance for doctors, researchers, and medical writers on the uses of ChatGPT in medical communications.

Keywords: Artificial intelligence, chatbot, Chat Generative Pretrained Transformer, medical writing

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E-mail: shital.sarah@hashtagco.in
Received: 09-06-23, **Revised:** 22-08-23, **Accepted:** 06-09-23, **Published:** 15-11-23.

INTRODUCTION

ChatGPT (Generative Pre-trained Transformer) is a chatbot that simulates natural human conversation – a natural language processing (NLP) model based on the GPT-3.5 architecture.[1] NLP enables machines to understand and generate human language.[2] OpenAI released ChatGPT in November 2022.[1]

Chatbots have tapped multiple sectors such as education, research, medicine, business development, coding, and arts transforming the way we communicate, illustrate, and create content.[3,4] They have potential uses in the health-care sector too, particularly in medical communications. They are already used in this sector to provide patient education, support, engagement, and personalized health care.[5,6] However, medical communication encompasses writing beyond patient education and support.[7]

Medical communications cover a large scope of writing including medical journalism, medical education, scientific

Access this article online	
Quick Response Code:	Website: www.picronline.org
	DOI: 10.4103/picr.picr_167_23

How to cite this article: Ahaley SS, Pandey A, Juneja SK, Gupta TS, Vijayakumar S. ChatGPT in medical writing: A game-changer or a gimmick? Perspect Clin Res 2024;15:165-71.

communication, regulatory writing, and market access writing or health economics and outcomes research.[7] Medical writers search literature for relevant information; create medically accurate content based on this information; illustrate content in the form of infographics, figures, and images; analyze statistics; and finally, present complex medical content in different formats to various audiences.[8] The use of artificial intelligence (AI)-powered tools such as Grammarly and Elicit to perform some of these tasks is extremely common. These tools increase efficiency while saving time.[9] Will ChatGPT or any other chatbot become yet another tool in their armamentarium?

This review focuses on ChatGPT and its potential applications from the perspective of medical writing, examining the current literature evidence of ChatGPT in medical writing as well as enlisting the challenges and limitations of its use. The recently updated guidelines regarding chatbot usage in scientific publications and the future directions on the utility of ChatGPT in medical writing are also discussed herein.

THE ADVENT OF CHATBOTS

The term "chatbot" refers to a computer program designed to mimic human conversation; it facilitates human–computer interaction.[3]

ELIZA, the first "chatbot" developed in 1966 by Prof. Weizenbaum from the Massachusetts Institute of Technology, was a computer program that could simulate conversation with a human operator.[10] From ELIZA to ChatGPT and further, the evolution of chatbots has accelerated over the years with many new chatbots being introduced in a short span of time.[4] Now, we have chatbots with domain-specific knowledge such as BioGPT and PharmaGPT (currently under development) for biomedical and pharmaceutical text mining and generation.[11,12]

Today, chatbots are used for a variety of purposes and their potential applications are increasing.[4] An advanced chatbot, ChatGPT, presents a potential use in medical writing, such as ideation, content drafting, summaries, and many more.

CHATGPT

ChatGPT is a sophisticated chatbot. It is capable of declining an improper request and accepting its error.[1] ChatGPT can generate text in a wide range of styles and tones, answer questions, and translate text between languages.[13] Another feature contributing toward its superiority over its predecessors is its 175 billion parameters [Figure 1].[1]

The number of parameters is analogous to the number of synapses in a human brain. In language models, these parameters are essentially the internal representations that the model uses to make predictions or generate text. The more parameters a model has, the more complex relationships and patterns it can learn from the training data, which can improve its performance.[1,13] The model is trained on a massive amount of text data. It also uses different learning approaches.[1] In addition, OpenAI continues to work on developing new versions of ChatGPT with even larger numbers of parameters, as well as versions that are more specialized for specific types of NLP tasks [Figure 1].[1,13-18]

ChatGPT usage is free. The main reason for this is to allow people to use and experiment with the technology, and to help promote and advance the field of NLP.[1] Researchers may use the information gained from ChatGPT usage to improve language models and advance the field.

In addition, ChatGPT's development is ongoing, and researchers may use user feedback to help improve the model's performance.[18]

This section of the review was written with the aid of ChatGPT. ChatGPT explained its development and functionality in a simple language. The authors developed this content further and rewrote this section.

POTENTIAL USES OF CHATGPT IN MEDICAL WRITING

The literature on ChatGPT usage in medical writing mostly revolves around academic manuscript writing. Several tasks are involved in writing a manuscript that are essential for clarity and brevity of the content but are time-consuming. ChatGPT can aid in several of these essential elements to provide a starting point on which the author can build a publication-worthy draft. It can assist in generating a zero (preliminary) draft of an article, editing, formatting, creating summaries, and preparing tables, or other content that requires sorting and organizing data [Table 1]. The results provided by ChatGPT may not always meet the desired quality or standards, but they can be economical on the writer's time and energy.

ChatGPT works best when used for summarizing content from the data provided. It can also be used to understand complex topics. However, this strictly applies to upgrading one's knowledge.

The responses of ChatGPT depend on prompts – the questions input by the user. It is a chatbot, and the

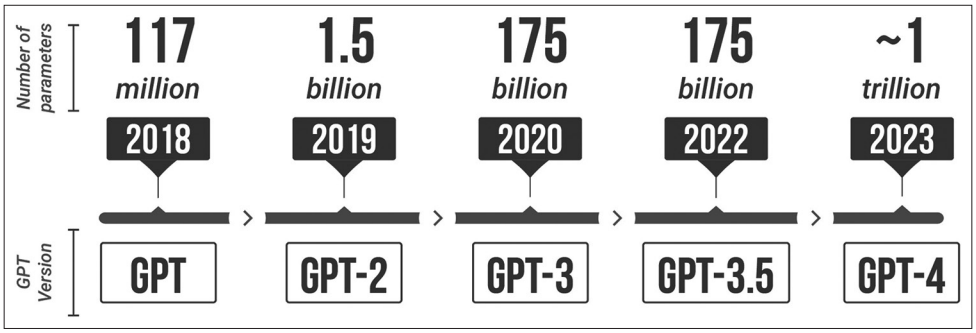

Figure 1: ChatGPT versions.[1,13-17] GPT = Generative Pre-trained Transformer

Table 1: Potential uses of ChatGPT in medical writing published in literature

Potential use as described in publications	Interpretation	References
Can make linguistically coherent text from scattered points	Like arranging a jigsaw puzzle	[19]
Reference and citation sorting and management	Not for searching references	[19,20]
Saves time in generating preliminary drafts	Gives the first rough draft within seconds	[21]
Provides fresh perspective on a research topic	Relevant literature survey can then be done based on the content	[21]
Can write conference abstracts	Based on data input by the authors	[22]
Provides initial draft of scientific paper	Provided a starting point to the authors to write the manuscript	[23]
Suggests title for scientific paper	It can be unoriginal but will be scientifically accurate. ChatGPT suggested the title for the present review	[23,24]
Writes methods section from raw information	Provides detailed methods from shorter input	[23]
Formatting and language editing	Very efficient at copyediting	[20,23,25]
Rewriting complex sentences or paraphrasing	Can provide several options of writing style to select from	[20,23]
Summarizing entire text for abstract	May miss on important information if the prompt is not detailed and specific	[20,23]
Automatic generation of tables	ChatGPT tabulated the content provided by the authors for the present review	[23]
Collaboration in academic writing	Provides assistance for writing	[24,26]
Suggests journals based on criteria provided	Authors do not report any instance of misinformation	[27]
Assists in brainstorming research hypothesis	Particularly helpful for entry-level researchers	[27]
Can write grant proposals in provided format	Needs further modification but provides a starting point	[28]
Can create case studies for student education	In our experience, ChatGPT may not provide satisfactory results for complex case reports	[29]
Writing patient-facing educational brochures	Uses appropriate language level and tone	[30]
Language translation	Translation capabilities need further improvement	[31]
Writing case reports	Several case reports were written with ChatGPT, with varying degrees of success	[32,33-40]
Potential for generating effective queries for systematic review literature surveys	This paper is not peer-reviewed	[41]
Development of topics for systematic reviews	65% accuracy in suggesting novel systematic review ideas	[42]

ChatGPT=Chat Generative Pre-trained Transformer

interaction has to be in a conversational tone. Thus, prompt engineering (writing a detailed and accurate prompt) is an important facet of ChatGPT usage. A clear, detailed, and unambiguous prompt will generate better responses than short, unclear prompts. The prompt engineering methods are not released by OpenAI but are proposed as guides by writers who have used and assessed ChatGPT extensively, albeit there is no research published on prompt engineering yet.[43]

Although ChatGPT's capability has caused quite an uproar globally, its potential uses and limitations in the medical communications sector have not been assessed objectively and comprehensively. While several reports have explored its potential as a writing tool, any claims must be evaluated before drawing conclusions.

LIMITATIONS OF CHATGPT

The capabilities of ChatGPT have the potential for both positive and negative impacts. ChatGPT is an assistant that necessitates human supervision. Inadequate prompts from a user will generate inaccurate outcomes. Table 2 summarizes the limitations of ChatGPT and was auto-generated by ChatGPT from content provided by the authors.

Every writer has a certain style of writing. ChatGPT is not a writer but a content generator. It is unoriginal; it lacks creativity, analytical skills, and the ability to infer complex medical content. All of these qualities and more are expected in a medical writer.[8] ChatGPT cannot be used for literature survey. The references have been shown to be fabricated most of the times.[19-22,24,44] Plausible-sounding

Table 2: Limitations of ChatGPT for medical writing

Limitation	Interpretation	References
Artificial hallucination	References are mostly wrong and can never be trusted	[19,20-22,24,44]
Ethical consideration for using ChatGPT as an author	No accountability	[21]
Risk of bias	Inherent bias in the training data	[20,21,30]
Inadequate inputs lead to inadequate responses	The prompts have to be detailed and specific	[23]
Lack of nuance, style, or originality	ChatGPT-generated text can be repetitive and unoriginal	[23,45]
Meticulous human supervision is required	Content needs to be verified by a human expert	[46]
Knowledge cutoff of September 2021	No access to current information	[47,48]

ChatGPT=Chat Generative Pre-trained Transformer

inaccurate content is termed as "hallucination" that is one of the most concerning challenges of AI.[1] ChatGPT hallucinates information, and if prompted, it confesses its mistake of providing inaccurate or misleading responses. While an expert and experienced writer will recognize hallucinations instantly, a novice may take more time to corroborate the information, or worse, they may rely on this inaccurate information for writing.

Furthermore, ChatGPT cannot provide current information because it was trained on data prior to September 2021.[1] The information may be outdated.

Thus, it is necessary to maintain strict vigilance while using ChatGPT. Medical writers should be aware of the misuse and potential ethical implications of using ChatGPT.

CHATGPT: A TALE OF TWO TRAJECTORIES

Since its advent, ChatGPT has been tried by several medical writers. Many discovered its strengths and pitfalls by trial and error. While some are deterred by the initial hiccups, others continue using ChatGPT incorrectly. We provide here two case studies of ChatGPT usage from published literature. These examples demonstrate the continued incorrect use of ChatGPT despite contrary data and the proclivity of medical writers toward or against ChatGPT.

THE "HALLUCINATION" EFFECT

Salvagno *et al.* published an article 3 months after ChatGPT release in which they claimed that ChatGPT can help in literature review, identify research questions, provide an overview of the current state of the field, and assist with tasks such as formatting and language review.[23] The writers used a prompt to summarize a research article published in 2023. ChatGPT hallucinated and provided plausible-sounding unrealistic content because the knowledge cutoff of ChatGPT is September 2021. To this publication, Azamfirei *et al.* replied that the response generated by ChatGPT was inaccurate and the premise of the prompt was incorrect.[47]

However, 2 months later, Beutel *et al.*[49] replied to the original article. Here, they repeated the prompt given originally. This time, ChatGPT did not provide a response; it explained that it is trained on data up to 2021 and has no access to the 2023 paper. This was a correct response by ChatGPT! However, the premise of the author was incorrect again. This same mistake of asking ChatGPT to create content based on information from a later date by other authors also yielded no results.[50]

If ChatGPT is used for incorrect purposes, the results will be unsatisfactory and misleading. And authors may dismiss the usage of ChatGPT for academic writing.[32]

POTENTIAL BIAS AMONG MEDICAL WRITERS

Altmäe *et al.* used ChatGPT for writing a complete manuscript based on fictional data. According to their assessment, ChatGPT can provide methods for analysis and suggest important factors to be considered in the analysis, generate an acceptable abstract, suggest a title for the paper, and write a good methods section.[24] The introduction, results, and discussion sections needed a lot of improvement. However, the draft provided by ChatGPT helped guide the authors to improve the content. The references were completely wrong and unreliable. When the manuscript was checked for plagiarism, the similarity index was 19%, which is acceptable for most journals. Thus, according to these authors, ChatGPT has the potential to design a study, suggest analyses, and draft the paper.[24]

On the other hand, some authors outrightly rejected the use of ChatGPT for academic writing because of incorrect references, inaccurate information (hallucinations), potential harm to the article's originality, and inability to write a complete error-free manuscript.[32,51]

If ChatGPT could write complete manuscripts, we would not need medical writers. ChatGPT cannot replace medical writers or the complete writing exercise. It can merely assist the writer to ease and improve their writing.

GUIDELINES ON CHATGPT IN SCIENTIFIC PUBLISHING

Several journals do not accept ChatGPT as an author.[30,52-56] Journal editors ask for a declaration in acknowledgments (or other sections) specifying the assistance of ChatGPT.[20,54-57] An international journal explicitly indicates that papers written using ChatGPT will have low priority for publication.[58]

On the other hand, Cureus journal had run a contest for case reports written with the assistance of ChatGPT.[59] This exercise may help the publishing industry evaluate the ability of ChatGPT to assist in manuscript writing.[32-40]

The World Association of Medical Editors (WAME) has clarified that "Chatbots cannot be authors." In addition, they also recommend transparency in reporting the use of chatbots. Authors should take full responsibility for the content provided by a chatbot. WAME also insisted that editors should also have access to tools to detect AI-generated text.[60] GPTZero, GPT-2 Output Detector, AI Detector by Content at Scale, and many other freely available tools report the likelihood of portions of text being human generated or AI generated; however, these tools can give flawed results and be easily "fooled" by simple paraphrasing of AI-generated text.[61,62]

The International Committee of Medical Journal Editors (ICMJE) has released a statement regarding not listing chatbots as authors. They recommend describing the use of AI-assisted technology in the cover letter and the manuscript.[63] Several manuscripts have mentioned ChatGPT usage in the "Acknowledgments" section. As per ICMJE criteria, "acknowledgment may imply endorsement by acknowledged individuals of a study's data and conclusions."[63] ChatGPT is incapable of endorsing content and, therefore, cannot be included in acknowledgments.

We suggest that the "Methods" section would be ideal for the description of ChatGPT usage. It would be equivalent to mentioning statistics software or image creation tools.

Providing guidelines is a decision of journal editors and experts. However, practicing high ethical publishing standards is expected from everyone involved in medical writing. Moreover, this includes disclosing the use of ChatGPT, and other AI tools designed or adapted for writer's assistance.

MEDICAL COMMUNICATIONS

Apart from scientific publications, medical writers also write plain language summaries, books, continued medical education slide decks, e-learning modules, patient brochures, promotional literature, blogs, advisory board meeting reports, regulatory documents, etc.[8] In one instance, ChatGPT was used to write patient-facing educational brochures.[30] Besides this, there are no instances of the use of ChatGPT for writing other medical communication documents in published literature. However, the principles learned from scientific writing can be applied for writing other documents too.

In medical marketing, market insights, competitor intelligence, and key opinion leaders' perspectives direct the flow and content of promotional literature. ChatGPT cannot capture the nuances in writing required for creating content for advisory board reports, slide decks, and other medical marketing documents.

Medical writers should exercise utmost caution while relying on information obtained from ChatGPT, rather it would be prudent to use ChatGPT for writing assistance only. It may be used to garner fresh perspectives on a particular topic or as a sounding board to spark creative ideas.[21]

Orchestrating meetings and communicating with clients is a major part of a medical writer's daily tasks. ChatGPT can help with rote tasks of drafting E-mails and minutes of meetings from pointers provided by the user. It can be a time-saving tool when used for these "nonmedical writing" tasks.

FUTURE DIRECTIONS

Advanced research in the field of large language models is expected to provide better chatbots with improved performance in the future. OpenAI introduced ChatGPT Plus, the paid version of ChatGPT with access to the GPT-4 model, in February 2023, which aims to provide a better user experience in terms of speed and quality of responses than ChatGPT.[14,15]

It is essential to evaluate the appropriate use of ChatGPT in medical communications. The papers in literature are either for or against ChatGPT. There are several reports that have encouraged medical writers to use ChatGPT but with caution. Currently, 85% of published papers concur that ChatGPT improves scientific writing and enhances research equity and versatility.[64] However, we need

insights into ChatGPT use in medical writing for drawing conclusions. If we adapt and adopt ChatGPT for medical writing, a calculated and regulated approach would reduce the liability associated with its use.

Apart from writing prowess, medical writers need to have several other competencies including in-depth knowledge of a drug, and therapeutic area; ability to understand, analyze, and present complex data; understanding of ethics in clinical research and publishing; and awareness of tools used for efficient medical writing.[65] Interestingly, NLP tools were predicted to aid medical writers in authoring structured content long before the release of ChatGPT.[9] They can help medical writers save time spent on mundane, tedious, and time-consuming tasks, which will allow them to focus on areas requiring creativity and medical expertise.

CONCLUSIONS

AI and chatbots are rapidly evolving and will continue to evolve. ChatGPT can be used for saving time and writing assistance. Medical writers should bear in mind the limitations of using chatbots, and meticulously supervise and revise the content provided by ChatGPT. Moreover, they should take full responsibility for the written document.

ChatGPT is not a writer but a tool to aid the writer. Medical writers should conscientiously follow guidelines and recommendations laid down by journals and experts.

So, is ChatGPT a game-changer or a gimmick? We say it is neither!

Acknowledgments

We acknowledge initial support provided by Dr. Neha Tanwar and creative support provided by D. Daniel Solomon Raj.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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