Review article:

The Future of Scholarly Communication: Integrating ChatGPT into Research Writing Practices

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Abstract:

The integration of artificial intelligence (AI), particularly large language models like ChatGPT, into healthcare and research processes has garnered significant interest. This review synthesizes findings from various studies examining the efficacy, benefits, and limitations of ChatGPT across multiple domains, including literature searches, data extraction, and academic writing. While ChatGPT demonstrates high sensitivity and efficiency in tasks such as abstract screening and data extraction from clinical notes, challenges remain regarding accuracy, ethical considerations, and the risk of misinformation. Many studies emphasize the necessity for human oversight to mitigate issues such as biases and hallucinations. Additionally, the potential for ChatGPT to enhance research workflows and improve scientific communication is underscored, though concerns regarding authorship and ethical usage persist. Overall, the findings highlight ChatGPT's transformative potential in healthcare and research while advocating for cautious integration and further validation of its capabilities.

Keywords:

Chat GPT, Artificial Intelligence, Healthcare, Ethical Considerations, Academic Writing

Introduction:

The process of academic writing is fundamental to the dissemination of new knowledge and the advancement of research. Crafting research papers involves a significant amount of time and effort, particularly in the field of clinical biochemistry where complex data and intricate methodologies are involved[1]. For non-native English speakers, the challenge is further compounded by the nuances of academic language and discourse[2]. In this context, the integration of artificial intelligence (AI) technologies, such as ChatGPT, offers promising opportunities to enhance the efficiency and quality of academic writing. ChatGPT, an advanced AI-powered generative language model, is capable of understanding and generating coherent text based on user inputs[3,4]. This review systematically evaluates the use of ChatGPT in the context of clinical biochemistry research paper writing, focusing on its benefits, limitations, and implications for academic productivity and integrity.

Methodology:

Search Strategy: A systematic search was conducted across major academic databases, including PubMed, IEEE Xplore, and Google Scholar. Keywords such as "ChatGPT," "GPT-3," "natural language processing," "clinical biochemistry," and "research paper writing" were employed. The search was restricted to studies published between January 2019 and June 2024 to capture the latest advancements and applications of ChatGPT in academic writing. Initially, 118 articles were identified. After removing 10 duplicates and excluding 82 articles that were unrelated to research papers, 26 articles were deemed relevant to our topic.

Inclusion Criteria:

- Empirical studies, case studies, and reviews evaluating ChatGPT's effectiveness in this specific domain.
- Articles published in English to ensure accessibility and comprehension.

Exclusion Criteria:

- Non-English language studies due to potential translation issues.
- Studies not directly related to ChatGPT's application in research paper writing

The following studies are included:

1. Methnani J et al: ChatGPT for Sample-Size Calculation[7].
2. Mondal H, Swain SM, Mondal S. on How to conduct descriptive statistics online: A brief hands on guide for biomedical researchers[8].
3. Tom Heyman et al.: ChatGPT can generate reliable pilot data for norming tasks but raises concerns over data authenticity and implications for research methodology[9].

4. Huh S. on Are ChatGPT's knowledge and interpretation ability comparable to those of medical students in Korea[10].

5. Mondal, Himel and Mondal, Shaikat : ChatGPT in academic writing: Maximizing its benefits and minimizing the risks[11].

6. Yong Nam Gwon et al.: ChatGPT's literature search capabilities are limited compared to humans, with low relevance and accuracy. It highlights the need for improvements in AI for literature searches[12].

7. Mahbod Issaiy et al.: ChatGPT shows potential for automating abstract screening with high sensitivity, though it requires further validation for broader medical applications[13].

8. Jingwei Huang et al.: ChatGPT excels in extracting structured data from clinical notes, outperforming traditional methods, especially in oncology and pediatrics[14].

9. Malik Sallam et al.: ChatGPT offers benefits in healthcare (e.g., writing, data analysis) but raises concerns over bias, hallucination, and ethics, highlighting the need for guidelines[15].

10. Shahab Saquib Sohail et al.: ChatGPT could help synthesize contradictory AI research, but its effectiveness needs further validation[16].

11. Som S. Biswas et al.: A guide on using ChatGPT for research workflows emphasizes its potential while addressing concerns like bias and plagiarism[17].

12. Mohsen Tavakol and David O'Brien.: The importance of crafting a good introduction to scholarly research: strategies for creating an effective and impactful opening statement[18].

13. Jingshan Huang et al.: ChatGPT can enhance scientific writing but requires careful review to avoid issues like plagiarism[19].

14. Suebsarn Ruksakulpiwat et al.: ChatGPT aids in rapid study identification for systematic reviews but lacks precision compared to human researchers, suggesting complementary use[20].

15. Diffusion of the Information and Communication Technologies (ICT) in Education, Perspectives and Limitations" by Marina Aivazidi and Christos Michalakelis[21], explores the slow rate of ICT adoption in education and emphasizes the critical role of teachers and students in the efficient implementation of ICT in educational contexts. The authors evaluate recent research literature on ICT in education to address questions related to the diffusion of innovation, focusing on the barriers and needs of educational stakeholders.

16. Afia Fatima et al. and Fatima et al: ChatGPT enhances healthcare research and communication but must be used cautiously due to inaccuracies and ethical concerns[5,22].

17. Mehul Bhattacharyya et al.: ChatGPT's medical content has significant accuracy issues, with many fabricated references, highlighting the need for careful verification[6,23].

18. Jing Miao et al.: A review on AI ethics stresses the need for transparency and integrity in AI usage for academic writing, especially in nephrology[24].

19. Dwivedi YK et al. So what if ChatGPT wrote it? Multidisciplinary perspectives on opportunities, challenges and implications of generative conversational AI for research, practice and policy[25].

20. Lingard L. on Writing with ChatGPT: An Illustration of its Capacity, Limitations & Implications for Academic Writers[26].

21. Gandhi Periaysamy A et al [27] on ChatGPT: roles and boundaries of the new artificial intelligence tool in medical education and health research – correspondence.

22. Gao, C.A. et al. on Comparing scientific abstracts generated by ChatGPT to real abstracts with detectors and blinded human reviewers[28].

23. Gurha P et al. on ChatGPT and other artificial intelligence chatbots and biomedical writing[29].

24. Hsu et al on Plagiarism, Quality, and Correctness of ChatGPT-Generated vs Human-Written Abstract for Research Paper[30].

1. Literature Search and Screening:

Generation of Search Queries: ChatGPT significantly enhances the literature search process by generating comprehensive and contextually relevant search queries. In the realm of clinical biochemistry, ChatGPT can expand search terms beyond initial keywords. For instance, when researching "oxidative stress biomarkers," ChatGPT can suggest related terms such as "oxidative markers," "biomarkers in biochemistry," and "oxidative stress in diseases." This broad approach increases the likelihood of capturing a wider range of relevant studies and minimizes the risk of omitting important literature[12].

Article Screening: Following the generation of search queries, ChatGPT aids in automating the screening process. It evaluates abstracts and full-text articles against predefined inclusion and exclusion criteria, such as study relevance, type, and methodology. This automation streamlines the process of identifying relevant studies, reducing manual workload and allowing researchers to concentrate on critical analysis rather than administrative tasks[13].

2. Data Extraction:

Automating Key Data Extraction: ChatGPT's capabilities extend to automating the extraction of essential data points from selected articles. In clinical biochemistry research, this includes:

- Study Objectives: Identifying the primary aims and research questions of each study, such as investigating the role of specific biomarkers in disease diagnosis.
- Methodologies: Summarizing experimental designs, data collection methods, and analytical techniques used in the studies, providing insights into the validity of findings.
- Results and Conclusions: Extracting key results and conclusions, including statistical outcomes and implications for clinical practice[14].

This automation not only speeds up the data extraction process but also improves accuracy by minimizing manual errors. It allows researchers to compile and analyze large datasets more efficiently.

3. Data Synthesis and Analysis:

Identifying Common Themes and Patterns: ChatGPT facilitates the synthesis of findings by data analysis across multiple studies to identify common themes and patterns. For example, in reviews of oxidative stress biomarkers in clinical biochemistry, ChatGPT can highlight recurring findings related to specific biomarkers and their diagnostic value. This synthesis helps consolidate evidence and draw meaningful conclusions about the role of oxidative stress in various diseases[15].

Highlighting Contradictions and Gaps: In addition to identifying commonalities, ChatGPT can detect contradictions and gaps in the literature. For instance, if studies report conflicting results regarding the effectiveness of certain biomarkers, ChatGPT can flag these discrepancies. This critical analysis supports the identification of areas requiring further research and helps in developing more nuanced interpretations of existing data[16].

Ensuring Accuracy in Data Extraction and Synthesis: While ChatGPT was utilized to assist in initial data organization, summarization, and thematic categorization, all extracted data were manually verified by two independent reviewers to ensure accuracy and consistency. Any discrepancies were resolved through discussion or consultation with a third reviewer. ChatGPT served solely as a supportive tool to enhance workflow efficiency, not as a replacement for critical human judgment. Emphasis was placed on cross-checking AI-assisted outputs with the original texts of the included studies to maintain methodological rigor and data integrity. This hybrid approach combined the speed of AI with the reliability of manual verification, strengthening the credibility of the findings.

Writing Assistance: Draft Generation for Research Paper Sections:

The integration of ChatGPT into the

drafting process of research papers offers substantial support across various sections, including the Introduction, Methods, Results, and Discussion[17]. Here's a detailed exploration of how ChatGPT contributes to each of these sections:

Introduction:

Contextualization of Research: The introduction is a crucial part of a research paper as it sets the stage for the study by providing background information and establishing the context. ChatGPT can generate introductory paragraphs that effectively contextualize the research topic. It achieves this by synthesizing information from relevant literature to explain the importance of the research area and highlight existing gaps or issues. For example, if the research focuses on "oxidative stress biomarkers in clinical biochemistry," ChatGPT might include background on oxidative stress, its role in various diseases, and the significance of identifying reliable biomarkers[18].

Summarizing Significance: ChatGPT can articulate the significance of the research by summarizing the potential impact or benefits of the study. It identifies how the research contributes to the field, addressing specific problems or advancing knowledge in clinical biochemistry. For instance, it could discuss how identifying new biomarkers might improve diagnostic accuracy or patient outcomes[18].

Outlining Objectives and Structure: In addition to providing background and significance, ChatGPT can outline the objectives and structure of the paper. This involves detailing the research aims and objectives, as well as providing a roadmap of the paper's structure. It ensures that readers understand what the paper will cover and what the research intends to achieve. For example, it might state, "This paper aims to identify novel oxidative stress biomarkers and evaluate their diagnostic potential, with the paper structured into sections on methods, results, and discussion."[19]

Literature Review:

The literature review is a pivotal component of academic research, setting the foundation for understanding the current state of knowledge on a particular topic. ChatGPT can significantly enhance the literature review process by leveraging its advanced natural language processing capabilities and extensive knowledge base[5]. Here's a detailed exploration of how ChatGPT can assist in conducting a literature review:

1. Accessing and Identifying Relevant Sources:

Efficient Search for Sources: ChatGPT can quickly access a vast array of academic papers, books, and articles, providing a broad overview of existing literature on a

given topic. When provided with specific keywords or research topics, ChatGPT can identify relevant sources and summarize their contributions to the field. This rapid access helps researchers to gather pertinent information without manually sifting through numerous databases and journals. Suggesting New Angles and Lesser-Known Studies: In addition to identifying well-known studies, ChatGPT can suggest new perspectives or lesser-known studies that might not be immediately apparent. For example, if researching "oxidative stress biomarkers in cancer," ChatGPT might introduce relevant studies from adjacent fields or recent publications that offer novel insights or methodologies[19].

2. Segmenting the Literature Review:

Dividing Topics into Segments: For a more organized approach, authors can divide the literature review topic into several distinct segments or subtopics. ChatGPT can generate text for each segment separately, allowing for a structured and detailed review. For instance, in a literature review on "neurodegenerative diseases," segments might include "biomarkers in Alzheimer's disease," "genetic factors in Parkinson's disease," and "therapeutic interventions for Huntington's disease." ChatGPT can generate focused content for each segment, which can then be combined into a comprehensive review[21].

Generating Segment-Specific Text: When generating text, ChatGPT may initially provide information in bullet points or numbered lists. To achieve a more cohesive narrative, authors should request ChatGPT to convert this information into well-structured paragraphs. For example, instead of receiving a list of key studies, ask ChatGPT to integrate these studies into a narrative that discusses trends, gaps, and key findings[21].

3. Crafting a Coherent Narrative:

Creating a Unified Review: Once text is generated for each segment, authors need to combine these segments into a unified literature review. ChatGPT's ability to produce coherent and contextually relevant content aids in weaving together different parts of the review. Authors can use the generated text to build a cohesive narrative that highlights the evolution of research, current understanding, and unresolved questions in the field[19].

Ensuring Continuity and Flow: ChatGPT can assist in ensuring that the literature review maintains continuity and flow. By reviewing and revising the generated text, authors can ensure that transitions between segments are smooth, and that the overall narrative logically progresses. This process involves integrating findings from different sections and ensuring that the review comprehensively covers the topic[19].

4. Addressing Limitations:

Outdated Information: One of the key limitations of using ChatGPT for literature review is the potential for outdated information. As ChatGPT's training data may not include the most recent publications or updates, the authors must cross-check the information against the latest research. Researchers should supplement ChatGPT's output with current sources to ensure the review reflects the most recent advancements in the field[22].

Validating and Synthesizing Information: Despite ChatGPT's ability to generate relevant content, authors must validate the accuracy and relevance of the information provided. This involves cross-referencing with primary sources, ensuring that the interpretations and summaries align with the actual findings of the studies reviewed[22].

Generating References Using ChatGPT:

References are a critical component of academic writing, ensuring that sources are properly credited and allowing readers to trace the origins of information. While ChatGPT can assist in generating references, there are important considerations and limitations to be aware of:

1. Risks of Fictitious References:

Potential for Inaccurate Citations: ChatGPT can sometimes generate fictitious or inaccurate references. This is because the model's responses are based on patterns in its training data rather than real-time access to academic databases or current sources. For example, ChatGPT might provide references that appear plausible but do not correspond to actual publications. This issue underscores the importance of manually verifying all references before including them in academic work[6]. Examples of Fictitious References: When using ChatGPT to generate references, it might produce entries like:

- "Smith, J. (2021). Innovations in Clinical Biochemistry. Journal of Biochemical Research, 45(2), 123-134." (This reference may not exist.)

2. Cross Checking and Verification:

Manual Verification: To ensure the accuracy of references, researchers must manually cross-check and verify each citation. This involves:

- Searching Academic Databases: Use databases like PubMed, IEEE Xplore, Google Scholar, or library catalogues to confirm the existence of the cited works.
- Reviewing Publisher Information: Verify that the journal names, publication years, volume and issue numbers, and page ranges match those provided by ChatGPT.
- Checking Authors' Names: Ensure that the authors listed in the references are correctly spelled and associated with

the cited works.

Updating References: Since ChatGPT does not have real-time access to current research databases, the references it provides might be outdated or missing recent publications. Researchers should supplement ChatGPT-generated references with the most up-to-date sources available[23].

3. Best Practices for Using ChatGPT in Reference Generation:

Using ChatGPT for Initial Drafts: ChatGPT can be useful for generating initial drafts of references, which can then be refined and verified. For example, it can format references according to specific styles (APA, MLA, Chicago), but researchers should always verify the details against primary sources[23].

Providing Context and Specifics: To get the most accurate references from ChatGPT, provide detailed information about the sources you need. Specify the type of publication (e.g., journal article, book), the subject area, and any other relevant details. This helps ChatGPT generate more relevant and contextually appropriate references[23].

Integrating with Reference Management Tools: After verifying and correcting references, consider using reference management tools like EndNote, Zotero, or Mendeley to organize and format your citations. These tools can help ensure consistency and accuracy in your reference list[23].

4. Ethical and Academic Integrity

Transparency and Disclosure: When using AI tools like ChatGPT for generating references, it is important to maintain transparency about the sources of information and the tools used, and acknowledge any assistance from AI in your research process to uphold academic integrity.

Avoiding Plagiarism: Ensure that all references used in your work are accurately cited to avoid plagiarism. Double-check that all citations correspond to genuine sources and that all borrowed ideas and data are properly attributed[24].

Methods:

Describing Research Methodologies: The Methods section is essential for detailing how the research was conducted, including study design, data collection, and analytical techniques. ChatGPT assists in drafting this section by summarizing and organizing complex methodological information. It ensures that the description is clear and comprehensive, covering aspects such as the following: [25]

- Study Design: ChatGPT can detail the type of study conducted (e.g., observational, experimental) and the rationale behind choosing this design.
- Sample size: Sample size calculation presents a significant challenge for many researchers. When provided with

the requisite parameters, ChatGPT can facilitate this process by detailing the appropriate formulas and procedural steps. For instance, with inputs such as effect size, alpha level, statistical power, and standard deviation, ChatGPT can compute the sample size using the relevant statistical methods. Nonetheless, while the theoretical framework and formulas employed are typically accurate, occasional discrepancies in the actual calculations have been observed. Consequently, it is imperative for researchers to meticulously verify and cross-check these computations before integrating them into their synopsis, thesis, or research manuscript[7].

- Data Collection Techniques: Use of ChatGPT in Data Collection[24].

ChatGPT can significantly enhance data collection by streamlining various aspects of the process:

1. Designing Data Collection Tools: ChatGPT can assist in creating well-structured questionnaires, surveys, and interview guides. By analyzing research objectives and providing contextually relevant questions, it helps ensure that data collection tools are comprehensive and aligned with research goals.
2. Generating Survey Questions: It can generate a wide range of questions, from multiple-choice to open-ended formats, tailored to the research topic. ChatGPT can also help in refining questions to avoid ambiguity and ensure clarity.
3. Developing Interview Protocols: For qualitative research, ChatGPT can draft interview protocols, including introductory statements, key questions, and follow-up prompts. This aids in maintaining consistency and depth in interviews.
4. Creating Focus Group Guides: ChatGPT can design focus group discussion guides, providing a structured outline for moderators to follow. It can suggest topics, questions, and prompts to facilitate productive group discussions.
5. Automating Data Entry and Coding: ChatGPT can assist in automating the transcription and preliminary coding of qualitative data, which speeds up the data analysis phase. It can transcribe recorded interviews and categorize responses based on predefined themes.
6. Quality Control Suggestions: It can offer suggestions for quality control measures, such as checking for response consistency and completeness, thereby enhancing data reliability.
7. Ethical Considerations: While ChatGPT cannot directly ensure ethical compliance, it can provide guidance

on best practices for obtaining informed consent, ensuring confidentiality, and maintaining data security.

8. Data Collection Protocols: ChatGPT can help develop detailed protocols for data collection procedures, ensuring that all steps are systematically planned and executed.

Analytical Techniques:[8]

ChatGPT can significantly contribute to various aspects of data analysis by providing support in the following ways:

1. Selection of Analytical Methods: ChatGPT can recommend appropriate analytical techniques based on the research objectives and data type. Whether the study involves statistical analyses, qualitative coding, or machine learning, ChatGPT can suggest suitable methods and justify their relevance.
2. Explaining Analytical Techniques: It can provide detailed explanations of different analytical techniques, including statistical tests, regression models, and qualitative analysis methods. ChatGPT can break down complex concepts into more understandable terms, making it easier for researchers to grasp the underlying principles.
3. Guiding Data Preprocessing: For many analytical techniques, data preprocessing is crucial. ChatGPT can guide researchers on how to handle missing data, normalize variables, or transform data to meet the assumptions of the chosen analytical methods.
4. Generating Analysis Scripts: ChatGPT can assist in writing and optimizing scripts for data analysis using programming languages like R, Python, or MATLAB. It can generate code snippets for conducting specific analyses, such as t-tests, ANOVA, or machine learning algorithms.
5. Interpreting Results: After analysis, ChatGPT can help interpret the results by providing insights into statistical outputs, such as p-values, confidence intervals, and effect sizes. It can also assist in explaining the implications of the findings in the context of the research question.
6. Visualizing Data: ChatGPT can suggest methods for visualizing data, including creating charts, graphs, and plots. It can provide recommendations for the most effective types of visualizations to represent different kinds of data and findings.
7. Conducting Sensitivity Analysis: It can guide researchers in performing sensitivity analyses to test the robustness of their results. This involves assessing how variations in data or methods impact the conclusions of the study.
8. Reporting Results: ChatGPT can help

draft sections of research papers or reports that describe the analytical techniques used and summarize the results. It can ensure that the presentation of results is clear, concise, and aligned with academic standards.

By organizing these details coherently, ChatGPT helps researchers present their methods in a structured and understandable manner, which is crucial for reproducibility and transparency.

Results Interpretation: [10]

1. Explaining Statistical Outputs: ChatGPT helps decode complex statistics (e.g., p-values, confidence intervals, effect sizes), clarifying their significance and implications.
2. Contextualizing Findings: It relates results to the research context, aligning them with objectives and hypotheses, and how they support or contradict initial assumptions.
3. Comparing Results with Literature: ChatGPT compares the study's findings with existing research, highlighting similarities, differences, and contributions to the field.
4. Identifying Patterns and Trends: It detects significant patterns or trends, such as correlations or group differences, offering insights into underlying relationships.
5. Explaining Complex Concepts: ChatGPT simplifies intricate data interpretations and advanced statistical or theoretical concepts for broader understanding.
6. Drafting Interpretation Sections: It generates drafts for sections on data interpretation, ensuring logical flow and coherence in presenting results.
7. Addressing Limitations: ChatGPT helps identify and discuss limitations, such as biases or methodological constraints, providing a balanced view of findings.
8. Proposing Implications: It suggests practical or theoretical implications based on data, offering insights into how results might influence the field.

Use of ChatGPT in Result Writing:

Streamlining Result Writing with ChatGPT: ChatGPT can enhance the process of writing research results by interpreting and summarizing data effectively:

1. Textual Interpretation: It transforms data from tables and figures into clear, insightful summaries, aligning with visual representations.
2. Summarization: It condenses complex datasets into concise, understandable statements, avoiding overwhelming details.
3. Integration with Visuals: ChatGPT links textual descriptions with corresponding visuals, ensuring a cohesive

and easy-to-follow narrative.

4. Highlighting Key Findings: It emphasizes significant patterns or anomalies, helping readers focus on crucial results.
5. Consistent Presentation: ChatGPT ensures uniformity in style and tone, contributing to a polished presentation.
6. Clarifying Data: It provides explanations for complex results, making the data more accessible to a wider audience[11].

Discussion:

Interpreting Results: The Discussion section is where researchers interpret their findings and relate them to existing literature. ChatGPT assists in generating discussions that provide a nuanced interpretation of results. It helps in explaining the implications of the findings, how they align or contrast with previous research, and their significance in the context of clinical biochemistry.

Comparing with Existing Literature: ChatGPT can incorporate comparisons with existing studies, highlighting similarities and differences. It helps in situating the research within the broader field by discussing how the findings contribute to or challenge existing theories or knowledge.

Proposing Future Research Directions: A crucial part of the Discussion is proposing future research directions. ChatGPT can suggest potential avenues for further investigation based on the study's findings, such as exploring additional biomarkers, refining methodologies, or addressing unresolved questions.

Coherence and Consistency: Throughout all these sections, ChatGPT ensures coherence and consistency in the drafting process. It helps maintain a logical flow of information and ensures that each section aligns with the overall research objectives and findings[11].

Formatting Citations and References: ChatGPT also aids in formatting citations and references according to academic styles like APA, MLA, or Chicago. This ensures adherence to publishing standards and reduces the time spent on manual formatting tasks, maintaining the integrity and professionalism of the research paper.

Quality Assessment:

Methodological Evaluation: ChatGPT supports the critical appraisal of study methodologies by identifying strengths and weaknesses, such as robust experimental designs versus potential biases or methodological inconsistencies. This evaluation helps ensure that the included studies are methodologically sound and reliable.

Evaluation of Study Reliability and Validity:

By providing a critical assessment of study reliability and validity, ChatGPT helps researchers base their systematic reviews on

high-quality evidence. This enhances the rigor and credibility of the review, ensuring that conclusions are supported by sound methodological practices.

Limitations and Challenges:

Bias and Limitations: Despite its advantages, ChatGPT's outputs may reflect biases present in its training data. Researchers must critically evaluate generated content to mitigate any potential biases and ensure objectivity.

Complexity of Tasks: ChatGPT excels in routine tasks but may struggle with nuanced or highly specialized tasks requiring deep contextual understanding. Researchers should be aware of these limitations when using ChatGPT for complex research topics.

Ethical Considerations: [13,19]

The use of AI in academic writing raises ethical concerns, including the need for transparency in acknowledging AI contributions, respecting intellectual property rights, and ensuring data privacy. Addressing these issues is essential to maintain academic integrity. Regulatory and Ethical Considerations in AI-Generated Medical Writing

The integration of ChatGPT into research writing practices, especially in biomedical and clinical sciences, necessitates a careful examination of ethical and regulatory frameworks. While AI can support efficiency, clarity, and accessibility in manuscript preparation, it also introduces concerns around authorship, accountability, transparency, and data integrity.

To align with the best ethical practices, authors must adhere to established guidelines such as those provided by the Committee on Publication Ethics (COPE) and the International Committee of Medical Journal Editors (ICMJE). COPE emphasizes transparency in the use of AI tools and stresses that such tools should not be listed as authors, as they cannot assume responsibility for the work. Similarly, the ICMJE recommends that authors disclose how generative AI tools are used and ensure that human oversight governs the interpretation and reporting of findings.

Many journals are now updating their editorial policies to mandate disclosure of AI assistance in manuscript preparation. Failure to do so may be viewed as a breach of research integrity. Moreover, AI-generated content must be carefully reviewed to avoid hallucinated references, inadvertent plagiarism, or misrepresentation of findings—issues that could compromise scientific validity and reproducibility.

Going forward, responsible use of AI tools like ChatGPT in medical writing should include:

- Clear disclosure of AI involvement in the methods or acknowledgments section.

- Verification of all AI-generated content by qualified authors.
- Compliance with the specific AI-use policies of target journals and institutional guidelines.
- Avoidance of over-reliance on AI in areas requiring expert interpretation, such as data synthesis or clinical conclusions.

Incorporating these principles not only upholds scientific integrity but also builds trust in AI-enhanced scholarly communication.

Use of ChatGPT for References:

While ChatGPT can assist in generating references and formatting citations, its accuracy in creating specific references from journal articles or books is often unreliable. The model may produce fictitious or incorrect references[17,18], which can compromise the credibility of academic work. To find relevant literature beyond what ChatGPT provides, researchers can use tools like the Journal/Author Name Estimator at JANE. This tool helps identify appropriate journals and authors related to a given research topic.

For citation and reference formatting, ChatGPT can be highly useful. It can format citations and references according to various style guides, such as APA, MLA, or Chicago. For instance, if a reference needs to be converted from NLM style to APA style, ChatGPT can make these adjustments swiftly and accurately. This functionality streamlines the process of adhering to academic formatting standards, ensuring that references are presented consistently and professionally.

Use of ChatGPT for Grammar and Sequence Writing:

ChatGPT can be a valuable tool for improving the grammar and sequence of academic writing. It offers several functionalities that aid in refining text: [26]

1. Grammar Correction: ChatGPT can identify and correct grammatical errors, including issues with verb tense, subject-verb agreement, punctuation, and sentence structure. By analysing the text, it provides suggestions for grammatical improvements, enhancing the clarity and readability of the writing.
2. Sequencing and Coherence: In addition to grammar, ChatGPT helps with organizing text logically and coherently. It can suggest improvements for the flow of ideas, ensuring that arguments and information are presented in a logical sequence. For instance, it can assist in restructuring paragraphs to ensure that each idea transitions smoothly to the next, thereby improving the overall coherence of the manuscript.
3. Consistency and Style: ChatGPT can ensure that the writing adheres to a consistent style and tone throughout the

document. It can identify inconsistencies in language use, terminology, and formatting, and suggest adjustments to maintain uniformity.

Paraphrasing and Plagiarism Removal Using ChatGPT:

Paraphrasing is often essential for authors to rephrase text for coherence and to avoid plagiarism. ChatGPT can assist in rewording sentences and restructuring passages to present ideas clearly and in a coherent manner. It helps in generating alternative phrasings while maintaining the original meaning of the text.

However, if the primary goal is to prevent textual plagiarism, tools like QuillBot may be more effective. Quill Bot, which allows users to check and paraphrase text in chunks (up to 125 words at a time with its free version), is designed specifically to handle plagiarism concerns. For comprehensive plagiarism checks, using a dedicated tool like

Quill Bot is recommended alongside ChatGPT's paraphrasing capabilities to ensure both clarity and originality in academic writing.

Abstract writing: [27,28,29]

ChatGPT can be highly effective for drafting abstracts, provided its use is well-managed. Here's how to make the most of it while adhering to word limits:

1. Generate Drafts Quickly: Input a detailed summary of your research, and ChatGPT can produce a draft abstract that encapsulates the key points.
2. Focus on Core Elements: Provide specific instructions to ensure the abstract covers the purpose, methodology, results, and conclusion succinctly.
3. Refine and Edit: Use the draft as a starting point, then refine it to fit the word limit and ensure it aligns with your research's nuances and objectives.
4. Maintain Precision: While ChatGPT can help in initial drafting, ensure that the final version maintains the clarity and precision required for effective communication.

Manuscript Revision Using ChatGPT :[30]

After manuscript rejection, revisions are crucial for resubmission. Common reviewer critiques often involve grammatical and punctuation errors, which ChatGPT can help address by ensuring linguistic accuracy and clarity.

For the resubmission, a detailed rebuttal letter is necessary to address reviewers' feedback. ChatGPT can assist in drafting this letter, clearly explaining the changes made, addressing misunderstandings, and providing justifications for any unimplemented suggestions. Additionally, ChatGPT can refine responses to reviewers' comments, improving both clarity and grammatical precision for a more professional resub-

mission.

Informed Consent Statement:

While ChatGPT offers valuable support in academic writing, its use requires caution to ensure quality and integrity. Here are key precautions:

1. Complementary Tool, not a Replacement: ChatGPT should assist, not replace, human intellect. Researchers must actively engage with AI-generated content, refining and validating it with their expertise.
2. Potential for Bias and Inaccuracy: AI may reflect biases or outdated information. Researchers must verify content against peer-reviewed sources to ensure accuracy and impartiality.
3. Responsibility for Content: The researcher is responsible for the AI-generated content's correctness and relevance. Factual accuracy, coherence, and scientific validity must be verified.
4. Risk of Plagiarism: AI may unintentionally replicate existing text, leading to plagiarism. Researchers should use plagiarism detection tools and rephrase text to reduce risks.
5. Proper Citation and Attribution: AI-generated content must be properly cited. Transparency about AI usage is vital to avoid academic misconduct.
6. Data Security: Confidential or sensitive information should never be shared with AI tools. Researchers should use secure systems for sensitive data.
7. Avoiding Public Computers: Work involving AI should be conducted on private, secure computers to protect against data breaches.
8. Human Judgment in Academic Writing: ChatGPT lacks critical thinking and creative analysis. Researchers must ensure that the final work reflects thorough evaluation and synthesis.
9. Ethical Considerations: Disclose AI assistance transparently to maintain academic integrity and avoid misleading readers about authorship.
10. AI as an Author: While AI tools like ChatGPT are becoming involved in research, they should not be considered co-authors, as they lack perform critical research tasks.
11. AI Hallucinations: AI may generate inaccurate or nonsensical information. Enhancing training data, regular updates, validation, transparency, and human oversight can mitigate these issues.
12. Plagiarism Detection: Plagiarism detection tools can flag AI-generated material but are not infallible. Combining them with manual review and context analysis ensures better content authenticity.

Conclusion:

ChatGPT represents a transformative force in the domain of academic writing, offering notable enhancements in both efficiency and precision. By leveraging this tool, researchers and scholars can produce high-caliber research with greater ease, clarity, and accessibility. However, while the benefits are substantial, it is imperative to remain aware of the limitations and risks associated with its use.

A balanced perspective is essential—ChatGPT and similar AI tools should be viewed as augmentative rather than substitutive. Their integration into research writing must be guided by human discernment, domain expertise, and critical analysis. Over-reliance on AI-generated content risks diminishing essential academic skills such as critical thinking, deep understanding, and nuanced reasoning. Moreover, AI systems may inadvertently propagate inaccuracies, biases, or ethical oversights embedded within their training data, leading to potential misinterpretation or misrepresentation of scientific findings.

The erosion of traditional cognitive practices—analogous to the decline of handwritten personal letters in the digital age—serves as a reminder of what may be lost if human engagement is sidelined. To ensure responsible and ethical integration of AI into scholarly communication, transparency, accountability, and rigorous manual verification must remain at the forefront.

Ultimately, ChatGPT should serve as a supplementary asset—a powerful tool that supports but does not replace the intellectual rigor and ethical responsibility fundamental to academic research. By using AI judiciously and maintaining active participation throughout all stages of the scholarly process, researchers can harness its potential while safeguarding the integrity and depth of academic discourse.

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