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Applications, Benefits, and Risks of ChatGPT in Medical and Health Sciences Research: An Experimental Study

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Abstract: This article explored the potential applications, benefits, and risks of using ChatGPT in medical and health sciences research. The experimental study was performed with content analysis of the potential applications, benefits and risks of using ChatGPT in medical and health sciences research. This study shows many potential applications, benefits, and risks of using ChatGPT in medical and health sciences research. The average experts' ChatGPT appropriateness and accuracy rates in the eight research themes were between 60% and 95%. This concludes that ChatGPT could help medical and health sciences researchers, especially new researchers, with caution in many aspects of research. The ChatGPT is still in the early phase of use by researchers worldwide, and its ability to help in research will be better soon. Attending training workshops about ChatGPT and AI is very important and highly recommended. The practice of ChatGPT in medical and health sciences research is important and recommended to explore the potential uses, benefits, risks and suggest recommendations for the best practice.

Keywords: artificial Intelligence; ChatGPT; medical; health sciences

1. Introduction

Researching the various aspects of medical and health sciences education and practice is very important to evaluate the current practices, identify the challenges and suggest recommendations to address the identified challenges. The evolution of technology has contributed effectively to the medical and health sciences education, practice, and research during the last decades; one of the new technologies is Artificial Intelligence (AI) which has been implemented in many fields, including medical and health sciences education, practice and research [1-9]. AI can be defined as the "science and engineering of making intelligent machines", especially intelligent computer programs. It is related to the similar task of using computers to understand human intelligence. Still, AI does not have to confine itself to methods that are biologically observable" [9], or as "a field of science and engineering concerned with the computational understanding of what is commonly called intelligent behavior, and with the creation of artifacts that exhibit such behavior" [10]. One of the recent advances in AI development is the launch of a model called ChatGPT, which interacts conversationally. It is an innovative kind of AI that can produce writing that seems to have been written by a person [11]. The dialogue format allows ChatGPT to answer follow-up questions, admit mistakes, challenge incorrect premises, and reject inappropriate requests;

ChatGPT is a general Large Language Model (LLM) developed recently by OpenAI. While the previous class of AI models has primarily been Deep Learning (DL) models, which are designed to learn and recognize patterns in data, LLMs are a new type of AI algorithm trained to predict the likelihood of a given sequence of words based on the context of the words that come before it [12]. The ChatGPT can be used to assist researchers and health professionals in generating real time information dissemination [13]. For instance, in a study done on the Covid-19 pandemic among Brunei Darussalam patients [14], by using ChatGPT, the researcher can quickly gather data and help in answering queries about the latest case numbers, government regulations and guidelines, testing centers, vaccination sites and trends in vaccination. In a systematic review, the potential benefits of ChatGPT health care education, research, and practice have been highlighted in improving writing, research efficiency, streamlined workflow, and personalized learning [15].

Moreover, it can assist in drug use pattern-related studies, where researchers conducting a comparative analysis of the factors that impact the pattern of procurement and usage of antithrombotic drugs can leverage the insights gained to inform their medical and health sciences research [16]. Additionally, they can harness the capabilities of ChatGPT, an AI-powered language model, to further enhance their studies. By synergistically combining the findings from their comparative analysis with the support of ChatGPT, medical and health sciences researchers can effectively advance their understanding of the subject matter and contribute to evidence-based practices in this domain. Furthermore, ChatGPT can be considered a supportive tool to facilitate the literature review process. It can help the researcher access a wide range of literature sources and provide an overview of studies from various disciplines and publications. For instance, in gathering data related to Mangrove Antinobacterial diversity [17], use of ibrutinib in multiple myeloma [18], or in identifying the prevalence of *Listeria monocytogens* [19] related studies, ChatGPT can provide relevant summaries of the studies, helping to identify important findings, methodologies, and identifying the research gaps in existing research. Besides that, by leveraging ChatGPT, researchers can access up-to-date information on topics like *Mycobacterium ulcerans* [20], facilitating data gathering and answering queries related to pathogenesis, diagnosis, and treatment. Additionally, ChatGPT can aid in exploring breakthroughs in Actinobacteria drug discovery research [21] by assisting in data analysis, literature reviews, and generating insights. Furthermore, in studying the chemistry of the gut microbiome [22], ChatGPT can assist researchers in retrieving relevant studies, analyzing complex interactions, and generating hypotheses for further investigation. Overall, ChatGPT can be a valuable tool in medical research, supporting researchers with information retrieval, data analysis, and knowledge synthesis [23].

As massive studies show that ChatGPT has the potential to revolutionize medical research in various ways [24-27], many medical and health sciences researchers started using ChatGPT at the end of 2022 for many purposes, including research and scientific writing. With its potential to revolutionize the clinical and translational medicine fields, ChatGPT offers benefits like access to current information, enhanced patient engagement, and reduced healthcare provider workloads [28]. This article aimed to explore the potential applications, benefits, and risks of using ChatGPT in medical and health sciences research.

2. Materials and Methods

2.1. Study Design

The researchers will perform the content analysis of the potential applications, benefits, and risks of using ChatGPT in medical and health sciences.

2.2 Data collection

The research was conducted between 01 January 2023 and 20 February 2023 to explore the potential applications, benefits, and risks of using ChatGPT in medical and health sciences research. Questions related to the medical and health sciences research were asked to explore the ability of ChatGPT to answer them; the questions were divided into the following themes:

2.2.1. Theme 1. Questions related to the research ideas

The questions were to suggest ideas for research projects; eight questions were related to pharmacy practice, public health, and patient care.

2.2.2. Theme 2. Questions related to the research proposal

The questions were to write a proposal for the research projects. Three projects were selected from what ChatGPT suggested in the previous step (Theme 1) related to pharmacy practice, public health, and patient care.

2.2.3. Theme 3. Questions related to the research background

The questions were to write a background for the research projects. Three projects were selected from what ChatGPT suggested in the previous step (Theme 2) related to pharmacy practice, public health, and patient care.

2.2.4. Theme 4. Questions related to the literature review

The questions were to write a literature review for the selected three projects.

2.2.5. Theme 5. Questions related to the research questions and objectives

The questions were to suggest research questions and objectives for the selected three projects.

2.2.6. Theme 6. Questions related to the research hypothesis

The questions were to suggest null and alternative hypotheses for the selected three projects.

2.2.7. Theme 7. Questions related to the significance of the study and expected outcomes

The questions were to write the significance of the study and expected outcomes for the three selected projects.

2.2.8. Theme 8. Questions related to the methodology

The questions were to suggest different study designs, data collection, populations, sample size calculation, sampling methods, and data analysis for the three selected projects.

2.3. Data Analysis

Four professors with long experience in medical and health sciences research (two from pharmacy school and two from medicine school) independently evaluated the answers by ChatGPT and rated the appropriateness and accuracy of each question as a percentage out of 100; the average of four professors' evaluations was considered in this study. Moreover, they will comment on the potential applications, benefits, and risks of using ChatGPT in medical and health sciences research.

3. Results

3.1. Theme 1 - Questions related to the research ideas

Analysis of the expert's opinion shows that ChatGPT was able to suggest more than ten research ideas for each specialty. Moreover, the ideas were good. The average of experts' rates of appropriateness and accuracy was 95%.

3.1.1. Potential benefits

ChatGPT can help medical and health sciences researchers, especially new researchers, select good ideas.

3.1.2. Potential risks

ChatGPT can generate general ideas but cannot generate specific ideas.

3.1.3. Recommendations

Medical and health sciences researchers, especially new researchers, can use ChatGPT as a guide for generating research ideas.

3.2. Theme 2 - Questions related to the research proposal

Analysis of the expert's opinion shows that ChatGPT could write brief research proposals for the three selected proposals. The average experts' rates of appropriateness and accuracy were 60%.

3.2.1. Potential benefits

ChatGPT can help medical and health sciences researchers, especially new researchers, as a guide in writing brief research proposals.

3.2.2. Potential risks

There are many steps in writing good proposals, which ChatGPT will not be able to do.

3.2.3. Recommendations

Medical and health sciences researchers cannot use ChatGPT to write good research proposals.

3.3. Theme 3 - Questions related to the research background

Analysis of the expert's opinion shows that ChatGPT could write research background with the rationality for the three selected projects. However, ChatGPT was not able to cite what was written appropriately. The average of experts' rates of appropriateness and accuracy was 75%.

3.3.1. Potential benefits

ChatGPT can help medical and health sciences researchers, especially new researchers, as a guide in writing background about research projects.

3.3.2. Potential risks

The background should include the appropriate references, which ChatGPT will not be able to do it.

3.3.3. Recommendations

ChatGPT can help medical and health sciences researchers, especially new researchers, as a guide in writing the research background.

3.4 Theme 4 - Questions related to the literature review

Analysis of the expert's opinion shows that ChatGPT was able to write a research literature review for the three selected projects. However, ChatGPT could not cite what was written appropriately. Moreover, the literature review was not up-to-date. The average experts' rates of appropriateness and accuracy were 70%.

3.4.1. Potential benefits

ChatGPT can help medical and health sciences researchers, especially new researchers, as a guide in writing literature reviews. This was in line with the finding by Vaishya et al. (2023), which states that the current ChatGPT version appears helpful to medical professionals [29].

3.4.2. Potential risks

Writing a literature review should include the appropriate references and update the literature, which ChatGPT will not be able to do.

3.4.3. Recommendations

ChatGPT can help medical and health sciences researchers, especially new researchers, as a guide in writing the literature review.

3.5. Theme 5 - Questions related to the research questions and objectives

Analysis of the expert's opinion shows that ChatGPT was able to suggest good objectives and study questions. The average experts' rates of appropriateness and accuracy were 90%.

3.5.1. Potential benefits

ChatGPT can help medical and health sciences researchers, especially new researchers writing the research objectives and study questions.

3.5.2. Potential risks

ChatGPT cannot generate specific objectives and research questions.

3.5.3. Recommendations

Medical and health sciences researchers, especially new researchers, can use ChatGPT as a guide for writing the study objectives and questions.

3.6. Theme 6 - Questions related to the research hypothesis

Analysis of the expert's opinion shows that ChatGPT was able to suggest good null and alternative hypotheses for the research projects. The average of experts' rates of appropriateness and accuracy was 90%.

3.6.1. Potential benefits

ChatGPT can help medical and health sciences researchers, especially new researchers, write the null and alternative hypotheses for research projects.

3.6.2. Potential risks

ChatGPT cannot generate specific null and alternative hypotheses for the research projects.

3.6.3. Recommendations

Medical and health sciences researchers, especially new researchers, can use ChatGPT as a guide for writing the null and alternative hypotheses for research projects.

3.7. Theme 7 - Questions related to the significance of the study and expected outcomes

Analysis of the expert's opinion shows that ChatGPT was able to write the significance of the study and expected outcomes for the research projects. The average experts' rates of appropriateness and accuracy were 80%.

3.7.1. Potential benefits

ChatGPT can help medical and health sciences researchers, especially new researchers, write the study's significance and expected outcomes for the research projects.

3.7.2. Potential risks

ChatGPT cannot generate specific significance of the study and expected outcomes for the research projects.

3.7.3. Recommendations

Medical and health sciences researchers, especially new researchers, can use ChatGPT as a guide for writing the significance of the study and expected outcomes for the research projects.

3.8. Theme 8. Questions related to the methodology

Analysis of the expert's opinion shows that ChatGPT could suggest different study designs, data collection, populations, sample size calculation, sampling methods, and data analysis for the selected projects. The average experts' rating of appropriateness and accuracy was 60%.

3.8.1. Potential benefits

ChatGPT can help medical and health sciences researchers, especially new researchers suggest different study designs, data collection, populations, sample size calculation, sampling methods, and data analysis for the selected projects. Moreover, ChatGPT can elaborate on each method, data collection, population, sample size calculation, sampling methods, and data analysis.

3.8.2. Potential risks

ChatGPT cannot generate valid and reliable methods. There are many steps to design valid and reliable questionnaires or qualitative interviews, which ChatGPT will not be able to do.

3.8.3. Recommendations

Medical and health sciences researchers, especially new researchers, in many can use ChatGPT as a guide for methodology. However, Medical and health sciences researchers cannot use ChatGPT to develop valid and reliable questionnaires and qualitative interviews.

4. Discussion

This study explored the potential applications, benefits, and risks of using ChatGPT in medical and health sciences research. The findings of this study can be classified into the following themes.

4.1. Theme 1 - Research ideas

This study's findings show that ChatGPT could suggest good research ideas. Research ideas are critical to start any research project; this could help new researchers in their early careers as a guide. However, researchers should apply critical thinking and search for new research ideas to fill the gap in the literature. Moreover, more information and research about this issue must be needed to compare and conclude that ChatGPT or the new AI technologies positively impact generating ideas. In conclusion, many medical and health sciences researchers, especially new researchers, can use ChatGPT as a guide for developing research ideas. For example, using a medical mobile phone application linked to ChatGPT assists in collecting a wealth of data and analyzing and interpreting this data into meaningful patterns and insights to support medical and health sciences research [30].

4.2. Theme 2 - Research proposal

This study's findings show that ChatGPT could write brief research, which is unacceptable to depend on for acceptable research proposals. However, ChatGPT is still in the early development phase, and it could be better soon and be able to generate better proposals.

4.3. Theme 3 - Research background and literature review

This study's findings show that ChatGPT could write research background without the appropriate references and updated literature. This could be due to many reasons, such as the nature of ChatGPT as a new language model and the need for access to scientific databases.

4.4. Theme 4 - Research questions, objectives and hypothesis

This study's findings show that ChatGPT was able to suggest good research objectives, questions, and hypotheses. Therefore, many medical and health sciences researchers, especially new researchers, can use ChatGPT as a guide for generating research objectives, questions, and hypotheses.

4.5. Theme 5 - Expected outcomes and significance of study

This study's findings show that ChatGPT could write the significance of the study and expected outcomes for the research projects but cannot generate specific significance of the study and expected outcomes for the research projects. This could be due to the nature of ChatGPT as a new language model. ChatGPT is still in the early development phase and could be better soon.

4.6. Theme 6 - Research methodology

This study's findings show that ChatGPT cannot generate valid and reliable methods. However, ChatGPT was able to suggest different study designs, data collection, populations, sample size calculation, sampling methods, and data analysis, which could help medical and health sciences researchers, especially new researchers.

5. Conclusions

In conclusion, ChatGPT could help medical and health sciences researchers, especially new researchers, with caution in many aspects of research. ChatGPT is still in the early phase of use by researchers worldwide, and its ability to help in research will be better soon. Attending training workshops about ChatGPT and AI is very important and highly recommended. Practice ChatGPT in medical and health sciences research is very important and highly recommended to explore the potential uses, benefits, and risks and suggest recommendations for the best practice.

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