# CHAT GPT in Health Sciences – A Journey from Bigotry to Peril

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**Abstract**

The new arrival of ChatGPT, an advanced version of chatbots which is a general language model contrivance created by Open AI in November 2022 for research projects is a sensation among both the overall population and clinical experts, gathering an extraordinarily enormous client base in a brief time frame. However, it will be prudent for healthcare professionals and academicians to stay reasonable amid the promotion as this AI-powered chatbot can help to detect patterns in data, but it is liable for “hallucinations” as the information provided by this advanced chatbot at times does not relate to the real-world scenario and has been dealt with monitoring and evaluation periodically by human intervention.

# Introduction

ChatGPT (Generative Pre-trained Transformer) is the new innovative version of chatbots or a generative language model contrivance created by Open AI in November 2022 as an application proficient with an ability to sift through at least three hundred billion words on various topics to make life easier for clinicians, students, and academics by summarizing research articles, formulate explanations of difficult topics with the help of additional visual aids and examples, and give tailored learning lessons to students by analysing their performance and providing them with relevant resources to help them with their studies1.

Historically, Chatbots were designed to communicate with humans via virtual email correspondence on the internet and were pre-programmed with a certain amount of data and rules of functioning but they did not generate any new information2; on the other hand, ChatGPT which works through algorithms3, is a radical form of chatbot. Unlike chatbots, it can produce new information outside their programming as they are trained on unsupervised data but the downside is that it has a liability for Artificial Hallucination2 where the information provided by this advanced chatbot does not relate to the real-world scenario and has dealt with monitoring and evaluation periodically4,2,5. For example, ChatGPT is trained on data only till 2021 and does not have access to the National Library of Medicine therefore it cannot give up- to-date information on medical issues accurately6.

Nevertheless, it has caught the eye of students and academicians in the research fields of science to write their essays and research articles in a jiffy without much effort. Even though ChatGPT has been mooted as a new panacea for students, researchers, and academicians to write credible essays but the issue remains- “Is the information provided trustworthy”?

For instance, a study4 done on the implications of the usage of ChatGPT in the field of medicine to write about the pathogenesis of Pompe Disease (LOPD) and Osteoporosis due to homocystinuria discovered that though ChatGPT could explain the facts of the above- mentioned conditions it could not reference the PubMed (PMID’s) well and gave a list of unrelated research papers. The authors of this study found that though ChatGPT can sort the bullet points of the literature review initially written by the authors it cannot deal with recurrent PMIDs mentioned in the text. This can be attributed to the fact that ChatGPT has been trained on colossal databases to look for patterns and bring together sentences based on likelihood calculations7.

Therefore, this literature review seeks to identify the usages and perils of employing ChatGPT as a credible tool in the fields of healthcare of both medicine and dentistry in academics.

# Methodology

For this review, the author sourced articles, chiefly full text, written in English from Pubmed and Google Scholar. Very few relevant articles were deemed eligible as most papers were either short with or without abstracts, editorials, or overviews of the subject. The review is laid out as a general overview and specific information is displayed as Table 1.

# ChatGPT in Healthcare

The uses and drawbacks of ChatGPT are listed as follows:

**Uses of ChatGPT in health care** 8,9.10,11 :

* Can be used as an additional tool in diagnoses in the fields of dentistry, cardiology, radiology, pathology, urology, plastic surgery, etc.
* It can assist in decision-making by identifying trends in data and predicting the diseases and their prognosis
* Suggest tailored therapies and improve patient outcomes by working as a virtual assistant and responding to their queries
* It can help medical services by scheduling appointments, remote monitoring, and sending reminders for medications.

**Drawbacks of this system are 8, 11, 12**:

* Needs human supervision as output can be biased.
* Expensive
* Needs large memory and computational power not possible in smaller medical apps.
* Not much information from external sources like medical journals and textbooks
* Risk of data privacy of patients
* Technical problems like hardware malfunction or software bugs can develop in the system

**Usages and perils of Chat GPT in Academics**

Covid-19 gave rise to an increase in many publications and some of them sidestepped the normal peer-reviewing process and resulted in unsubstantiated assertions being referenced. This issue may have enhanced the use of AI tools like ChatGPT to aid scientific medical writing by making it easy and faster to come up with high-quality publications. As ChatGPT can quickly analyse the articles for their content and arrange the information into a much more coherent conclusion using visuals and graphs and it helps to arrange the references and improve the quality of the manuscript at large13,14.

Academicians in the past have used manual methods to search and sift through vast amounts of written data and the advent of Chat GPT a module of the Natural Language processing algorithm has made life easy for academicians as it can-write codes, coherently summarise the literature, and write grammatically correct research papers15,16. NLP is an advanced deep learning algorithm of AI trained on large text datasets of the internet and this gave birth to Open AI’s Chat GPT 2 & 3 models which use training data to write and generate text to help queries on various texts by a large number of consumers15,16.

But this technology is not fullproof as mooted by its developers as study 17 found sixty-three percent bogus abstracts quoted by Chat GPT among the research publications raising serious doubts on its genuineness. Therefore, the researchers need to double-check the references cited by Chat GPT.

# Effect of ChatGPT on the Student’s learning curve

Another study18 reflects on the procedures employed by ChatGPT to tutor students based on their individual needs by explaining to them their misconceptions via a conversational model and helping them to enhance their learning outcomes. It can grade and translate essays and educational material in different languages19,20 and serves as an educational source for students as virtual learning with artificial intelligence-sourced apps. It can assist students of medicine and dentistry by creating assignments for students and helping the teachers in their assessments but the downside is that it produces instant answers also which may hamper learning among students21-. The students can end up writing their research assignments without much effort and may fall prey to plagiarism and unsound research articles as ChatGPT is not very reliable in obtaining correct information from tables, graphs, and medical databases.

Language Learning Models (LLM) were developed to help healthcare consumers with additional information and interaction with the medical domain however it has not shown promising results in testing the student's clinical knowledge in the licensing exams2,22,23.

ChatGPT can mimic human behaviour but cannot provide the same interaction as a human teacher; being trained on statistical data cannot truly reason and understand underlying concepts so it cannot clear the student's misconceptions completely as needed and are prone to bias18.

# Chat GPT in Dentistry

ChatGPT has found various uses in dentistry ranging from diagnosis of dental anomalies from OPG radiographs, assessing the risk of diseases- periodontal diseases, root caries, bone lesions, recording digital data, and even scheduling dental appointments24, 25,26,27. This helps with patient education, quality, safety, and awareness of different dental services.

# Figure 1: ChatGPT use

**s in Dentistry** (Ref: 24)

Artificial Intelligence in

Dentistry is

(Data oriented)

It uses tools such as:

( NLP, Data Mining, Radiographic Analysis)

**Deep Learning**

* Decision making
  + Treatment planning
    - Prediction and outcome of treatment

(Identifies Pattern in manually derieved Data)

**Machine Learning**

(Artificial neural network inspired by the human Brain uses raw input data and extracts the necessary features)

* Caries detection
* Endodontics- periapical lesions , root fractures
  + Orthodontics- Cephalometric

6 points, anlyze anatomy, growth andand development

* Plan Orthognathic surgery
* Implants

# Table 1: Specific overview of ChatGPT in healthcare

|  |  |  |  |
| --- | --- | --- | --- |
| Author/ Year/ref.no | **Study design** | **Number of Respondents/**  **Records** | **Results** |
| Hosseini/2023/28 | Survey | 420 responses/ 844 participants | * 40% had tried ChatGPT * 64.2% were medical trainees * 56.6% were Postdoc graduates * 49%faculty * Clinicians 31.1% * At-least sixty percent   believed it could be used in health care and education\* |
| Sallam/2023/29 | Systematic Review | 60 records | * 51.7% Efficiency and versatility in writing * 33.3% benefits in scientific research * 23.3% benefits in healthcare * 11.7% benefits in healthcare education * 96.7% had concerns with   ethics, plagiarism, |

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  | inaccurate content, hallucinations, risk of bias  , incorrect citations, and  cybersecurity issues. |
| Athaluri/ 2023/30 | Analytical Design | 178 references | * 69 references did not have Digital Object Identifier (DOI) * 28 references were bogus as they were not on Google   search and had no DOI. |
| Strunga/ 2023/31 | Scoping | 27 studies | * The use of telemedicine is |
|  | Review |  | improving in modern |
|  |  |  | dentistry and orthodontics |
|  |  |  | helps better patient |
|  |  |  | monitoring and compliance |
|  |  |  | with treatment. It saves |
|  |  |  | chairside time and benefits the |
|  |  |  | patient financially, |
|  |  |  | psychologically, and |
|  |  |  | aesthetically. |
|  |  |  | * AI software used in |
|  |  |  | orthodontics helps to detect |
|  |  |  | early debonding of brackets, |
|  |  |  | relapse in malocclusion, etc. |

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  | * Cephalometric tracings can monitor and evaluate orthognathic cases and detect dental and skeletal abnormalities * AI-powered tools help with prediagnosis, clinical stability, and post- treatment evaluation of the orthodontic patient. * But the limitations are that it is not hundred percent accurate as the algorithms can be biased and incorrect and need the intervention of a   trained orthodontist. |
| Sinha/ 2023/32 | Cross-sectional study | 100 high-order reasoning queries solved by ChatGPT | * The program could solve   100 high-order queries in 45.31±7 seconds per answer with 80% accuracy   * The overall median score was 4.08\* * Chat GPT was able to   solve 4 out of 5 responses accurately to 100 random |

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  | questions posed in a high reasoning pathology test.   * ChatGPT can and can help students and academicians to solve reasoning- type questions in Pathology with a   good amount of accuracy. |
| Li/ 2023/33 | Systematic | 16 records | * ChatGPT’s question – and- |
|  | Review |  | answer interface can be |
|  |  |  | integrated into the clinical |
|  |  |  | workflow as it can justify its |
|  |  |  | answers and also provide |
|  |  |  | feedback in real-time. |
|  |  |  | * ChatGPT is still in its |
|  |  |  | experimental phase and needs |
|  |  |  | more work before it can be |
|  |  |  | deployed exclusively in the |
|  |  |  | healthcare sector. |
|  |  |  | * It tends to fabricate |
|  |  |  | information and needs human |
|  |  |  | intervention for final decision |
|  |  |  | - making in the medical |
|  |  |  | sector. |

|  |  |  |  |
| --- | --- | --- | --- |
| Khalil / 2003/34 | Descriptive Study | 50 topics | * Turintin (25 essays) and iThenticate(25 essays) were checked for plagiarism * iThenticate-ChatGPT assisted essays 68% had high originality * Turintin showed 20-40% plagiarism in more than 10 % of the essays * Turintin could correctly   predict that 46 / 50 articles were done with ChatGPT |
| Kung/2023/35 | Analytical  Study | - | * ChatGPT cleared USMLE   with 60% accuracy. |
| Sullivan/2023/36 | Content analysis | 100 articles | * Most articles (n=88) spoke of concerns regarding academic integrity and found that students were “cheating” and “plagiarism: on writing their essays as they got the work done from a chatbot. * Incorrect information |

**To Summarize…**

1. ChatGPT is most preferred by medical post-doc trainees for their research work, especially in medical writing of their assignments.
2. It has huge concerns for plagiarism, ethics, bias, incorrect content, etc.
3. It has been used in dentistry, especially in Orthodontics with success in AI-powered apps for cephalometric tracings and it can detect skeletal abnormalities with good accuracy.
4. It has proved to be able to pass exams like USMLE and answer pathological queries with 60-80% accuracy respectively
5. ChatGPT-written essays have about 68% of accuracy.

# Conclusion

ChatGPT works on the principles of prediction by classifying and seeking patterns in data. It cannot understand the gist and perspective of the given information well, as it is programmed on prevailing data and therefore it cannot be used as a stand-alone tool for decision making it needs human intervention to complete the cycle of its innovative abilities.

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