

A pilot study on the capability of artificial intelligence in preparation of patients' educational materials for Indian public health issues

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ABSTRACT

Background: Patient education is an essential component of improving public health as it empowers individuals with the knowledge and skills necessary for making informed decisions about their health and well-being. Primary care physicians play a crucial role in patients' education as they are the first contact between the patients and the healthcare system. However, they may not get adequate time to prepare educational material for their patients. An artificial intelligence-based writer like ChatGPT can help write the material for physicians. **Aim:** This study aimed to ascertain the capability of ChatGPT for generating patients' educational materials for common public health issues in India. **Materials and Methods:** This observational study was conducted on the internet using the free research version of ChatGPT, a conversational artificial intelligence that can generate human-like text output. We conversed with the program with the question - "prepare a patients' education material for X in India." In the X, we used the following words or phrases - "air pollution," "malnutrition," "maternal and child health," "mental health," "noncommunicable diseases," "road traffic accidents," "tuberculosis," and "water-borne diseases." The textual response in the conversation was collected and stored for further analysis. The text was analyzed for readability, grammatical errors, and text similarity. **Result:** We generated a total of eight educational documents with a median of 26 (Q1-Q3: 21.5-34) sentences with a median of 349 (Q1-Q3: 329-450.5) words. The median Flesch Reading Ease Score was 48.2 (Q1-Q3: 39-50.65). It indicates that the text can be understood by a college student. The text was grammatically correct with very few (seven errors in 3415 words) errors. The text was very clear in the majority (8 out of 9) of documents with a median score of 85 (Q1-Q3: 82.5-85) in 100. The overall text similarity index was 18% (Q1-Q3: 7.5-26). **Conclusion:** The research version of the ChatGPT (January 30, 2023 version) is capable of generating patients' educational materials for common public health issues in India with a difficulty level ideal for college students with high grammatical accuracy. However, the text similarity should be checked before using it. Primary care physicians can take the help of ChatGPT for generating text for materials used for patients' education.

Keywords: Artificial intelligence, ChatGPT, education, health awareness, intelligence, internet, patient, physicians, publication

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Introduction

Patient education is an essential component of improving public health as it has several benefits. It helps in the empowerment of patients with the knowledge and skills to make informed

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decisions about their health and well-being.^[1] This helps to improved health outcomes and increased patient satisfaction. Informed patients also develop improved health behaviors such as increased adherence to medication regimens and healthier lifestyle choices. Proper education also has the potential to reduce the need for unnecessary medical interventions and ultimately lower healthcare costs.^[2] Patients suffering from chronic disease with proper education on the disease can improve their ability to self-manage their condition, leading to better health outcomes and reduced healthcare utilization. It also facilitates a better communication with healthcare providers and improved health outcomes.^[3]

Public health education material plays a critical role in improving the health of the population. It helps raising awareness about important health issues, such as the risks of communicable diseases, the importance of healthy lifestyles, and the dangers of air pollution.^[4] A printed material or online material can provide information about healthy behaviors, such as proper hand washing, safe food preparation, and the benefits of regular exercise, which can help to adopt healthier lifestyles. Hence, a simple educational material has potential to reduce the spread of communicable diseases, limit noncommunicable diseases, and improve the overall health of the population.^[5,6]

Primary care physicians play a crucial role in patients' education. They are the first contact between patients and health system. They can prepare educational materials and provide patients with personalized information about their health and well-being, including information about their medical conditions, medications, and treatment options.^[7] They can also help educate patients about healthy behaviors, such as proper nutrition, regular physical activity, and stress management, and can help patients adopt these behaviors. With proper education, many of the misconceptions about health and wellness can be eliminated to help patients make informed decisions about their health.^[8-10] However, primary care physicians in India are burdened with high patients load. Hence, they may rarely get adequate time and motivation for preparation of those materials.^[11]

Artificial intelligence-based writer can help generating human-like text with the advent of language-based models. Chat Generative Pre-trained Transformer (ChatGPT) is one such model that is being in the scientific discussions all around the world. This conversational program can help generating articles according to preference of the user.^[12,13]

With this background, in this pilot study, we aimed to ascertain the capability of ChatGPT for generating patients' educational materials for some of the common public health issues in India. The study result would help deciding the adoption of the program for creating text content for public health awareness. Primary care physicians can take help of the program for creating materials for patients' education, if the program is found to be suitable for the purpose.

Materials and Methods

Settings and ethics

This cross-sectional observational study was done on the internet. We used a personal computer with a personal broadband connection for collecting data. The data were available in an artificial intelligence-based language model that provides free service at the point of time for research purposes. No data of human research participants or sensitive data were analyzed in this study. Hence, this study did not require any clearance from Institutional Ethics Committee according to prevailing guidelines.

Tools

We used ChatGPT (<https://chat.openai.com>) as the artificial intelligence-based writer for creating textual content. For calculating the Flesch Reading Ease Score and Flesch-Kincaid Grade Level, we used an online calculator available at <https://goodcalculators.com/flesch-kincaid-calculator>. This calculator also calculates the number of sentences, number of words, average words per sentence, and average syllables per word. The grammatical errors were tested with the free version of Grammarly available at <https://app.grammarly.com/docs/new>. This application provides the number of errors in the text, a total correctness score of 100, clarity, engagement, and delivery. The text similarity was checked by Turnitin available at <https://www.turnitin.com>. The report shows the overall similarity index (i.e., text plagiarism) in percentage along with the percentages of sources categorized into internet sources, publications, and students' papers.

Data collection method

We conversed with ChatGPT with the question - "prepare a patients' education material for X in India." In the place of X, we used the following words or phrases - "air pollution," "malnutrition," "maternal and child health," "mental health," "noncommunicable diseases," "road traffic accidents," "tuberculosis," "vector-borne diseases," and "water-borne diseases" to create a total of nine commands.^[14,15] Each of the commands was entered in the chat box. The textual response in the conversation was collected and stored for further analysis.

Data analysis

Generated text for each interaction was tested individually. The text was tested for readability, grammatical errors, and text plagiarism. Continuous data were presented as median and interquartile range (first quartile [Q1] - third quartile [Q3]) for observing the central tendency. Categorical data were presented in numbers. Categorical data were tested by Chi-square test. A *P* value of <0.05 was considered statistically significant. We used GraphPad Prism 7.0 (GraphPad Software Inc., USA) for statistical test.

Result

A total of nine conversational texts were analyzed in this study. An example of part of a conversation is shown in Figure 1.

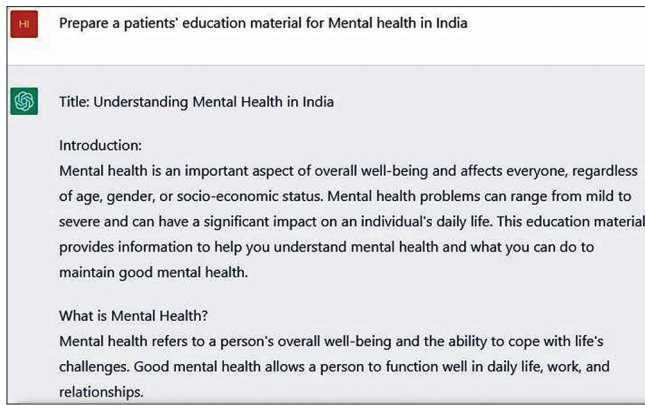


Figure 1: A screenshot showing part of a conversation with ChatGPT (generated from <https://chat.openai.com> on 07 February 2023)

A total of 3415 words were generated with the conversation with a median of 349 words with a median of 26 sentences. The reading ease score was 48.2, which indicates that a college student can easily read and understand the text. The details are shown in Table 1.

The generated text had negligible grammatical or punctuation errors. In a total of 3415 words, there were only 7 errors as detected by Grammarly. Eight of the documents was “very clear” to understand and one was “a bit unclear.” The engagement was “a bit bland” for 6 documents, and one was “engaging” and another “very engaging.” The delivery was “just right” for all the documents. A median score of 85 was achieved by the documents in a score of 100 with a quartile ranging from 82.5 to 85.

The text similarity report is shown in Table 2. There was a median text similarity of 18% with the source being the internet and students’ paper. The text was not sourced from publication.

Discussion

With an aim to ascertain the capability of generating patients’ educational materials for public health issues in India, we found that ChatGPT is capable of writing short documents of approximately 349 words with high grammatical accuracy and tolerable level of text similarity instantly that can be read and understood by a college going student.

The ideal reading score for health education materials depends on the target audience. It is generally recommended to aim for a reading grade of 6th standard.^[16] This level of difficulty is easily understandable for most people. This ensures that the information is effectively communicated to a wide range of individuals, including those with limited literacy skills. The text we got from the ChatGPT conversation was suitable for the college level. Hence, while generating text from ChatGPT, its difficulty levels may be an issue for its suitability for a layman. After getting the text from the program, it may be further edited

Table 1: Characteristics of the texts with reading score

Parameter	Median	First quartile–third quartile
Sentences (n)	26	21.5-34
Words (n)	349	329-450.5
Word/sentence	14.6	12.4-15.4
Syllable/words	1.7	1.7-1.8
Grade level*	10.2	9.05-11.65
Ease score [†]	48.2	39-50.65

*Flesh-Kincaid Grade Level indicates the grade of education (e.g., a grade of 10 indicates a person with 10th grade of education can read and understand the text). [†]Flesch Reading Ease Score indicates show how readable a text is (ranges from 0-100; higher the score higher the ease of reading)

Table 2: Text similarity of the generated text

Parameter	Median	First quartile–third quartile
Text similarity index (%)	18	7.5-26
Internet source (%)	11	4.5-18.5
Publication (%)	0	0-1
Student papers (%)	11	0-14.5

Report generated on 08 February 2023

for making smaller sentences and words may be replaced with easier synonyms, if needed.

Non-native speakers of English may face several challenges when writing a health-related document in English.^[17] Although Indian physicians are trained in English medium, they may still face difficulty with complex grammatical structures and sentence structures, leading to unclear messages in a document aimed at educational purposes. They may not be familiar with the idiomatic expressions and colloquialisms commonly used in English-language health writing. Furthermore, they may have difficulty conveying complex health information in simple terms. These can be handled by the use of artificial intelligence-based writers like ChatGPT. In our study, we found that the conversation text from the program is having negligible grammar and punctuation errors. Hence, this method of writing educational material would be of great help to a non-native English speaker.

However, the ChatGPT text may have text similarity with other resources available on the internet, research publications, or other sources. When these models generate text, they may reuse the pre-existing texts that were used for training the program. This can sometimes result in text that lacks originality and is similar to other sources. In our pilot study, we found that the text similarity was below 20% ranging from a minimum of 3% to a maximum of 37%. Hence, texts sourced from the program have some limitations. Along with that, physicians should always properly attribute any text generated by the model.^[18] In addition, we found that a significant percentage of the text is sourced from students’ assignments as detected by Turnitin. However, this may be because many students around the world are using ChatGPT for generating their school or college assignments. When they submit it for assessment via Turnitin, then the software considers the source of the student’s paper.

A primary care physician may get help from ChatGPT in writing patient education documents by using the model as a writing assistant.^[19] The physician can provide context and information about a particular health topic, and the model can generate text that explains the topic in a clear, concise, and easy-to-understand manner.^[20] Any prospective users can take the help of the program with more customization of commands according to necessity. However, it is not a substitute for the expertise and judgment of a physician. The physician should always review and edit the text generated by the model to ensure accuracy, appropriateness, and relevance to their patients.

Conclusion

The research version of the ChatGPT (January 30, 2023 version) is capable of generating patients' educational materials for common public health issues in India with a difficulty level ideal for college students with high grammatical accuracy. Although the text similarity was low, it should be checked before using the text in any document. Primary care physicians can take the help of ChatGPT for generating text for materials used for patients' education at their clinics or hospital where they are working.

Plain language summary

This study looked at using an artificial intelligence tool called ChatGPT to create educational materials for patients about public health issues in India. The study found that ChatGPT was able to create materials that were easy for college students to understand and had good grammar, but the text was similar to other sources, so it should be checked before using it. Overall, the study suggests that primary care doctors can use ChatGPT to create educational materials for their patients.

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Conflicts of interest

There are no conflicts of interest.

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