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# Nurses' assessment of artificial intelligence chatbots for health literacy education

Gulsum Asiksoy

## Abstract:

**BACKGROUND:** Artificial intelligence (AI)-powered chatbots are emerging as a new tool in healthcare, offering the potential to provide patients with information and support. Despite their growing presence, there are concerns regarding the medical reliability of the information they provide and the potential risks to patient safety.

**MATERIAL AND METHODS:** The aim of this study is to assess the medical reliability of responses to health-related questions provided by an AI-powered chatbot and to evaluate the risks to patient safety. The study is designed using a mixed-methods phenomenology approach. The participants are 44 nurses working at a private hospital in Cyprus. Data collection was conducted via survey forms and focus group discussions. Quantitative data were analyzed using descriptive statistics, while qualitative data were examined using content analysis.

**RESULTS:** The results indicate that according to the nurses' evaluations, the medical reliability of the AI chatbot's responses is generally high. However, instances of incorrect or incomplete information were also noted. Specifically, the quantitative analysis showed that a majority of the nurses found the chatbot's responses to be accurate and useful. The qualitative analysis revealed concerns about the potential for the chatbot to misdirect patients or contribute to diagnostic errors. These risks highlight the importance of monitoring and improving the AI systems to minimize errors and enhance reliability.

**CONCLUSION:** AI chatbots can provide valuable information and support to patients, improving accessibility and engagement in healthcare. However, concerns about medical reliability and patient safety remain. Continuous evaluation and improvement of these systems are necessary, alongside efforts to enhance patients' health literacy to help them accurately assess information from AI chatbots.

## Keywords:

Artificial intelligence, chatbot, health literacy, healthcare, patient safety

Department of Education  
and Instructional  
Technology, Atatürk  
Faculty of Education,  
North Cyprus via Mersin  
10, Turkey

## Address for correspondence:

Prof. Gulsum Asiksoy,  
Department of Education  
and Instructional  
Technology, Atatürk  
Faculty of Education, Near  
East University, North  
Cyprus via Mersin 10,  
Turkey.  
E-mail: gulsum.asiksoy@  
neu.edu.tr

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## Introduction

In recent years, integrating artificial intelligence (AI) technologies into healthcare has created major transformations across various domains of medical practice.<sup>[1]</sup> These transformations encompass a broad spectrum, ranging from education and patient care to administrative tasks.<sup>[2]</sup>

Particularly noteworthy are AI-powered chatbots, which hold immense potential in providing patient information and

support. These chatbots can interact with users in natural language, facilitating seamless knowledge sharing.<sup>[3]</sup> AI and chatbots have undergone a remarkable developmental journey spanning approximately 60–70 years. However, ChatGPT is a transformative advancement in this domain.<sup>[4]</sup> ChatGPT, an acronym for “Chat Generative Pre-trained Transformer,” was developed by OpenAI and launched on November 30, 2022.<sup>[5]</sup> Recent research delves into the multifaceted impacts of ChatGPT across diverse sectors, encompassing business, economics, security, healthcare, and education.<sup>[6-8]</sup>

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ChatGPT holds immense potential to revolutionize the healthcare sector by empowering individuals and communities to make informed decisions regarding their health, leveraging its ability to generate human-like text.<sup>[6,9]</sup> Research into using ChatGPT within the health sciences has rapidly grown in recent years. This technology presents significant opportunities across various domains, encompassing clinical decision support systems and patient education.<sup>[10,11]</sup> For instance, patients can inquire about their ailments, treatments, or medications, and ChatGPT can address these queries, facilitating patient education.<sup>[12]</sup> Similarly, AI chatbots can assist patients in making more informed decisions about their health by providing educational materials on disease symptoms, risk factors, and healthy lifestyle practices.<sup>[13]</sup>

AI chatbots can further empower patients by providing information on appropriate healthcare institutions to seek medical attention.<sup>[14]</sup> By inquiring about patient symptoms, AI chatbots can facilitate more accurate assessments and ensure access to accurate information.<sup>[12]</sup>

In a study by Liu *et al.*,<sup>[15]</sup> the potential of ChatGPT as a clinical decision support system was investigated. Physicians evaluated ChatGPT's responses based on usefulness, acceptability, relevance, understandability, bias, and redundancy criteria. The findings revealed that ChatGPT generated highly intelligible and relevant responses, demonstrated moderate usefulness, and exhibited low bias and errors. Beam *et al.*<sup>[14]</sup> underscore that AI chatbots hold significant potential in guiding patients toward appropriate healthcare facilities and serving various functions, including diagnosis, consultation, and educational support.

However, despite the advantages above, the widespread adoption of ChatGPT in healthcare settings has also raised concerns regarding its practical implementation.<sup>[16]</sup> These concerns encompass issues of medical reliability, efficacy, and patient safety. The potential for dissemination of misinformation or erroneous guidance could jeopardize patient safety in clinical settings.<sup>[17]</sup> Large language models like ChatGPT may also reflect biases inherent in the data they are trained on. When employed in healthcare contexts, this could lead to discriminatory practices or misdiagnoses affecting specific patient groups.<sup>[18]</sup> Additionally, the inner workings and training data of ChatGPT are not always transparent. This lack of transparency can undermine trust in the model's outputs.<sup>[19]</sup> To address these concerns, it is crucial to establish guidelines for the development and utilization of AI chatbots, while simultaneously enhancing healthcare literacy levels.

Despite the increasing research on AI chatbots in healthcare, there is still a notable gap in understanding

their impact on patient safety and health literacy. Previous studies have mainly focused on their technological capabilities and user satisfaction, with limited evaluation of the medical reliability of their information and associated risks.<sup>[16,17]</sup> Additionally, a few studies have examined the perspectives of healthcare professionals like nurses. This study aims to fill these gaps by assessing the medical reliability of an AI chatbot's responses and the potential risks to patient safety from nurses' perspectives. The findings will inform guidelines and best practices for AI chatbot use in healthcare, enhancing their reliability and safety.

This study aims to evaluate the application of AI-powered chatbots in healthcare literacy by examining the medical reliability and patient safety implications of their responses to health-related inquiries. Unlike previous research, which primarily focused on the technological capabilities or user satisfaction of AI chatbots, this study uniquely emphasizes the perspective of healthcare professionals, specifically nurses, in assessing the potential risks to patient safety. By integrating both quantitative and qualitative data, this research provides a comprehensive evaluation of AI chatbots, contributing novel insights into their real-world implications in clinical settings and highlighting areas where improvements are necessary to enhance their reliability and safety.

The main objective of this study is to explore the application of ChatGPT in healthcare, with a particular focus on its usage among nurses, the medical reliability of its responses, and any potential risks it may pose to patient safety.

## Materials and Methods

### Study design and setting

This study is designed as a mixed-methods phenomenological study. Phenomenology, a qualitative research method, was employed to examine nurses' perceptions of an AI-powered chatbot's responses to health-related inquiries. Phenomenology aims to deeply explore consciously experienced but not fully understood phenomena.<sup>[20]</sup> In addition to qualitative analyses, quantitative analyses of Likert-type survey questions were conducted.

### Study participants and sampling

At the study's outset, a focus group discussion was conducted with a team of four expert nurses to determine the most appropriate questions to pose to ChatGPT. Based on this discussion, three questions were identified and directed to ChatGPT 3.5. The responses obtained from ChatGPT were shared via questionnaires administered to 65 nurses, of whom 44

completed. Table 1 provides a detailed breakdown of the age and professional experience distribution of nurses participating in the study.

Table 1 shows that 20 nurses are in the 20–30 age range and possess 1–5 years of professional experience. Twelve participants belong to the 31–40 age group and have 6–15 years of experience. Six nurses are in the 41–50 age bracket and have 16–25 years of professional experience. Notably, only four nurses participating in the study are 50 or older and have 25 years or more of experience.

## Data collection tools and technique

### Focus group discussion

The following procedures were employed to determine the questions posed to ChatGPT. A panel was formed with the participation of four expert nurses, and focus group discussions were conducted. During these discussions, questions directed toward ChatGPT were deliberated upon, and the opinions of the participants were solicited. Participants evaluated whether the questions were explanatory, comprehensible, and feasible. Finally, based on the feedback obtained from the focus group discussions, the questions were revised, resulting in the identification of three ChatGPT questions.

### Survey questions

The researcher developed the survey forms used in the study. These forms contain Likert-type and open-ended questions created for nurses to evaluate the answers given by ChatGPT-3.5. The stages of creating the survey form are as follows:

- Literature Review: Initially, a literature review was conducted by examining similar survey forms in the healthcare domain and studies assessing AI-powered tools.
- Determination of Survey Questions: The survey questions were organized into the following categories:
  - Demographic Information
  - Reliability of Responses: Questions about the accuracy and consistency of responses provided by ChatGPT-3.5.
  - Patient Safety: Potential impacts of ChatGPT-3.5 responses on patient safety.
  - Overall Assessment: General usability of ChatGPT-3.5 and its potential benefits in healthcare services.
- Expert Opinion Collection: After the preparation of survey questions, feedback was sought from five

academics and healthcare professionals well-versed in the subject matter to ensure the comprehensibility, scope, and appropriateness of the questions. Necessary adjustments were made based on expert opinions. An example of the survey form sent to nurses is shown in Figure 1.

### ChatGPT3.5

In this study, ChatGPT-3.5, developed by OpenAI, was utilized. The reasons for selecting ChatGPT-3.5 include its extensive knowledge base, ability to provide high accuracy and consistency in user interactions, and capability to respond to health-related queries. Compared to its predecessors, ChatGPT-3.5 boasts enhanced natural language processing capabilities and more significant potential for presenting accurate information.<sup>[5]</sup> Therefore, it has been evaluated as an ideal choice regarding the availability and accuracy of information in healthcare services.

### Data collection procedure

In this study, an expert panel was first formed with the participation of four expert nurses to determine the questions to be posed to ChatGPT. A focus group discussion was conducted for this purpose. Three fundamental questions were identified through deliberations among the experts during this discussion. These three questions were directed to ChatGPT 3.5, and the responses obtained were conveyed to 65 expert nurses working in a private hospital in Cyprus for their evaluation via Google Forms. In total, 44 out of the 65 expert nurses participated in the survey, providing data.

### Data analysis

In the initial phase of the study, the nurses' demographic characteristics, such as age and professional experience, were presented using frequency distributions. This analysis was conducted to understand the profile of the participants. Next, we meticulously examined the nurses' responses to Likert-type questions using descriptive statistics. This analysis was instrumental in revealing the distribution and trends of the nurses' opinions on ChatGPT. Furthermore, the qualitative data obtained from open-ended questions posed to the nurses were analyzed using the content analysis method. The responses provided by the nurses were categorized and analyzed by forming thematic codes. This analysis was conducted to unveil the detailed thoughts and opinions of the nurses.

## Results

RQ1) What is the prevalence of ChatGPT usage among nurses?

**Table 1: Distribution of nurses' age and professional experience**

Age	20-30	31-40	41-50	50+
Experience (years)	1-5	6-15	16-25	25+
Number of Nurses	20	12	6	4

**Your age:**

(Select only one option)

- ☐ 20-30    ☐ 31-40    ☐ 41-50    ☐ Over 50

**Experience (year):**

- ☐ 1-5    ☐ 6-15    ☐ 16-25    ☐ Over 25

**Have you used ChatGPT before?**

(Select only one option)

- ☐ Yes  
☐ No

**Have you used ChatGPT for health information before?**

(Select only one option)

- ☐ Yes  
☐ No

**Q 1: What methods can be used for pain management during childbirth?****Response**

ChatGPT

Pain management during childbirth is essential for a positive experience. Methods are divided into pharmacological and non-pharmacological categories.

**Pharmacological Methods:**

1. **Medications:** Pain relievers like analgesics can be given intravenously or orally.
2. **Epidural/Spinal Anesthesia:** Numbing medication is injected into the spinal region to block pain.
3. **General Anesthesia:** Used mainly for cesarean sections, making the mother unconscious.

**Non-pharmacological Methods:**

1. **Breathing Techniques:** Deep breathing and breath holding exercises.
2. **Position Changes:** Standing, walking, or kneeling can provide relief.
3. **Massage:** Massaging the lower back or abdomen to relax muscles.
4. **Heat/Cold Therapy:** Warm compresses, warm baths, or cold compresses.
5. **Support:** Emotional comfort from a supportive partner or attendant.

6. **Herbal Remedies:** Some herbs are used for relaxation and pain relief.

ChatGPT uygulamasına ileti gönder

**Q1a) How reliable is ChatGPT's response to Q1?**

(Select only one option)

- Unreliable     $\longrightarrow$     Highly reliable
- |                       |                       |                       |                       |                       |                       |                       |                       |                       |                       |
|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| 1                     | 2                     | 3                     | 4                     | 5                     | 6                     | 7                     | 8                     | 9                     | 10                    |
| <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

Figure 1: Example of a questionnaire sent to nurses

The responses of the 44 participating nurses regarding whether they had previously used ChatGPT and whether they had used it for health-related queries are presented in Table 2.

According to the data in Table 2, 28 of the nurses have used ChatGPT before, while 16 have not. Additionally, while the number of nurses using ChatGPT for health

information was 21, seven nurses did not use it for this purpose. These findings reveal that most nurses who have used ChatGPT before are open to using it to obtain health-related information.

RQ2) Do ChatGPT's responses to health-related inquiries exhibit medical reliability?



To evaluate the reliability of ChatGPT's responses to health-related inquiries, 44 nurses participated in an assessment. The nurses independently rated the perceived reliability of each of the three distinct responses generated by ChatGPT for the three predetermined questions. The rating scale employed a 1-to-10-point system, with higher scores indicating greater perceived reliability. The collected scores were then analyzed to gain insights into the level of trustworthiness associated with the information provided by ChatGPT [Table 3].

As seen in Table 3, when the means and standard deviations are evaluated, it is seen that the reliability-accuracy scores for all three questions are quite high ( $\bar{X} = 8.40$ ,  $\bar{X} = 8.19$ ,  $\bar{X} = 8.56$ ), and there was no significant difference between them.

A survey was conducted among participating nurses to qualitatively assess the perceived reliability of ChatGPT's responses to health-related questions. The survey employed an open-ended question, "In your opinion, are ChatGPT's responses to health-related questions reliable?", to gather qualitative data on nurses' perceptions. The collected qualitative data were subsequently analyzed and summarized using content analysis methods. Table 4 summarizes the nurses' responses, including the specific statements and the number of nurses who expressed each sentiment.

ChatGPT consistently emphasized the need to seek medical advice over the information it provided, directing users to consult a healthcare professional in each query. Among the 44 nurses evaluating ChatGPT's responses, 32 indicated that this redirection enhanced the perceived reliability of the responses. Additionally, 17 nurses noted the absence of definitive statements in ChatGPT's responses, while 11 nurses explicitly acknowledged the accuracy of the provided information. Examples of nurses' responses to the open-ended question on reliability are provided below.

*The patient is referred to a doctor in every case. This is a positive situation.* (Nurse 7)

*In all cases, his characterization of it as important to consult a healthcare professional to get an accurate answer adds to his credibility.* (Nurse 23)

*ChatGPT's statements "I am just an AI language model and do not have medical expertise, but I can share general information. In any case, it is important to consult a healthcare professional to get an accurate answer" increases reliability by reducing risk.* (Nurse 6)

*It is very positive that he does not speak clearly, does not give direct guidance, but only gives information.* (Nurse 9)

*The information given is generally correct.* (Nurse 15)

**Table 2: Nurses' ChatGPT usage status**

Usage	Used	Not used
Overall	28	16
For health information	21	7

**Table 3: Descriptive analysis of ChatGPT response reliability**

	<i>n</i>	$\Sigma X$	$\bar{X}$	$\Sigma X^2$	<i>SD</i>
Question 1	44	370	8.401	2988	1.311
Question 2	44	361	8.191	3152	1.592
Question 3	44	377	8.562	3482	1.481

**Table 4: Themes related to the perceived reliability of ChatGPT's responses**

Theme	<i>n</i>
Always refer the patient to a physician	32
Avoid making definitive statements	26
Ensure information is consistent with literature and accurate	17
Provide up-to-date information	13
Ensure information is clear and easy to understand	11

*Explanations entirely in accordance with the medical literature.* (Nurse 35)

*"I did not come across anything that could be wrong in the information.* (Nurse 41)

*"The information provided by ChatGPT should be considered a guide only. Patients should talk to their doctors about treatment options and risks.* (Nurse 14)

**RQ3) Do ChatGPT's responses pose any risks to patient safety?**

The purpose of this research question is to examine the potential risks that ChatGPT may pose on patient safety from the perspective of nurses. To achieve this objective, nurses were presented with responses generated by ChatGPT to three different health queries. They were then asked to assess the level of risk for each response on a scale ranging from 1 to 10, where 1 indicates the lowest risk and 10 indicates the highest. Table 5 provides the scores assigned by nurses to the questions and the averages of these scores.

Table 5 shows that the usefulness scores for the three questions were relatively high ( $\bar{X} = 2.59$ ,  $\bar{X} = 3.49$ , and  $\bar{X} = 2.50$ , respectively) when considering the means and standard deviations. The second question was rated as having a higher potential risk, while the first and third questions were assessed as having lower potential risk levels.

Based on the nurses' perspectives, the risks associated with ChatGPT's responses to health-related questions were qualitatively assessed regarding patient safety. The

qualitative findings, along with the number of nurses expressing these concerns, are summarized in Table 6.

According to Table 6, 19 nurses indicated that ChatGPT's responses could be incomplete or incorrect, potentially providing patients with misleading information. Seventeen nurses noted that ChatGPT might not fully understand the patient's condition, which could lead to patients requesting inappropriate treatments. Additionally, eight nurses expressed concerns that ChatGPT might misinterpret the patient's words or symptoms, resulting in delays or incorrect treatments. These findings suggest that ChatGPT poses certain risks to patient safety. These risks should not be overlooked, and the use of ChatGPT in healthcare should be carefully evaluated. Examples of nurses' responses to the open-ended question regarding patient safety risks are provided below:

*ChatGPT's mention of all pain relief options during delivery may confuse pregnant women and lead to misdirection. (Nurse 5)*

*Patients ask ChatGPT about their symptoms, not the diagnosis, and they come with the most pessimistic guess, saying they have cancer, based on what I researched on the internet. (Nurse 2)*

*Patients can use the medications they learn from ChatGPT. (Nurse 43)*

*ChatGPT cannot fully understand medical terminology and concepts. "This can lead to misunderstandings and erroneous interpretations. (Nurse 18)*

*ChatGPT's medical knowledge base is limited and not constantly updated. Therefore, it may not be aware of new medical developments or understand the nuances of complex medical conditions. (Nurse 27)*

*Is it very dangerous for ChatGPT to recommend medication? (Nurse 10)*

**Table 5: Risk assessment of ChatGPT's responses related to health in terms of patient safety**

	<i>n</i>	$\Sigma X$	Mean	$\Sigma X^2$	SD
Question 1	44	115	2.591	411	1.451
Question 2	44	156	3.493	801	2.301
Question 3	44	110	2.501	372	1.599

**Table 6: Patient safety risks of ChatGPT responses based on nurses' perspectives**

Theme	<i>n</i>
Lack of Medical Knowledge	19
Inadequate Assessment	17
Misinterpretation	8

*ChatGPT cannot take into account the patient's overall health or underlying medical conditions. "This can lead to misdiagnosis or inappropriate treatments. (Nurse 18)*

*ChatGPT may misunderstand or misinterpret medical terminology and abbreviations. (Nurse 1)*

## Discussion

AI-powered chatbots can be evaluated as a novel and potential tool to enhance health literacy and provide information and support to patients. This study examines the medical reliability of ChatGPT 3.5's responses to patient questions and the risks it may pose to patient safety.

The study's first finding is derived from quantitative data obtained from nurses evaluating ChatGPT's responses to three different questions, indicating that ChatGPT's responses are generally of high reliability. This finding is consistent with existing literature.<sup>[8,11,21-23]</sup> Previous studies have demonstrated the platform's ability to generate accurate health information and adequately preserve key messages during text revisions.<sup>[24]</sup> For instance, Jeblick *et al.*<sup>[23]</sup> noted that clinicians rated ChatGPT summaries of radiology reports as relatively accurate, clear, and concise.

Another finding of our study indicates that ChatGPT's responses entail certain risks regarding patient safety. However, the extent of the risk of producing erroneous information by ChatGPT will be better understood with its wider usage.<sup>[25]</sup> It is a positive feature that ChatGPT emphasizes the necessity of consulting a physician for each response and avoids making definitive judgments. However, individuals with inadequate health literacy are likely to misunderstand the information provided by ChatGPT. This situation may endanger patient safety by acquiring incorrect or incomplete information and consequently making erroneous health decisions.<sup>[26]</sup>

The utilization of AI-powered chatbots as supportive tools in healthcare services holds the potential to enhance health literacy. Optimizing these technologies is essential to provide more accessible and understandable information, especially for individuals with low health literacy. Healthcare professionals should exercise caution and ensure proper guidance when integrating these tools to assist patients.

In conclusion, ChatGPT can be regarded as a supportive tool for enhancing health literacy. However, to effectively utilize this tool, it is imperative to elevate individuals' levels of health literacy. Organizing educational programs and awareness campaigns is crucial to achieving this objective.

### Limitations and recommendation

This study has several limitations. First, the sample size was limited to 44 nurses from a single hospital in Cyprus, which may affect the generalizability of the results. Future research should include a larger and more diverse sample of healthcare professionals from various regions to improve external validity. Second, the study only evaluated the ChatGPT 3.5 version and a limited set of health-related questions. Future studies should explore different AI chatbot versions and a broader range of medical queries to provide a more comprehensive understanding of their reliability and associated risks. Third, the specific areas of expertise and professional experience of the participating nurses were not thoroughly examined, which could influence their evaluations. Future research should stratify participants by specialties and experience levels to determine if these factors affect their perceptions of AI chatbot responses. Additionally, the qualitative findings highlighted potential risks, such as the provision of incomplete or incorrect information. Future research should focus on developing interventions to mitigate these risks and enhance the transparency and reliability of AI systems. Improving patient health literacy is crucial for the safe and effective use of AI chatbots in healthcare. Future studies should investigate strategies to enhance health literacy, such as targeted educational programs, and assess their impact on patients' ability to interpret and use information from AI chatbots accurately.

### Conclusion

This study contributes valuable insights into the emerging role of AI-powered chatbots in healthcare, particularly from the perspective of nursing professionals. The findings indicate that while AI chatbots like ChatGPT 3.5 can offer reliable and accessible information to patients, significant concerns regarding their potential to jeopardize patient safety persist. Specifically, the high medical reliability observed in the chatbot's responses is tempered by risks associated with incomplete or misleading information, particularly for individuals with lower health literacy. This underscores the need for continuous monitoring and refinement of AI systems in healthcare settings.

Moreover, the study highlights the importance of integrating AI chatbots within a framework that emphasizes the enhancement of patient health literacy. As these technologies continue to evolve, healthcare professionals must be vigilant in guiding patients to interpret and apply the information provided by AI tools accurately. This dual approach—improving the reliability of AI chatbots while simultaneously enhancing patient health literacy—will be crucial in realizing the full potential of these technologies to support safe and effective healthcare delivery.

In summary, while AI chatbots hold promise as a supplementary tool in patient education and support, their integration into clinical practice must be approached with caution. Ensuring that patients are equipped with the necessary skills to critically assess AI-generated information, alongside ongoing improvements to the technology itself, will be key to mitigating the risks identified in this study. Further research should continue to explore these dimensions, with an emphasis on broader and more diverse populations, as well as the development of targeted interventions to safeguard patient safety.

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### Ethical consideration

Ethical approval for this study was obtained from the Near East University Ethics Committee (Reference number: VDR/EC/6010). Informed consent was obtained from all students who agreed to participate in this study.

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### Conflicts of interest

There are no conflicts of interest.

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