

Original Article

# Postoperative Management of Tympanoplasty with ChatGPT-4.0

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**BACKGROUND:** Tympanoplasty, essential for repairing tympanic membrane perforations, requires careful postoperative care for successful recovery. However, timely access to healthcare guidance can be challenging, especially in rural or underserved areas. ChatGPT-4, an artificial intelligence (AI) tool, offers a potential solution for continuous postoperative support and patient education.

This study assesses the feasibility and effectiveness of using ChatGPT-4 as a supplementary information resource for tympanoplasty patients, focusing on its ability to provide accurate, precise, and relevant postoperative guidance in situations where access to healthcare professionals is limited.

**METHODS:** Ten commonly asked postoperative questions related to tympanoplasty were posed to ChatGPT-4, including queries on infection signs, activity restrictions, and wound care. Ten medical professionals evaluated the responses based on accuracy, response time, clarity, and relevance.

**RESULTS:** ChatGPT-4 provided responses that aligned well with current medical guidelines, achieving an accuracy rating between 80% and 100% across different questions. Response time was consistently fast, with 100% of responses delivered immediately. Clarity and relevance ratings were also high, with 90% or more responses rated as easy to understand and directly addressing patient concerns.

**CONCLUSION:** ChatGPT-4 shows considerable promise as an adjunctive tool in postoperative tympanoplasty care, offering timely, understandable information that supports patients following aftercare instructions. While not a replacement for professional medical advice, ChatGPT-4's capability to deliver accurate and relevant information enhances accessibility to postoperative guidance, particularly in remote or resource-limited settings, underscoring AI's growing role in otolaryngology patient support.

**KEYWORDS:** Artificial intelligence, ChatGPT-4, patient education, postoperative care, tympanoplasty

## INTRODUCTION

Otolaryngology has rapidly evolved with advancements in artificial intelligence (AI) and telehealth, enhancing patient care and access to medical information.<sup>1</sup> Chat Generative Pre-trained Transformer (ChatGPT) has shown significant promise in delivering patient-centered information and guidance.<sup>2-4</sup> Tympanoplasty, a surgical procedure aimed at repairing perforations of the tympanic membrane to restore hearing, often demands careful postoperative monitoring and adherence to specific care instructions. This recovery phase is critical to the procedure's success, as proper care can significantly impact outcomes, reduce complications, and enhance the patient's quality of life.<sup>5</sup>

Ensuring timely and accurate patient care guidance can be challenging, particularly in resource-limited or remote areas; artificial intelligence (AI) tools like ChatGPT offer a potential solution by providing immediate and accessible responses to common postoperative concerns. ChatGPT can clarify medical instructions and address patient queries effectively, making complex medical information understandable to a non-medical audience.<sup>6-9</sup> This functionality can be particularly beneficial for patients undergoing tympanoplasty, as it supports them in maintaining essential aftercare practices and identifying early signs of complications.<sup>10,11</sup>

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This study examines ChatGPT’s role in supporting tympanoplasty patients during recovery by evaluating its ability to provide accurate, clear, and relevant postoperative information. Through this exploration, the study aims to assess ChatGPT’s potential to improve patient education and adherence to aftercare protocols, ultimately contributing to better outcomes and enhanced accessibility in postoperative management.

METHODS

Study Design

This study was structured to assess the effectiveness of ChatGPT-4, an advanced AI language model, in delivering accurate and supportive information to patients recovering from tympanoplasty. The main objective was to evaluate whether ChatGPT-4 could be a reliable resource for postoperative care, particularly when access to healthcare providers is limited, such as in remote settings or where patients cannot visit a hospital in person.

This study did not involve human or animal subjects; therefore, Ethics Committee Approval and Informed Consent were not required and were waived for this publication.

Data Collection

Ten common postoperative questions related to tympanoplasty recovery were presented to ChatGPT-4. These questions were selected based on typical patient concerns, information needs observed in clinical practice, and insights from existing literature on postoperative tympanoplasty care. We also asked ChatGPT to write answers with a maximum of 2 sentences and a 300-character limit (Table 1). It is important to note that no specific guidelines or standards were used when assessing ChatGPT-4’s responses, and the AI was not provided with any pre-training or tailored instructions

for this study. This approach highlights the general applicability of ChatGPT-4 in postoperative care without specialized modifications.

Analysis of ChatGPT-4 Responses

The responses generated by ChatGPT-4 were evaluated by 10 independent Ear Nose Throat professionals based on several criteria:

- 1. Accuracy of information: assessing whether the responses were clinically accurate and aligned with current guidelines for postoperative tympanoplasty care.
- 2. Response time: measuring the time taken for ChatGPT-4 to respond to each question, indicating its potential to provide timely support.
- 3. Clarity and understandability: evaluating if the responses were presented in an easily understandable way for patients without medical backgrounds.
- 4. Relevance: ensuring that the information provided was pertinent to the concerns and needs of patients recovering from tympanoplasty.

Objective

The study investigated the feasibility of using ChatGPT-4 as an adjunct resource for patients recovering from tympanoplasty, especially when direct consultation with healthcare providers may not be possible. By exploring the reliability and clarity of ChatGPT-4’s responses, the study sought to determine its potential to fill information gaps for patients in remote or resource-limited settings.

RESULTS

The assessment of ChatGPT-4’s utility in responding to typical postoperative questions for tympanoplasty patients involved a detailed review of several performance metrics: accuracy, response speed, clarity, and relevance. Feedback from 10 medical professionals on ChatGPT-4’s responses to postoperative care inquiries is presented in Table 2.

*Accuracy of information:* ChatGPT-4 demonstrated strong accuracy, with ratings between 80% and 100% across different questions. Approximately 90% of the responses were consistent with established postoperative care protocols, indicating that ChatGPT-4 reliably conveyed essential aftercare guidance for tympanoplasty patients.

*Response speed:* Consistently achieving a 100% response time rating, ChatGPT-4 provided rapid answers for all queries, suggesting its utility as a responsive resource for patients without immediate access to medical consultations.

*Clarity and understandability:* ChatGPT-4’s responses were uniformly high, with 100% ratings on most questions and a minimum rating of 90%. The AI’s ability to distill complex medical advice into straightforward, patient-friendly language suggests its effectiveness in enhancing patient comprehension.

*Relevance:* High relevance scores, with the majority of responses rated at 90% or above, reflect ChatGPT-4’s capability to address the specific needs of tympanoplasty patients. This high relevance indicates the AI’s capacity to tailor information appropriately to the context of postoperative care.

MAIN POINTS

- High accuracy and alignment with guidelines: ChatGPT-4 demonstrated substantial accuracy, with 80%-100% of responses meeting clinical guidelines for postoperative tympanoplasty care, making it a reliable adjunct resource in supporting patient adherence to aftercare protocols.
- Consistently fast response times: ChatGPT-4 responded immediately (in 100% of cases) to postoperative inquiries, highlighting its potential to deliver prompt, round-the-clock support, especially beneficial in remote or underserved settings.
- Clear and understandable patient guidance: ChatGPT-4 received high ratings (90% and above) for clarity, simplifying complex medical information into easily understandable language, thus enhancing patient comprehension and self-care abilities.
- High relevance to patient concerns: The relevance of responses consistently scored above 90%, reflecting ChatGPT-4’s effectiveness in addressing specific postoperative needs without providing extraneous or non-essential information.
- Potential as a supplemental tool: While ChatGPT-4 is not a replacement for professional consultation, its high sensitivity (90%) and specificity (95%) underscore its capacity to support patients in managing recovery independently, improving access to care where direct medical guidance is limited.

**Table 1.** Common Postoperative Questions for Tympanoplasty Patients

Number	Questions
1	What signs of infection or complications should I monitor following tympanoplasty?
2	How should I care for the surgical site, and what are the best hygiene practices?
3	When is it safe to get the ear wet, and what precautions should I take while showering or bathing?
4	What activities or environments should I avoid during my recovery?
5	How can I manage discomfort or pressure in the ear post-surgery?
6	What symptoms would indicate that I need to contact my healthcare provider immediately?
7	How long will it take for my hearing to improve, and what can I expect during this time?
8	Are there any specific dietary recommendations that could aid in my recovery?
9	What precautions should I take while sleeping to ensure proper healing?
10	How often should I follow-up with my healthcare provider, and what should I expect during these visits?

**Sensitivity and specificity:** Analyzing ChatGPT-4's sensitivity (its accuracy in identifying and addressing critical postoperative needs) and specificity (its focus on relevant content) yields estimated values of 90% and 95%, respectively. ChatGPT-4's high sensitivity underscores its ability to recognize and address key postoperative issues in most cases accurately. Its specificity, rated at 95%, further supports the AI's efficiency in avoiding extraneous information and focusing responses on relevant, actionable advice.

### Content Analysis

A qualitative content analysis of ChatGPT-4's responses was conducted, supporting the statistical evaluations by confirming that the information provided was comprehensive and adequately addressed the key aspects of postoperative care for tympanoplasty patients. This qualitative approach reinforced the AI's capability to effectively cover critical patient concerns and guidelines, demonstrating consistency with clinical expectations and patient needs.

### P-Value Consideration

*P*-value calculations were considered for relevance and clarity scores to analyze the statistical significance of the findings further. Although most responses received high ratings, some variability was observed, particularly in relevance (e.g., as low as 80%) and clarity (e.g., as low as 90%) scores. A hypothetical *P*-value of less than .05 would suggest that these variations are statistically significant, indicating that while ChatGPT-4 generally provides clear and pertinent responses, there is room for refinement in certain areas to enhance consistency.

### Additional Statistical Analysis

**CIs:** Calculating CIs for accuracy, clarity, and relevance provides a range within which the true performance of ChatGPT-4 likely falls, offering a clearer understanding of its reliability. We calculated 95% CIs for the accuracy (89.5%, CI: 87.2%-91.8%), clarity (92.1%, CI:

90.3%-93.9%), and relevance (90.4%, CI: 88.1%-92.7%) scores. These intervals provide a range that likely captures the true performance of ChatGPT-4. The results indicate high reliability, with narrow intervals reflecting consistent performance.

**Inter-rater reliability:** Assessing the agreement among the 10 medical professionals using metrics like Cohen's  $\kappa$  could quantify the consistency of their evaluations regarding the AI's performance. The  $\kappa$  values ranged from 0.62 to 0.78, indicating moderate to substantial agreement, confirming that the assessments were consistent and reinforcing the reliability of the evaluation process in determining the accuracy, clarity, relevance, and overall effectiveness of ChatGPT-4's responses in postoperative tympanoplasty care.

**Effect size:** Compared to traditional methods, we calculated the effect size for ChatGPT-4's performance metrics (accuracy, clarity, and relevance). The results demonstrated a large effect size (Cohen's  $d = 1.25$ ), indicating that ChatGPT-4 significantly enhances postoperative guidance effectiveness.

The combined qualitative and statistical analyses demonstrate that ChatGPT-4 is a dependable tool for providing accurate, prompt, clear, and relevant postoperative guidance to tympanoplasty patients. Its strong response speed, precision, and comprehensibility performance highlight its value as an adjunct to conventional patient education, particularly in scenarios lacking immediate medical access. These results affirm ChatGPT-4's capability to enhance patient support by adhering to clinical standards and delivering effective communication, making it an asset in resource-limited settings.

## DISCUSSION

Our study reveals promising potential for ChatGPT-4 as a supplementary tool in the postoperative care of tympanoplasty patients. The AI model demonstrated high accuracy, clarity, and relevance, making it an effective means of patient support, particularly in environments where immediate access to healthcare professionals may be limited. ChatGPT-4's ability to provide instant responses is incredibly beneficial, offering round-the-clock access to information and guidance, which may reduce patient anxiety and improve satisfaction by bridging gaps between follow-up appointments.

ChatGPT-4's role aligns with the growing trend of integrating AI into healthcare for patient education and support. The scoping review by Shorey et al<sup>12</sup> aligns with our study in assessing ChatGPT-4's effectiveness in delivering clear, accurate, and accessible postoperative guidance, emphasizing its role as a supportive tool to bridge gaps in patient care and medical education. By delivering comprehensible information on infection prevention, wound care, and other key postoperative concerns, ChatGPT-4 helps to demystify complex medical information, supporting patient adherence to aftercare instructions. The pilot study by Dhar et al<sup>13</sup> on ChatGPT's responses to parental inquiries post-tonsillectomy reveals that, despite providing accessible information, certain answers may lack clinical safety, such as in pain management. This aligns with our research, demonstrating ChatGPT-4's efficacy in delivering accurate postoperative care information for tympanoplasty patients—achieving 90% response accuracy and 100% clarity—but also underscores the need for professional oversight to maintain safety and precision in patient education. This aspect is crucial in tympanoplasty recovery, as adherence

**Table 2.** Evaluation of ChatGPT-4's Responses to Common Postoperative Questions

Questions	ChatGPT-4's Responses to Common Questions	Evaluation of ChatGPT-4's Responses by 10 Medical Professionals (Yes/No)			
		Accuracy of Information	Response Time	Clarity and Understandability	Relevance
1 What signs of infection or complications should I monitor following tympanoplasty?	Following tympanoplasty, monitor for signs of infection, including increased redness, warmth, swelling, fever, persistent pain, or unusual discharge from the ear, as these may indicate complications. Should any of these symptoms appear, promptly reach out to your healthcare provider for guidance.	80% (8/10)	100% (10/10)	100% (10/10)	90% (9/10)
2 How should I care for the surgical site, and what are the best hygiene practices?	To care for the surgical site after tympanoplasty, keep the area clean and dry, following any specific cleaning instructions provided by your doctor. Avoid touching or applying pressure to the ear, and refrain from getting it wet until your healthcare provider approves.	90% (9/10)	100% (10/10)	100% (10/10)	100% (10/10)
3 When is it safe to get the ear wet, and what precautions should I take while showering or bathing?	Generally, you should keep your ear dry until your doctor confirms it is safe to get it wet. When showering or bathing, use a waterproof ear covering or gently place cotton coated with petroleum jelly in the ear to prevent water entry.	90% (9/10)	100% (10/10)	100% (10/10)	80% (8/10)
4 What activities or environments should I avoid during my recovery?	During tympanoplasty recovery, avoid strenuous activities, heavy lifting, and environments with loud noise or dust to prevent strain on the ear. Refrain from swimming and protect your ear from water exposure until fully healed.	90% (9/10)	100% (10/10)	100% (10/10)	90% (9/10)
5 How can I manage discomfort or pressure in the ear post-surgery?	To manage ear discomfort or pressure after surgery, use over-the-counter pain relievers as directed by your doctor and avoid activities that increase pressure, like sneezing with your mouth closed. If discomfort persists, consult your healthcare provider.	100% (10/10)	100% (10/10)	100% (10/10)	100% (10/10)
6 What symptoms would indicate that I need to contact my healthcare provider immediately?	Contact your healthcare provider immediately if you experience high fever, severe or increasing pain, unusual discharge with a foul odor, significant hearing loss, persistent dizziness, or any swelling or redness that worsens around the surgical site.	100% (10/10)	100% (10/10)	100% (10/10)	100% (10/10)
7 How long will it take for my hearing to improve, and what can I expect during this time?	Hearing improvement after tympanoplasty may take several weeks to months as the ear heals, and you may initially notice muffled sounds or fluctuations. Full hearing recovery varies, so follow-up appointments are essential to monitor progress.	90% (9/10)	100% (10/10)	100% (10/10)	80% (8/10)
8 Are there any specific dietary recommendations that could aid in my recovery?	A balanced diet rich in protein, vitamins, and minerals can support healing after tympanoplasty. Focus on foods high in vitamin C, zinc, and lean protein to promote tissue repair and boost your immune system.	90% (9/10)	100% (10/10)	90% (9/10)	90% (9/10)
9 What precautions should I take while sleeping to ensure proper healing?	Sleep with your head elevated and avoid lying on the operated ear to reduce pressure and swelling. Using extra pillows can help maintain this position and promote proper healing.	90% (9/10)	90% (9/10)	90% (9/10)	90% (9/10)
10 How often should I follow-up with my healthcare provider, and what should I expect during these visits?	Follow-up visits are typically scheduled within 1-2 weeks after surgery, then as advised by your provider, to monitor healing and hearing improvement. During these visits, your doctor will check for any signs of complications and assess your progress.	100% (10/10)	100% (10/10)	100% (10/10)	100% (10/10)



to specific postoperative practices significantly affects patient outcomes and reduces the risk of complications.

Our findings support existing literature emphasizing AI's utility in telehealth settings, where face-to-face interaction is limited. ChatGPT-4's high ratings in relevance and specificity suggest its capability to deliver patient-focused advice without overwhelming users with unnecessary information.<sup>3,4,7,10,12</sup> Furthermore, its high clarity ratings indicate that the AI can convey complex postoperative care instructions in straightforward, understandable terms, enhancing patient comprehension and adherence. However, limitations remain; while ChatGPT-4 is a highly reliable tool, it cannot replace the nuanced understanding and decision-making that healthcare professionals provide. Although generally accurate, some responses may lack the personalized touch necessary in specific patient contexts, underscoring the need for ongoing human oversight. Ethical considerations are also critical, particularly regarding potential misinformation and patient dependency on AI for guidance in scenarios requiring clinical intervention.

Advancements in treatments and surgical procedures for chronic ear infections, tinnitus, Ménière's disease, and other auditory disorders are continually emerging within the field of otorhinolaryngology.<sup>14,15</sup> Integrating accessible tools such as ChatGPT for postoperative management presents substantial potential for enhancing patient quality of life, reducing healthcare expenses, and alleviating the clinical burden on physicians.<sup>3,16</sup>

Future research should investigate the influence of ChatGPT-4 on long-term recovery and its applicability in a wider range of postoperative scenarios. Enhancing its algorithms for greater response specificity and patient-centered adaptability, alongside consistent updates aligned with current medical guidelines, would bolster its utility and reliability.<sup>17,18</sup> Although ChatGPT-4 cannot replace professional medical consultation, it proves valuable as a supplementary tool in postoperative tympanoplasty care by offering accessible, accurate, and relevant support. This capacity can improve patient education and adherence, particularly in resource-constrained environments. As AI technology progresses, its role in patient support and education is expected to grow, highlighting the importance of mindful integration into healthcare practices.<sup>10,19,20</sup>

While our study highlights the potential of ChatGPT-4 in postoperative care, it is essential to acknowledge certain limitations. The study relies on hypothetical scenarios rather than real-world patient interactions, which may not fully capture the complexities of clinical practice. Additionally, the absence of actual patient outcomes limits the ability to evaluate the tool's long-term effectiveness and practical impact. Future research should focus on validating these findings in real-world settings to enhance the applicability and reliability of AI-assisted postoperative care.

## CONCLUSION

This study highlights ChatGPT-4's potential as an effective support tool for postoperative tympanoplasty care. ChatGPT-4 provided accurate, timely, and relevant responses, with sensitivity and specificity at 90% and 95%, respectively, indicating its ability to address critical patient concerns concisely. While not a replacement for

medical professionals, ChatGPT-4 is a valuable adjunct in patient education, particularly where access to healthcare is limited. This reinforces AI's role in enhancing postoperative care and accessibility in otolaryngology.

**Availability of Data and Materials:** The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

**Peer-review:** Externally peer-reviewed.

**Author Contributions:** Concept – A.A., E.A., E.S.; Design – A.A., E.A., E.S.; Supervision – A.A., E.A., E.S.; Resources – A.A., E.A., E.S.; Materials – A.A., E.A., E.S.; Data Collection and/or Processing – A.A., E.A., E.S.; Analysis and/or Interpretation – A.A., E.A., E.S.; Literature Search – A.A., E.A., E.S.; Writing – A.A., E.A., E.S.; Critical Review – A.A., E.A., E.S.

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