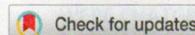


# Is ChatGPT a reliable source of scientific information regarding third-molar surgery?



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## ABSTRACT

**Background.** ChatGPT (OpenAI) is a large language model. This model uses artificial intelligence and machine learning techniques to generate humanlike language and responses, even to complex questions. The authors aimed to assess the reliability of responses provided via ChatGPT and evaluate its trustworthiness as a means of obtaining information about third-molar surgery.

**Methods.** The authors assessed the 10 most frequently asked questions about mandibular third-molar extraction. A validated questionnaire (Chatbot Usability Questionnaire) was used and 2 oral and maxillofacial surgeons compared the answers provided with the literature.

**Results.** Most of the responses (90.63%) provided via the ChatGPT platform were considered safe and accurate and followed what was stated in the English-language literature.

**Conclusions.** The ChatGPT platform offers accurate and scientifically backed answers to inquiries about third-molar surgical extraction, making it a dependable and easy-to-use resource for both patients and the general public. However, the platform should provide references with the responses to validate the information.

**Practical Implications.** Patients worldwide are exposed to reliable information sources. Oral surgeons and health care providers should always advise patients to be aware of the information source and that the ChatGPT platform offers a reliable solution.

**Key Words.** Artificial intelligence; oral surgery; third molar.

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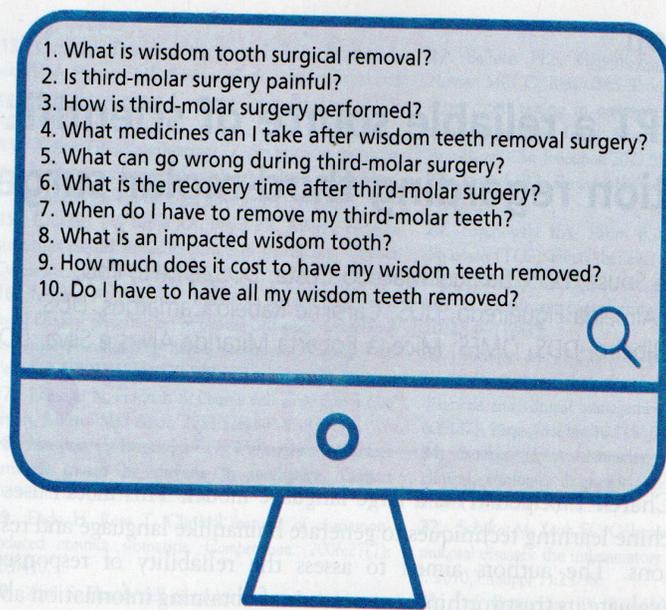
OpenAI, an artificial intelligence (AI) laboratory, has developed an advanced language model known as ChatGPT, which, when given a prompt, can generate responses that are similar to human language. The model has been trained on a large amount of text data and uses deep learning algorithms to determine the most probable response on the basis of the input provided.<sup>1,2</sup> In the health care sector, ChatGPT has the potential to revolutionize the way health care professionals interact with patients and provide care. Other AI initiatives have also been developed, such as Selta Square (IBM) and IBM Watson (IBM). Owing to its ability to comprehend natural language and produce responses, ChatGPT can be used to provide personalized medical guidance and assistance to patients. For example, the model can be trained with medical information and patient records to provide intelligent replies to frequently asked health care–related questions.<sup>3</sup> Patients can communicate with the model using chatbots or other conversational interfaces and receive real-time support.<sup>2,4</sup>

However, there are concerns about the accuracy and reliability of the responses that the model provides. Although ChatGPT has been trained with a large amount of data, it may not always provide the most precise or trustworthy information. Moreover, there is a risk of bias in the training data, which may lead to partial responses. The privacy and security of patient data are also potential concerns with ChatGPT, as the model requires access to patient data to offer personalized advice and support. If the data are not secured and safeguarded appropriately, privacy concerns may arise.<sup>1,2</sup>



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**Figure.** The 10 most frequently asked questions about third-molar extraction surgery, collected using Google Trend (Google) analytics.

In dentistry, surgical extraction of the mandibular third molar is one of the most common procedures performed. Mandibular third molars are the last teeth to develop and, therefore, they frequently encounter difficulty emerging through the gingivae and become impacted, which can cause pain and swelling. In addition, third molars occupy the posterior region of the mouth—a difficult location to perform proper hygiene—making them more vulnerable to caries lesions, which, when not assessed, can require tooth extraction. Patients often have doubts and fear the surgical procedure but may not have a valid source of information.<sup>5</sup>

Our aim was to assess the accuracy of ChatGPT-generated responses regarding frequently asked questions about third-molar extractions. This involved comparing the findings with previously published scientific data.

### METHODS

Our study was a longitudinal analysis of the reliability of the ChatGPT platform in responding to questions about mandibular third-molar surgery. The collection and evaluation of questions related to third-molar surgery were conducted following the Strengthening the Reporting of Observational Studies in Epidemiology statement<sup>5</sup> (eTable 1, available online at the end of the article). Ethics committee authorization was not required and was waived, as no patients or medical records were involved.

#### Selection of questions

The 10 most frequently asked questions were collected using Google Trend (Google) analytics. Oral surgeons adjusted the 10 most frequently asked questions to ensure appropriate nomenclature and scientific accuracy. Two different authors (R.A.d.S., P.H.A.F.) submitted the questions to the ChatGPT platform using different computers to avoid biases in the AI algorithm. The selected questions can be found in the figure.

#### Evaluation of questions

Before submission, 2 specialists in oral and maxillofacial surgery (S.M.C., B.C.R.) evaluated and answered the questions using available literature on the topic. The responses provided via ChatGPT were then compared with reference standard responses using a modification of the Chatbot Usability Questionnaire,<sup>6</sup> a 4-step questionnaire that assesses the chatbot's ability to explain the scope of the question, usefulness, appropriateness, informativeness, friendliness, and relevance. The level of agreement among evaluators was assessed using  $\kappa$  analysis. Responses with a Chatbot Usability Questionnaire score higher than 80% were considered highly relevant.

### ABBREVIATION KEY

- AI:** Artificial intelligence.
- NA:** Not applicable.

**Table.** Chatbot Usability Questionnaire<sup>6</sup> applied to ChatGPT (OpenAI) to evaluate answers to the most frequently asked questions about mandibular third-molar extraction surgery.

QUESTION	CHATGPT EXPLAINED THE SCOPE AND PURPOSE	CHATGPT ANSWER WAS USEFUL, INFORMATIVE, AND APPROPRIATE	CHATGPT ANSWERS WERE RELEVANT	WERE CHATGPT ANSWERS FRIENDLY TO THE GENERAL PUBLIC?
1. What Is Wisdom Tooth Surgical Removal?	Yes	Yes	Yes	Yes
2. Is Third-Molar Surgery Painful?	Yes	Yes	Yes	Yes
3. How Is Third-Molar Surgery Performed?	Yes	Yes	Yes	Yes
4. What Medicines Can I Take After Wisdom Teeth Removal Surgery?	Yes	Yes	Yes	Yes
5. What Can Go Wrong During Third-Molar Surgery?	Yes	Yes	Yes	Yes
6. What Is the Recovery Time After Third-Molar Surgery?	Yes	No	Yes	Yes
7. When Do I Have to Remove My Third-Molar Teeth?	Yes	Yes	Yes	Yes
8. What Is an Impacted Wisdom Tooth?	Yes	Yes	Yes	Yes
9. How Much Does It Cost to Have My Wisdom Teeth Removed?	No	No	No	No
10. Do I Have to Have All My Wisdom Teeth Removed?	Yes	Yes	Yes	No
<b>Total, %</b>	NA*	NA	NA	90.63

\* NA: Not applicable.

## RESULTS

In general, responses provided by the platform were helpful to the general public, delivering precise, accurate, and comprehensive scientific details regarding third-molar surgery (eTable 2, available online at the end of the article). The Chatbot Usability Questionnaire<sup>6</sup> test overall score for ChatGPT was 90.63%, and the answers for each question are provided in the table.

When asked “What is wisdom tooth surgical removal?” (question 1), ChatGPT answered that it “is a dental procedure in which one or more wisdom teeth are removed from the mouth.” The platform also provided additional information about tooth eruption and that not everyone has these teeth. ChatGPT gave information about the indications for extraction and suggested a general idea of how the surgery is performed and the postoperative care. The answer was considered complete and consistent with the literature on the subject.

The second question asked “Is third-molar surgery painful?,” and ChatGPT responded that it “can cause some pain and discomfort.” ChatGPT provided information about interpersonal differences (eg, age, sex, medical history, and complexity of the procedure) when it comes to the sensation of pain and common medications that oral surgeons prescribe to control postoperative pain. The response conformed with the literature on the topic.

When asked “How is third-molar surgery performed?” (question 3), ChatGPT described a 5-step procedure including preoperative evaluation, anesthesia, incision and extraction, closure, and postoperative care. The platform was helpful to the general public, providing general information about the steps taken by the dental care professional. The platform’s response was considered highly comprehensible to the non-dental care professional public.

Question 4 concerned the medications that can be taken after the surgery. ChatGPT gave 4 types of medicines that can be taken: painkillers (eg, acetaminophen and ibuprofen), antibiotics (not always, but when infection prevention is required, penicillin and amoxicillin were the suggested drugs), nonsteroidal anti-inflammatory drugs (eg, ibuprofen), and mouthrinses to keep the mouth clean to prevent infections. In addition, the ChatGPT platform recommended patients not take the medications until they had consulted with their oral surgeon. The outcome was considered helpful to the public and harmonious with the literature on this issue.

Question 5 asked “What can go wrong during third-molar surgery?” and ChatGPT answered with 7 types of complications that can occur during or after the surgery, such as pain, swelling, bleeding, infection, dry socket, numbness, and sinus complications. The literature provided more complete

information on the prevention and treatment of these complications but, in general, ChatGPT's response was acceptable to inform the public about the risks of undergoing this type of procedure.

ChatGPT's response to "What is the recovery time after third-molar surgery?" (question 6) was that it can vary depending on factors such as complexity of the surgery, number of teeth extracted, and patient's general health, but that it can take 7 through 10 days to fully recover from the procedure. The platform emphasized the importance of following the oral surgeon's aftercare recommendations. ChatGPT's answer was considered correct and consistent with the collected answer provided by specialists.

When asked "When do I have to remove my third-molar teeth?" (question 7), ChatGPT answered that the time and necessity of surgery vary from person to person, but some factors may guide the decision, such as pain, discomfort, impacted teeth, and desire for a preventive measure. ChatGPT also emphasized following the guidance and clinical examination of an oral surgeon. The platform's response was considered useful, appropriate, and informative.

ChatGPT provided a satisfactory response to the question "What is an impacted wisdom tooth?" (question 8), based on the given text, defining it as a tooth "stuck in the jawbone or gums" that can cause pain, swelling, infection, and damage to adjacent teeth or nerves. The chatbot also explained that impaction is an indication for surgical extraction.

When asked "How much does it cost to have my wisdom tooth removed?" (question 9), ChatGPT replied that the price varies depending on several factors, such as tooth location, complexity of procedure, insurance coverage, country of residence, and the dental care professional performing the procedure. The chatbot provided an average cost of \$75 through \$100 per tooth. Although this answer was considered helpful to the general public, it was incomplete and lacked background in the literature.

Finally, when asked "Do I have to have all my wisdom teeth removed?" (question 10), ChatGPT advised that not all third molars require extraction and suggested seeking guidance from a dental care professional. The answer provided by the chatbot was confirmed with literature on the topic (eTable 2, available online at the end of the article).

## DISCUSSION

Our aim was to evaluate the reliability and usability of ChatGPT as an information provider for patients, and it was clear that the responses were often positively related to the scientific literature. Third-molar extraction is the most frequent surgery an oral surgeon performs, thus this concept is highly relevant.<sup>5</sup> The literature content was consistent with the ChatGPT response to question 1, which was considered less technical, helpful, and comprehensible to the general public, describing third-molar surgery as the most common surgical procedure that the oral surgeon performs and explaining the value of preoperative examination, diagnosis, and planning.<sup>5</sup>

Among the most common concerns patients had regarding oral surgery was whether pain, discomfort, and a medication prescription should be expected, factors that may cause fear and avoidance in patients. The responses were considered appropriate and informative, as studies published previously explained that some discomfort is expected after the surgery, including postoperative pain and swelling, but that the intensity and duration may vary among patients, depending on the extent and complexity. The collected answer provided by specialists also described that complications during the procedures may influence these symptoms.<sup>5,7-10</sup>

Extraction of any tooth requires analysis and study of the proper techniques that the oral surgeon must master. The responses among the topics were considered acceptable because they provided the general steps that are taken during the procedure. However, the literature described the full extent of the extraction, from diagnosis to planning to each step of surgery, applying the fundamental principles of oral surgery.<sup>4,5,9</sup>

As with every surgery, there is the potential for complications during or after mandibular third-molar extraction. ChatGPT's response to the question about complications was accurate and in accordance with information provided in the literature background, which included perioperative complications, such as excessive bleeding, root fracture, and, less commonly, mandibular fracture, and postoperative complications, such as numbness due to nerve lesion, infection, dry socket, oronasal communication, and trismus.<sup>4,6,7,10-12</sup>

Patients are frequently concerned about the expected time of recovery. The answers emphasized that recovery time is dependent on factors from the surgical procedure, such as time

spent in surgery and bone management, and personal patient factors, such as general health, nutrition intake, and postoperative care. The collected answer provided by specialists also cited the value of a 1-week recall visit to remove the sutures and evaluate the surgical wound healing, and the biological aspects that occur during healing; for those reasons, the answer was considered less informative.<sup>3,4</sup>

The queries suggested that the indications and best time for surgery are frequent concerns for patients and, compared with the literature, the outcome of the ChatGPT platform was considered accurate, as it considered aspects regarding the tooth, such as caries, pulpal necrosis, periodontal disease, the relation of the tooth with pathologic processes, impaction, and the association of these factors with symptoms, such as pain and swelling.<sup>4,5</sup>

Tooth extraction can be challenging for the oral surgeon, as in cases of impaction. These cases are commonly referred for more specialized care, which requires a financial investment. This topic was discussed in question 9, to which the platform gave a nonspecific answer. However, ChatGPT provided the factors that may influence the final price, which align with ours, such as the ability and qualification of the surgeon and the extent and complexity of the procedure. This response lacked background in the literature.

In addition to the specific questions asked to ChatGPT, it was also asked about its veracity and, in response, it gave a general answer saying that it is an AI model and cannot evaluate the accuracy of its answers in real time. In addition, it answered that it is trained on a large data set of human-generated text and is optimized to generate responses that are contextually appropriate and grammatically correct based on the input it receives. Furthermore, as the ChatGPT answers concerned human health, it does not accept all responsibility and, for that reason, it advises patients seek the assessment of a health care professional.

ChatGPT uses a large amount of text web data and previous user entries to enhance its replies; however, no references are provided to support its acknowledgments, which would give validation of the data it provides.<sup>2,4</sup>

Furthermore, ChatGPT, when used to search for general information about third-molar extractions, provided data that we considered to be helpful for a general and nonmedical public and, most importantly, scientifically consistent with the dental and surgical literature. The platform approach for this kind of question was considered highly amiable for the nonmedical public, as it simplified the answer, providing essential and general information and making it understandable for that audience.<sup>11</sup>

AI is a dynamic virtual learning tool that has the potential to disseminate science-backed knowledge. However, ethical evaluation of AI is necessary. The effectiveness of ChatGPT as a consultant in dentistry has not yet been fully established and more research is necessary to confirm its validity. Although ChatGPT may show promise in providing insights and recommendations to dental care professionals, it is important to evaluate its accuracy and reliability before fully integrating it into dental practice. This requires rigorous testing with additional studies and analysis to ensure that ChatGPT provides consistent and accurate advice that is helpful to dentists and their patients. In addition, AI developers should enhance AI devices with scientific content.

## CONCLUSIONS

We found ChatGPT to be an easy-to-use platform for answering the general public's questions about third-molar surgery. However, when dealing with scientific topics, it is essential to consult with specialized personnel, and oral surgeons should be consulted on third-molar surgery. The ChatGPT platform can be used to answer the patient's questions. ■

## DISCLOSURE

None of the authors reported any disclosures.

## SUPPLEMENTAL DATA

Supplemental data related to this article can be found at: <http://doi.org/10.1016/j.adaj.2023.11.004>.

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