

## Main Article

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# The role of ChatGPT in enhancing ENT surgical training – a trainees' perspective

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## Abstract

**Objective.** ChatGPT, developed by Open AI (November 2022) is a powerful artificial intelligence language model, designed to produce human-like text from user-written prompts. Prompts must give context-specific information to produce valuable responses. Otolaryngology is a specialist field that sees limited exposure during undergraduate and postgraduate education. Additionally, otolaryngology trainees have seen a reduction in learning opportunities since the coronavirus disease 2019 pandemic.

**Method.** This article aims to give guidance on optimising the ChatGPT system in the context of education for otolaryngology by reviewing barriers to otolaryngology education and suggesting ways that ChatGPT can overcome them by providing examples using the authors' experience.

**Results.** Overall, the authors saw that ChatGPT demonstrated some useful qualities, particularly with regards to assistance with communication skills and individualised patient responses.

**Conclusion.** Although ChatGPT cannot replace traditional mentorship and practical surgical experience, it can serve as an invaluable supplementary resource to education in otolaryngology.

## Introduction

ChatGPT has been developed by Open AI (November 2022) as a powerful artificial intelligence (AI) language model based on the GPT-4 (version 4) architecture.<sup>1</sup> Artificial intelligence is the term used to describe the ability of a computer system to mimic human cognitive functions, and GPT is defined as 'generative pre-trained transformer'. 'Generative' refers to its ability to produce unique creative outputs that are not predefined. It was 'pre-trained' from large datasets to build a model that is now fine-tuned for specific tasks. 'Transformer' is part of the system that uses mechanisms to understand and generate human language by looking at the context of words and the relationships of these words.<sup>2</sup> As such, ChatGPT has been designed to produce human-like text pulled from enormous datasets. Text is produced based on user-written prompts that ask the AI chatbot to generate specific information that the user requires within seconds from its vast neural network. Its applications are extensive and include essay writing, artwork and explanation of complex concepts tailored to the user's needs.<sup>3,4</sup>

Within the literature, ChatGPT has not been seen to be used in the field of otolaryngology (ENT). It is a specialist field which does not feature prevalently in the UK undergraduate medical curriculum.<sup>5</sup> Even though such a short time is dedicated to education in otolaryngology, ENT-related conditions are a common patient presentation to both primary and secondary care facilities across the UK.<sup>6,7</sup> Therefore, education to medical students, general practitioners and non-specialists is especially important. In addition, during the coronavirus disease 2019 (Covid-19) pandemic, otolaryngology trainees saw a significant drop in their elective operating time,<sup>8</sup> meaning less exposure to common procedures, and reduced time spent with experienced mentors and ability to maintain surgical skills.

Medical and surgical education has always seen these challenges, but the Covid-19 pandemic saw several new obstacles.<sup>9</sup> Trainers had to adapt quickly to continue providing trainee surgeons with up to date and relevant education. This saw many surgical educational resources take a turn to virtual or simulation-based methods.<sup>10</sup> Therefore, any medical professional looking to accelerate learning in the otolaryngology field may find that ChatGPT provides them with detailed contextual answers, with a myriad of examples, to help them understand complex material in a more simplified manner. The diversity of ChatGPT opens up the possibility of providing a reliable, quick and applicable educational resource for surgical trainees as the world of medical education quickly turns to a virtual format.<sup>4</sup>

Although ChatGPT is a potential invaluable training resource, to gain the most from this system it is important to be very specific and detailed in the information that is provided to the AI chatbot. It is also imperative that this is also given in context to the situation. It is the authors' experience that including details, such as what background the AI

assumes to provide the information, the audience it is teaching and what level to pitch the information, can all be very useful. The more context and detail that is provided the more the AI chatbot can provide a tailored approach.<sup>11,12</sup> In addition, errors can be generated by ChatGPT, but this can be highlighted and corrected by the chatbot. In this article, we look at these various barriers to medical education in otolaryngology training and suggest ways that ChatGPT can overcome them.

## Materials and methods

Authors used the ChatGPT system to suggest the most important barriers after prompting it for such a topic.

You have been tasked to find all the ways in which ChatGPT has a role in medical education for surgical trainees in the ENT specialty. Please highlight the barriers that surgical trainees experience during their training and for each one how ChatGPT can help.

Example prompts for each barrier were then created by the authors and inputted into the GPT-4 version of ChatGPT to generate responses. Responses were then trialled by two of the authors, both at different stages of training (core training 1 and post CCT-Fellow of the Royal College of Surgeons specialty trainee level 8 ENT registrar) to provide a review from junior and senior trainee perspectives. The responses were also validated by the ENT consultant author as a third independent reviewer for accuracy of information. Therefore, examples provided used the authors' experience to further highlight the practicalities.

## Results

### Limited access to experienced mentors

For otolaryngology trainees, an experienced mentor, for example a consultant surgeon, may not always be available to guide them through procedures or answer difficult clinical questions. ChatGPT can serve as a supplementary resource for otolaryngology trainees by answering questions or providing insights based on its extensive training data.<sup>11</sup> This could potentially provide a constant ability to 'ask the expert' and therefore accelerate the trainees learning.<sup>13</sup>

Example prompt: 'You are a senior ENT consultant surgeon working in a university hospital in the UK, who has extensive experience in the tonsillectomy procedure. You undertake these using the bipolar electrocautery technique. You are skilled in the ability to explain complex concepts in a simple way. What are the key steps in performing a tonsillectomy?'

Interestingly, the chatbot did provide an initial disclaimer stating that it is a 'simplified explanation, and the actual procedure is more complex and requires specialised training and expertise'. It then went on to provide a step-by-step explanation which was at a level that a medical student could understand as seen in [Figure 1a](#). A more detailed explanation when prompted was then provided ([Figure 1b](#)).

### Time constraints

The busy lifestyle as a surgical trainee means that time to read, study and analyse the vast amount of medical literature relevant to their speciality is limited. ChatGPT can assist in

summarising medical articles or identifying key points to provide an up to date and concise resource saving hours of valuable time.<sup>14</sup>

Example prompt ([Figure 2](#)): 'You are a professor in rhinology and are up to date with all the current guidelines and new discoveries in the current specialty. You are able to critically appraise the literature and summarise detailed studies into bullet point key findings that are easy to understand by junior trainees. Summarise the main findings of the European Position Paper on Rhinosinusitis and Nasal Polyps 2012 (EPOS 2012)'.

This example was chosen for ease of verifying the information provided from the AI chatbot with the original source. The AI language model does provide a simplified overview of the EPOS 2012 guidelines. The AI chatbot does however emulate a discussion with an expert in the field, allowing for opportunities to ask questions for clarification. It can also be prompted to 'provide several examples' to further consolidate the concepts that are mentioned.

### Knowledge retention

Retaining and recalling essential information during high-pressure situations can be challenging for surgical trainees. Trainees can use ChatGPT to create customised quizzes, flashcards and revision resources to help reinforce their knowledge, providing access through their smartphone at any time.<sup>15</sup>

Example prompt: 'You are an experienced ENT surgeon and expert anatomist who has been tasked with creating flash card style questions to help junior ENT trainees learn and retain knowledge on the topic of clinical anatomy of the skull base at the level of what an ENT surgeon undertaking skull base surgery should know. Please ask questions one at a time which have very specific answers and only move on the next question once answered'.

This interactive session with appropriate questions and answers gives students the ability to constantly examine themselves ([Figure 3](#)). This allows for more focused reading leading to a more efficient learning process.<sup>16</sup>

### Surgical technique improvement

Developing and refining surgical skills requires practice and feedback, which may not always be readily available. Trainees can describe specific surgical techniques or scenarios to ChatGPT and receive feedback or suggestions on areas for improvement.

Example prompt: 'I'm an ENT trainee who is having difficulty with visualisation during endoscopic sinus surgery. Can you as an expert rhinologist and excellent trainer suggest any tips to improve my technique using the 0-degree endoscope to visualise the nasal cavity during sinus surgery. Please ask any questions to clarify before starting?'

The ChatGPT can provide tips for surgical procedures using its extensive data pool of surgical literature. The prompt in this example allows the chatbot to ask more questions which can further tailor the information that is given ([Figure 4](#)).

### Communication and collaboration

Effective communication and collaboration with colleagues and other healthcare professionals are crucial but can be challenging for trainees to master. Trainees can use ChatGPT to

(a)

2. Oral cavity exposure: A mouth gag is inserted to keep the mouth open and expose the oral cavity. This provides the surgeon with better access to the tonsils.
3. Identifying the tonsils: The surgeon locates both the left and right palatine tonsils, which are situated on either side of the throat, between the anterior and posterior pillars of the soft palate.
4. Bipolar electrocautery: The surgeon uses a bipolar electrocautery device to remove the tonsils. This instrument has two tips that generate an electrical current between them. The surgeon applies the tips to the tissue surrounding the tonsils, and the electrical current causes the tissue to heat up and coagulate. This process helps minimize bleeding during the surgery.
5. Tonsil removal: The surgeon uses the bipolar electrocautery device to separate the tonsils from the surrounding tissue. The tonsils are then carefully removed from their beds, taking care not to damage any adjacent structures.

(b)

3. Exposure of the oropharynx: Insert a Crow-Davis or McIvor mouth gag to retract the tongue and obtain adequate exposure of the oropharynx. The mouth gag is secured to the Mayo stand for stability.
4. Identification of landmarks: Visualize the palatine tonsils bilaterally, bordered by the anterior and posterior tonsillar pillars. Note the relationship of the tonsils to adjacent structures, such as the uvula, soft palate, and lateral pharyngeal walls.
5. Bipolar electrocautery dissection: Utilize a bipolar electrocautery device for both dissection and hemostasis. The device generates an electrical current between its two tips, allowing for precise tissue cutting and coagulation with minimal thermal injury to surrounding structures.
6. Tonsil incision and elevation: Make an incision along the mucosa between the anterior and posterior tonsillar pillars, taking care not to injure the underlying internal carotid artery. Carefully elevate the tonsil using a tonsil dissector or similar instrument, separating it from the underlying tonsillar capsule and exposing the tonsillar bed.
7. Peritonsillar dissection: Continue the dissection along the peritonsillar tissue, staying close to the tonsillar capsule to minimize injury to the glossopharyngeal nerve, superior constrictor muscle, and styloglossus muscle. Complete the dissection in a superior to inferior direction, ensuring all fibrous attachments and blood vessels are coagulated with the bipolar electrocautery device.

**Figure 1.** (a) Snapshot of example response generated for key steps in tonsillectomy. Figure from chat.openAI.com. (b) Snapshot of example response generated for altered prompt for key steps in tonsillectomy. Figure from chat.openAI.com

practice various communication scenarios, such as presenting cases, discussing treatment plans or explaining procedures to patients.<sup>17</sup>

Example prompt: 'For the duration of this conversation, please fully immerse yourself in the persona of a 30-year-old female professional singer who has a hoarse voice. Your



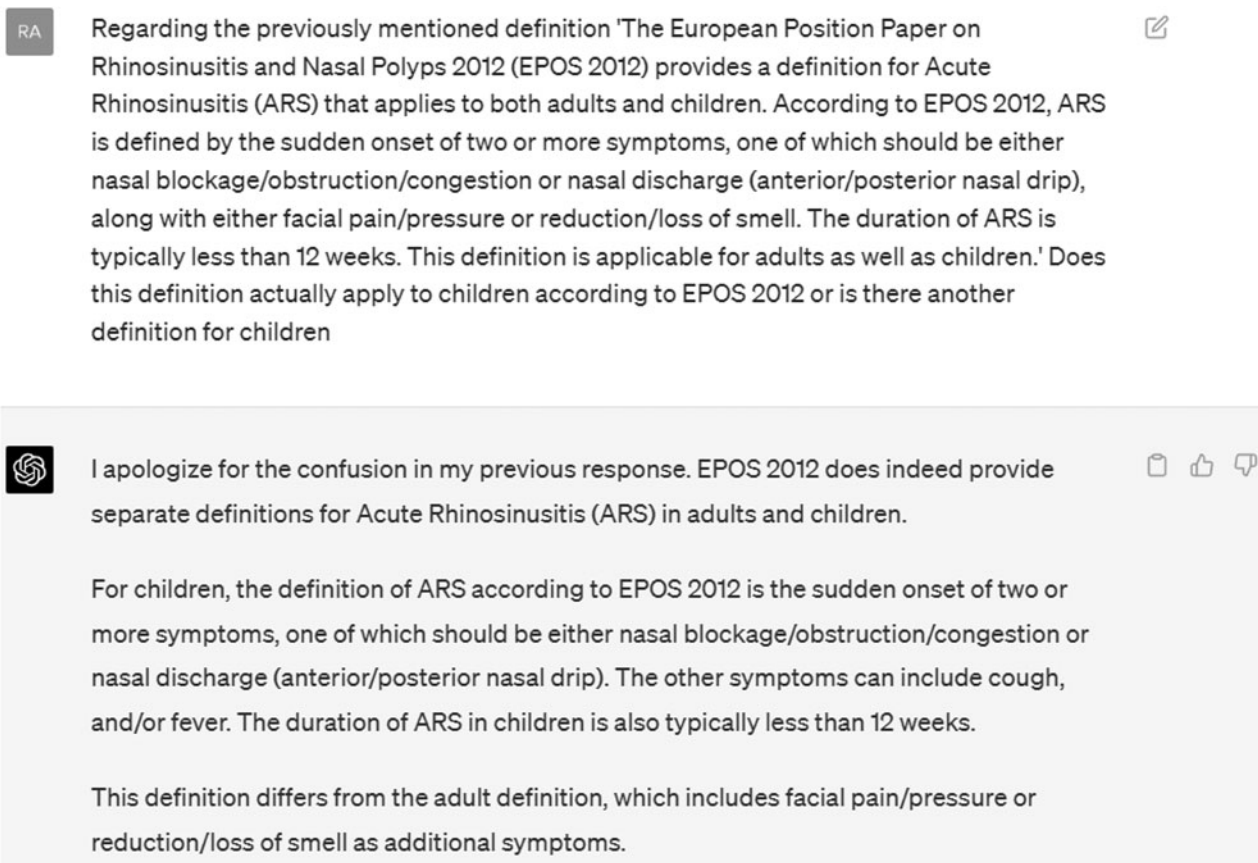


Figure 2. Example response generated when chatbot notified of error. Figure from chat.openAI.com.

responses should be consistent with her beliefs, knowledge and experiences of such a life. Additionally, please convey their speaking style and anxious nature during this difficult period whilst not being able to sing. You have attended an ENT out-patient clinic to see me to discuss your diagnosis. As I ask questions, please respond appropriately, providing me with a truly engaging interaction’.

The virtual patient would increase the trainee’s confidence in various aspects of patient interaction, including breaking bad news and discussing management plans. The ChatGPT system generates these dialogues in a varied manner (Figure 5), meaning the same prompts can lead to unique conversations and so can provide further authenticity to the interactions.<sup>18</sup>

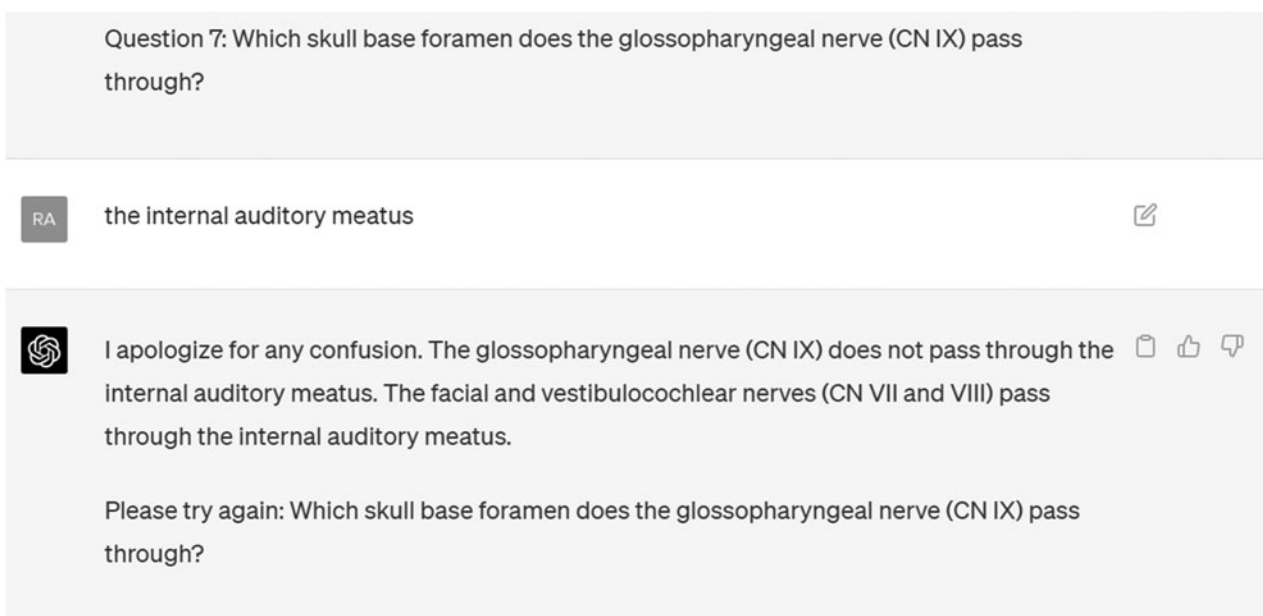


Figure 3. Example response generated when user inputted incorrect answer to revision question. Figure from chat.openAI.com. CN = cranial nerve.

RA

Forget all prior prompts. I'm an ENT trainee who is having difficulty with visualisation during endoscopic sinus surgery. Can you as an expert rhinologist and excellent trainer suggest any tips to improve my technique using the 0 degree endoscope to visualise the nasal cavity during sinus surgery. Please ask any questions to clarify before starting?



As an AI language model, I am not an expert rhinologist or trainer, but I can certainly provide some tips based on the knowledge I have been trained on. To better help you, I'll need to know your specific difficulties in visualizing the nasal cavity during sinus surgery. Are you having trouble with depth perception, instrument handling, orientation, or maintaining a clear surgical field? Once I understand your specific challenges, I can provide more targeted advice.

**Figure 4.** Figure example response generated where chatbot establishes users' needs. Figure from chat.openAI.com.



Doctor, thank you so much for seeing me today. I have been really worried about my voice, you know? It's been really hoarse lately, and it's causing me a lot of anxiety. Singing is my livelihood, and I just can't imagine my life without it. I'm really hoping you can help me figure out what's going on and how to fix it.

RA

Thank you for coming to see me. After taking a history and examination with a flexible nasoendoscope, I have unfortunately seen a lesion on your right vocal cord. It does not look obviously sinister



Oh no, that sounds really scary. Thank you for being honest with me, though. I've heard about vocal cord lesions before, but I don't know much about them. Can you please explain what this might mean for my singing career and how we can treat it? I'm really anxious about the impact this could have on my life.

**Figure 5.** Example response generated from chatbot responding as a patient. Figure from chat.openAI.com.

## Discussion

Overall, all authors felt that ChatGPT demonstrated some useful qualities, particularly with regards to assistance with communication skills and individualised patient responses (Table 1). ChatGPT as a revision tool was also highlighted as a main strength; the AI chatbot provided a stream of varied questions related to the prompted topic and was appropriate for all stages of training. Authors saw however that when prompted for more specific answers relating to surgical skills in otolaryngology and otolaryngological guidelines that ChatGPT was lacking. Specific concerns include the need for

the user to notice mistakes in order to ask an alternative prompt and generate a corrected response, as well as the lack of detail needed for a more senior trainee learning higher surgical skills.

The reliability and validity of data analysed and provided with ChatGPT has not yet been assessed. Therefore, the production of incorrect or inadequate information may be seen, especially with insufficient prompts. However, OpenAI have a clear disclaimer prior to beginning a chat warning that this may be the case. During author reviews of information generated from the same prompts we saw some variability in responses

**Table 1.** Author experiences of responses generated

Response	Author A	Author B	Author C
Limited access to experienced mentors	'The initial response gave a good overview of the procedure for my level and when probed for specifics about difficulties I have had with tonsillectomies it gave helpful tips for how I can improve my skills'	'The chatbot provided a simple step by step explanation. A subsequent prompt to expand at a level for a more senior surgeon provided a more detailed and accurate description of steps which was appropriate for my training level' (Figure 1b)	'I felt the basic explanation over-explained some things such as bipolar but didn't explain essential things such as surrounding structures. No mention of dissection planes'. 'In the advanced explanation again it over-explained things that are not specific to the procedure such as intubation/GA. The anatomy was over detailed and not particular relevant'. 'It is not normal practice to attach the gag to a mayo stand in the UK'
Time constraints	'The summary of this new guideline was very helpful for my stage of training and I would use this to build upon my learning'	'When asked to provide a strict definition of Acute Rhinosinusitis for adults on a subsequent prompt, the chatbot provides an accurate answer. However, it mentioned 'this definition is applicable for adults and children' which was incorrect. When challenged, it did correct itself (Figure 2), showing the fallibility of ChatGPT and highlighting the importance of cross-referencing'	'A reasonable summary of the EPOS guidelines and subsections which would be suitable for a medical student or very junior trainees'. 'It provided an accurate answer when asked specifically for a definition of Acute rhinosinusitis. It was not able to differ between adults and children, but did when challenged, correct itself. This is concerning if you are unable to check its responses'.
Knowledge retention	'A wide variety of questions related to the chosen topic was provided and the AI bot did not proceed without a response which would provide me with a good revision tool'	'This provided an interactive session with appropriate questions and answers. It gave immediate feedback for incorrect answers (Figure 3) and provided another opportunity to answer correctly. This allows trainees to highlight gaps in their knowledge and ask for more detailed explanations'	'This seems a good function of the ChatGPT. The questions were at a good level for a senior trainee and provided adequate answers. Also provided reasonable explanations/descriptions to questions that the trainee did not know'
Surgical technique improvement	'Prior to providing me with any additional information it asked me more questions about my needs which allowed the response generated to be tailored specifically to me'	'During this prompt, the chatbot asked if the problem was "angling the endoscope, maintaining a clear view or identifying anatomical structures". This allows trainees to ask difficult questions and highlight areas of weakness in an unintimidating environment'.	'Once the chatbot determined what the trainees issue was specifically, it gave some good tips, and had the insight that you need to practice!' 'It needs to know more about endoscopic sinus surgery approaches and techniques for the question regarding access to the maxillary sinus'.
Communication & collaboration	'The responses for this were the most impressive of all the trialled prompts. The chat bot gave me personalised answers which made it feel as though I was talking to a real patient online'.	'The chatbot assumed a virtual patient and interacted in this manner, providing an almost authentic dialogue that could occur in an outpatient clinic. It replicated questions that may be asked in the real setting allowing the trainee to practice and prepare'.	'This was very realistic and could make a valuable tool for medical students to practice taking a history. Slightly scary how realistic it is!'

Author A – core trainee 1, Author B – ENT speciality registrar, Author C – ENT consultant. AI = artificial intelligence; GA = General Anaesthetic; EPOS = European Position Paper on Rhinosinusitis and Nasal Polyps.

generated. Core facts remained the same overall, but wording was sometimes changed. This may be advantageous when using ChatGPT for communication skills but could be less appropriate for surgical techniques and guideline summaries. As such, with no current review boards or guidelines there is no accountability for the information provided to students.

- Artificial intelligence and ChatGPT are still in the early stages of development, but already offer exciting promise for the development of medical education
- ChatGPT has already been found to be useful in enhancing surgical training through summaries of large quantities of information (e.g. guidelines or literature), patient consultation simulation, and revision resources
- So far however there are no reviews of how ChatGPT could be a potential adjunct for education in Otolaryngology
- This article found that specific prompts currently must be written in order to generate the most useful responses
- However, some aspects of the ChatGPT system for education in Otolaryngology are already beginning to show to be an invaluable supplementary resource

Additionally, medical education requires cost effective and economically viable resources in order to be accessible to everyone who requires it. Although ChatGPT has a free package at present, there may be additional costs in the future as it develops and is used on a commercial basis.

In summary, although the potential of this software offers exciting developments in the field of medical education there are of course limitations. In its present stage, ChatGPT requires detailed input of salient information under specific circumstances within the prompts to generate a worthwhile response. This is likely to continue to develop quickly, but in its current state would require careful expert review and possibly the development of guidance to students who are using it.

## Conclusion

Even in its first 18 months of development ChatGPT has already shown the enormous potential for improving medical education by addressing common barriers to education in

otolaryngology. By leveraging this powerful AI tool, trainees could enhance their knowledge, refine surgical techniques and improve communication skills, ultimately leading to better patient care and outcomes, as well as enhanced trainee satisfaction of training. It is important to stress however that much like other online resources the quality and accuracy of the information provided by the AI chatbot are variable and sometimes incorrect. Therefore, we would advise caution when undertaking such exercises. While ChatGPT cannot replace traditional mentorship and practical surgical experience, it can serve as an invaluable supplementary resource to education in otolaryngology.

**Competing interests.** None declared

## References

- 1 Biswas S. ChatGPT and the future of medical writing. *Radiology* 2023;**307**: e223312
- 2 ChatGPT. In: <https://chat.openai.com> [3 May 2023]
- 3 Patel SB, Lam K. ChatGPT: the future of discharge summaries? *Lancet Digit Health* 2023;**5**:e107–8
- 4 Eysenbach G. The role of ChatGPT, Generative language models, and artificial intelligence in medical education: a conversation with ChatGPT and a call for papers. *JMIR Med Educ* 2023;**9**:e46885
- 5 Mayer AW, Smith KA, Carrie S, Authors C. A survey of ENT undergraduate teaching in the UK. *J Laryngol Otol* 2020;**134**:553–7
- 6 Hayois L, Dunsmore A. Common and serious ENT presentations in primary care. *InnovAiT* 2023;**16**:79–86
- 7 Hospital Admitted Patient Care Activity 2018–19. NDRS. In: <https://digital.nhs.uk/data-and-information/publications/statistical/hospital-admitted-patient-care-activity/2018-19> [6 April 2023]
- 8 The UK otolaryngology trainees' lived experience during the COVID-19 pandemic. In: ENT & Audiology News. <https://www.entandaudiologynews.com/development/trainee-matters/post/the-uk-otolaryngology-trainees-lived-experience-during-the-covid-19-pandemic> [16 April 2023]
- 9 Kaul V, Gallo de Moraes A, Khateeb D, Greenstein Y, Winter G, Chae J *et al.* Medical education during the Covid-19 pandemic. *Chest* 2021;**159**:1949–60
- 10 Khan S, Mian A. Medical education: Covid-19 and surgery. *Br J Surg* 2020;**107**:e269
- 11 The role of an open artificial intelligence platform in modern neurosurgical education: a preliminary study. In: <https://link.springer.com/article/10.1007/s10143-023-01998-2> [17 April 2023]
- 12 Balel Y. Can ChatGPT be used in oral and maxillofacial surgery? *J Stomatol Oral Maxillofac Surg* 2023;101471
- 13 Sallam M. ChatGPT utility in healthcare education, research, and practice: systematic review on the promising perspectives and valid concerns. *Healthcare* 2023;**11**:887
- 14 Kumar AH. Analysis of ChatGPT tool to assess the potential of its utility for academic writing in biomedical domain. *BEMS Reports* 2023;**9**: 24–30
- 15 Gilson A, Safranek CW, Huang T, Socrates V, Chi L, Taylor RA *et al.* How does ChatGPT perform on the United States medical licensing examination? The implications of large language models for medical education and knowledge assessment. *JMIR Medical Education* 2023;**9**:e45312
- 16 Kung TH, Cheatham M, Medenilla A, Sillos C, Leon LD, Elepaño C *et al.* Performance of ChatGPT on USMLE: potential for AI-assisted medical education using large language models. *PLOS Digital Health* 2023;**2**: e0000198
- 17 ChatGPT for clinical vignette generation, revision, and evaluation. In: <https://www.medrxiv.org/content/10.1101/2023.02.04.23285478v1> [2 May 2023]
- 18 Khan RA, Jawaid M, Khan AR, Sajjad M. ChatGPT - reshaping medical education and clinical management. *Pak J Med Sci* 2023;**39**:605–7