

Editorial

Potential of Large Language Model (ChatGPT) in Constructing Multiple Choice Questions

Ajeet Kumar Khilnani

Department of Otorhinolaryngology, Gujarat Adani Institute of Medical Sciences and GK
General Hospital, Bhuj, Kachchh, Gujarat-370001

Correspondence: Dr Ajeet Kumar Khilnani (ajeetkhilnani@gmail.com)

ChatGPT (Generative Pre-trained Transformer) is a large language model chatbot based on artificial intelligence (AI). It has gained popularity since its launch in November, 2022. Its utility is being explored in various fields, including medical education,¹ medical writing and research.² The potential of ChatGPT in framing Multiple Choice Questions (MCQs) in medical subjects is yet to be explored. Writing a good quality MCQ requires time and effort. The purpose of this write-up is to know whether ChatGPT can construct good quality MCQs or not. An account was created at <https://chat.openai.com/auth/login> and the chatbot was asked to create MCQs on *otosclerosis* with varying difficulty levels and addressing different learning domains. Few examples of the MCQs framed by ChatGPT are shown below:

Example-1

Write an MCQ on otosclerosis that addresses the recall domain of learning. MCQ should have three options.

ChatGPT's response

What is the most common cause of hearing loss in otosclerosis?

- A) Damage to the hair cells in the inner ear
- B) Infection in the middle ear
- C) Abnormal bone growth in the middle ear

Answer: C) Abnormal bone growth in the middle ear

Explanation: Otosclerosis is a condition in which there is abnormal bone growth in the middle ear, specifically around the stapes bone. This bone plays a crucial role in transmitting sound waves to the inner ear. When the stapes bone is affected by otosclerosis, it cannot move as freely, which can lead to hearing loss. Damage to the hair cells in the inner ear and infection in the middle ear are not typically associated with otosclerosis.

Example-2

Write an MCQ on otosclerosis based on comprehension of knowledge. MCQ should have 4 options.

ChatGPT's response

What is the most effective treatment for otosclerosis?

- A) Antibiotics
- B) Hearing aids
- C) Surgery
- D) Speech therapy

Answer: C) Surgery

Explanation: Surgery is the most effective treatment for otosclerosis, especially when hearing loss is significant. There are two main surgical options: stapedectomy and stapedotomy. Both involve removing a portion of the stapes bone and replacing it with a prosthetic device that allows sound waves to be transmitted to the inner ear. Antibiotics are not effective for treating otosclerosis as it is not caused by an infection. Hearing aids can help with hearing loss, but they may not be as effective as surgery in severe cases. Speech therapy may be helpful for individuals with hearing loss, but it is not a treatment for otosclerosis itself.

Example-3

Write an MCQ on otosclerosis addressing the affective domain.

ChatGPT's response

How does otosclerosis impact an individual's emotional state?

- A) It can cause anxiety and depression
- B) It can lead to anger and irritability

- C) It can result in feelings of guilt and shame
- D) It has no impact on an individual's emotional state

Answer: A) It can cause anxiety and depression

Explanation: Otosclerosis can lead to hearing loss, which can impact an individual's emotional state. Studies have shown that individuals with hearing loss are at an increased risk of anxiety and depression. In some cases, otosclerosis can also lead to social isolation and difficulty communicating with others, which can further contribute to negative emotions. While otosclerosis may not directly cause anger or irritability (Option B) or feelings of guilt and shame (Option C), it can indirectly impact an individual's emotional state in many ways. Option D is incorrect as otosclerosis can have an impact on an individual's emotional well-being.

Example-4

Write 3 MCQs on otosclerosis with varying difficulty levels

ChatGPT's response

Easy level:

What is otosclerosis?

- A) A type of ear infection
- B) A condition that affects bone growth in the middle ear
- C) A type of hearing aid

Answer: B) A condition that affects bone growth in the middle ear

Explanation: Otosclerosis is a condition in which there is abnormal bone growth in the middle ear, specifically around the stapes bone. This bone plays a crucial role in transmitting sound waves to the inner ear.

Moderate level:

What is the most effective treatment for otosclerosis?

- A) Antibiotics
- B) Hearing aids
- C) Surgery
- D) Speech therapy

Answer: C) Surgery

Explanation: Surgery is the most effective treatment for otosclerosis, especially when hearing loss is significant. There are two main surgical options: stapedectomy and stapedotomy.

Difficult level:

What is the relationship between otosclerosis and osteoporosis?

- A) Otosclerosis and osteoporosis are unrelated conditions

B) Individuals with otosclerosis have an increased risk of developing osteoporosis

C) Individuals with osteoporosis have an increased risk of developing otosclerosis

D) Otosclerosis can lead to the development of osteoporosis in the affected area

Answer: B) Individuals with otosclerosis have an increased risk of developing osteoporosis

Explanation: While otosclerosis and osteoporosis are distinct conditions, some research suggests that individuals with otosclerosis may be at increased risk of developing osteoporosis. This is thought to be due to the abnormal bone growth in the middle ear interfering with the normal bone remodeling process.

Example-5

Write a negative type of MCQ on otosclerosis

ChatGPT's response

Which of the following is NOT a symptom of otosclerosis?

- A) Hearing loss
- B) Tinnitus
- C) Vertigo
- D) Ear pain

Answer: D) Ear pain

Explanation: Ear pain is not a typical symptom of otosclerosis. Otosclerosis is characterized by hearing loss, often accompanied by tinnitus (ringing in the ears) and vertigo (dizziness). However, ear pain can be a symptom of other ear conditions, such as ear infections or temporomandibular joint disorder (TMJ).

Example-6

Write a case based MCQ on otosclerosis

ChatGPT's response

Case: A 35-year-old woman presents to the ENT clinic with a complaint of progressive hearing loss in her left ear for the past few years. She reports that her hearing loss has been slowly worsening and that she now has difficulty hearing conversations in noisy environments. She denies any history of ear infections, trauma, or exposure to loud noise. She has no significant medical history and takes no medications.

Based on this history, what is the most likely diagnosis?

- A) Meniere's disease
- B) Acoustic neuroma

- C) Otosclerosis
- D) Presbycusis

Answer: C) Otosclerosis

Explanation: The patient's history of progressive hearing loss, especially in one ear, is consistent with otosclerosis. Meniere's disease and acoustic neuroma typically present with hearing loss in both ears, while presbycusis is age-related hearing loss that typically presents later in life.

Following points are worth noting regarding the ability of ChatGPT in framing MCQs:

- ChatGPT could instantly frame multiple MCQs on otosclerosis addressing different levels of cognitive domain with explanation of each option. The suggested answers to the all MCQs were correct (*Examples 1 and 2*).
- Interestingly, it could also frame MCQs on otosclerosis addressing the affective domain (*Example 3*).
- The negative words in the stem of MCQs (e.g., NOT, EXCEPT) were written in capital letters which is a good practice of writing MCQs (*Example 5*).
- ChatGPT could frame MCQs with different options when asked (3, 4 or 5 option MCQs) (*Examples 1 and 2*). When not specified, the MCQs generally had 4 options.
- When asked, ChatGPT could also frame MCQs with varying difficulty levels. However, this can only be verified by item analysis (*Example 4*).
- ChatGPT could frame a case-based MCQ on otosclerosis (*Example 6*).

Finally, when asked about its potential in framing MCQs for medical subjects, the following is the response from ChatGPT:

ChatGPT's response

As an AI language model, ChatGPT has a great potential in framing MCQs on medical subjects. With its vast database of medical knowledge, ChatGPT can generate questions that are both challenging and informative, covering a wide range of topics in medicine, including anatomy, physiology, pathology, pharmacology, and more.

Moreover, ChatGPT can generate questions that are tailored to the learner's level of expertise, ensuring that they are neither too easy nor too difficult. This feature makes it an ideal tool for educators and medical professionals who want to assess and improve their students' or colleagues' knowledge of a particular medical subject.

Furthermore, ChatGPT can provide feedback and explanations for each answer choice, helping the learner to better understand the material being tested. This can be especially helpful in medical education, where it is crucial to have a deep understanding of complex medical concepts.

Overall, ChatGPT's potential in framing MCQs on medical subjects is immense, and it has the potential to revolutionize medical education and improve the quality of care provided by medical professionals.

CONCLUSION

ChatGPT is a useful tool to prepare large number of different varieties of good quality MCQs quickly though it can't be blindly relied upon. Its potential limitations may be lack of medical expertise, difficulty in understanding context, inability to verify answers and inability to generate visual aids. Hence, it is the sole responsibility of a teacher to ascertain that the MCQs framed by ChatGPT are valid and reliable.

REFERENCES

1. 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. doi: 10.2196/46885
2. Arif TB, Munaf U, Ul-Haque I. The future of medical education and research: Is ChatGPT a blessing or blight in disguise? *Medical Education Online* 2023;28:1-2. DOI: 10.1080/10872981.2023.2181052

Source of support: Nil

Conflict of interest: None declared

How to cite: Khilnani AK. Potential of Large Language Model (ChatGPT) in Constructing Multiple Choice Questions. *GAIMS J Med Sci* 2023;3(2):1-3.