

# Pioneering the Integration of Artificial Intelligence in Medical Oral Board Examinations

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Review began 01/03/2024

Review ended 01/07/2024

Published 01/15/2024

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## Abstract

We evaluated the use of ChatGPT-4, an advanced artificial intelligence (AI) language model, in medical oral examinations, specifically in anesthesiology. Initially proven adept in written examinations, ChatGPT-4's performance was tested against oral board sample sessions of the American Board of Anesthesiology. Modifications were made to ensure responses were concise and conversationally natural, simulating real patient consultations or oral examinations. The results demonstrate ChatGPT-4's impressive adaptability and potential in oral board examinations as a training and assessment tool in medical education, indicating new avenues for AI application in this field.

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**Categories:** Anesthesiology, Medical Education

**Keywords:** anesthesiology, medical education technology, chatgpt-4, oral board examination, artificial intelligence (ai)

## Editorial

Artificial intelligence (AI) has recently made remarkable strides in medicine [1-3], leaving indelible footprints, particularly with the emergence of ChatGPT [4,5]. The advanced language model, ChatGPT-4, has demonstrated a striking aptitude for emulating human conversation since its launch in early 2023. This AI's prowess is notable in written examinations [6-8], such as the U.S. Medical Licensing Examination [9] and specialty board certification written examinations, including the Royal College of Anaesthetists written examination [10].

Nevertheless, a hitherto unexplored territory is the potential of ChatGPT in oral examinations. We delved into the performance of ChatGPT-4 in oral board examinations, which evaluate an examinee's clinical judgment, adaptability to unanticipated clinical changes, and proficiency in organizing and presenting information. Remarkably, when published American Board of Anesthesiology (ABA) sample sessions [11] were presented to ChatGPT-4, it generated answers that met, or even exceeded, the passing criteria for all questions, as judged by two ABA board-certified anesthesiologists (SH and KT). The initial responses were thorough and comprehensive; however, they were lengthy and lacked a natural conversational tone (Figure 1).

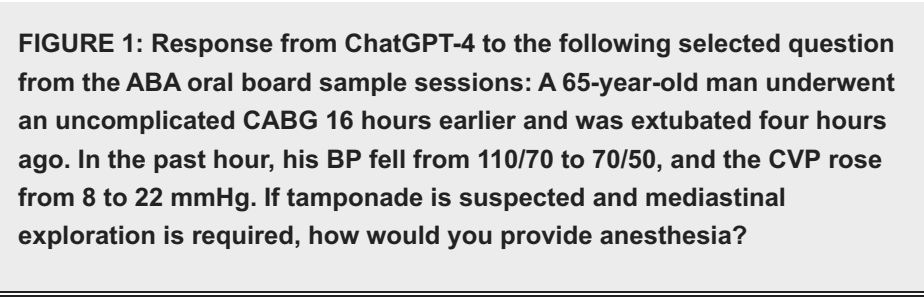
### How to cite this article

Hanada S, Hayashi Y, Subramani S, et al. (January 15, 2024) Pioneering the Integration of Artificial Intelligence in Medical Oral Board Examinations . Cureus 16(1): e52318. DOI 10.7759/cureus.52318

Anesthetic management for emergent re-exploration after cardiac surgery for suspected tamponade should be done with meticulous care as the patient can be in a highly unstable condition. Here are the steps that should be taken:

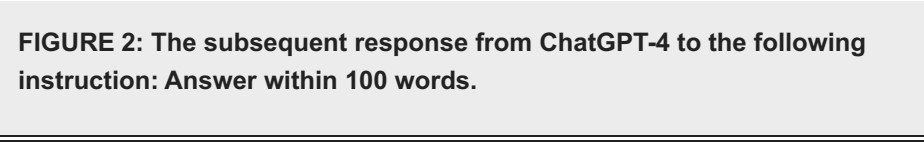
1. **Pre-operative optimization:** Quick assessment of the patient's general condition, comorbidities, and specific complications. Detailed assessment is not feasible due to the emergency nature of the situation, but labs, echocardiography, chest X-ray, and a brief history should be reviewed. Central venous and arterial lines should already be in place, and if not, should be inserted. Fluid resuscitation or inotropes may be needed to improve hemodynamics before anesthesia.
2. **Induction of Anesthesia:** The choice of induction agent depends on the patient's hemodynamic status. As the patient is hemodynamically unstable, an induction agent with minimal cardiovascular effects should be used, like etomidate. Rapid sequence induction (RSI) is usually carried out due to the emergency nature of the situation.
3. **Analgesia:** Fentanyl or remifentanyl are commonly used as they have both analgesic and cardiovascular stabilizing effects.
4. **Muscle Relaxant:** Succinylcholine or rocuronium can be used to facilitate intubation.
5. **Maintenance of Anesthesia:** This can be achieved using a combination of inhalational (like sevoflurane) and intravenous (like propofol) agents, bearing in mind the need to balance the depth of anesthesia with the patient's hemodynamic status.
6. **Ventilation:** Positive pressure ventilation with a lung-protective strategy would be suitable, while ensuring adequate oxygenation and ventilation.
7. **Monitoring:** Standard ASA monitoring should be present, including pulse oximetry, non-invasive blood pressure, EKG, end-tidal CO<sub>2</sub>, temperature, and depth of anesthesia monitoring. Additional monitoring might include invasive arterial blood pressure monitoring, central venous pressure, and possibly transesophageal echocardiography (TEE) if available and there's time for placement.
8. **Intraoperative Management:** Anticipate sudden changes in hemodynamics during the relief of tamponade. Upon opening the pericardium and relieving the tamponade, there might be a sudden increase in venous return and thus preload, which might require reduction in vasopressor support or increase in anesthetic depth.
9. **Emergence:** The patient should be extubated only if he is hemodynamically stable, well-reversed from neuromuscular blockade, adequately warmed, and has no major coagulopathy. Given the nature of the surgery, it might be appropriate to plan for delayed extubation and post-operative ventilation.
10. **Postoperative Analgesia:** Good postoperative analgesia can be provided by opioids, non-steroidal anti-inflammatory drugs (NSAIDs), or regional techniques like thoracic epidural analgesia if it was placed preoperatively.

Overall, the anesthetic goal in managing a suspected cardiac tamponade is to maintain stable hemodynamics, provide good analgesia, and ensure rapid emergence if possible. The management should be adjusted based on the patient's response and intraoperative events. Communication with the surgical team is key throughout the procedure. Please note that this is general advice, and the specific case of each patient may require a different approach. Always consult with the appropriate medical professionals in such a situation.



Thus, we implemented constraints, instructing AI to limit responses to a word count, as if a person had paused to think and respond in the allotted time (Figure 2).

In this patient suspecting cardiac tamponade, anesthesia should be carefully managed. Use etomidate for induction to maintain hemodynamic stability. Apply Rapid Sequence Induction with rocuronium for intubation, considering the risk of aspiration. Vasopressors and/or inotropes, such as norepinephrine or dobutamine, may be needed to manage hypotension and high CVP. Opioids like fentanyl can provide analgesia and stabilize hemodynamics. Anesthetic maintenance could combine volatile anesthetics and propofol, adjusted to the patient's response. Ensure ventilation and oxygenation balance, and prepare for possible emergent sternotomy. Advanced monitoring like a pulmonary artery catheter and transesophageal echocardiography could guide management.



We then added instructions to emulate a conversational tone and to simulate an anesthesiologist's consultation with a patient or a board examination scenario. This resulted in concise, information-dense answers that adhere closely to human conversation patterns, such as in a real oral examination (Figures 3A-3C).

**(A) Answer within 100 words in a human conversational manner.**

Sure, in simple terms, if this gentleman needs emergency surgery due to suspected tamponade, we'd handle his anesthesia very carefully. Before we start, we'd try to stabilize his blood pressure with fluids or medicines. We'd use anesthetic drugs that have minimal effects on the heart and blood pressure. During the operation, we'd monitor his vitals very closely and prepare for any sudden changes when the tamponade is relieved. After surgery, we'd only wake him up and remove the breathing tube when he's stable and warm enough. We'd also make sure he's comfortable and free from pain with suitable medications. Every patient is unique, so we might need to adapt our approach as we go along.

**(B) Answer within 100 words as if you are the anesthesiologist taking care of this patient.**

As your anesthesiologist, I'll manage your situation carefully. To start, I'll stabilize your blood pressure with fluids or medications as needed. For the anesthesia, I'll use agents that are gentle on your heart. During surgery, I'll closely monitor your vital signs and be ready for any sudden changes when the tamponade is relieved. After the procedure, I'll make sure you're stable, warm, and comfortable before waking you up and removing the breathing tube. I'll provide suitable pain medications to keep you comfortable. Remember, each patient is unique, so I'll tailor my approach to your specific needs and responses throughout this process.

**(C) Answer within 100 words as if you are a candidate at the anesthesiology oral board examination.**

As part of my anesthetic plan for this patient, I would first stabilize the patient's hemodynamics with fluids or inotropes. For induction, I'd choose an agent like etomidate with minimal cardiovascular effects, paired with opioids for analgesia. Muscle relaxants would facilitate intubation. Anesthesia would be maintained using a mix of inhalational and IV agents, always monitoring the patient's vitals and depth of anesthesia. I would anticipate abrupt hemodynamic changes upon relieving the tamponade. The patient would only be extubated postoperatively, provided he is stable, adequately reversed from muscle blockade, and well warmed. For analgesia, opioids or NSAIDs would be provided. This plan can change according to intraoperative findings.

**FIGURE 3: The subsequent responses from ChatGPT-4 to the following instruction: (A) Answer within 100 words in a human conversational manner. (B) Answer within 100 words as if you are the anesthesiologist taking care of this patient. (C) Answer within 100 words as if you were a candidate for the anesthesiology oral board examination.**

AI has access to a wealth of information; still, it requires clear instructions to provide the expected response. Our expertise lies in anesthesiology; thus, we chose an anesthesia example. However, this model could be applied to diverse medical specialties. The responses provided by AI are truly impressive, complete with clinical decision-making and the reasoning behind it. This technology could serve as a tool to test both the validity and reliability of question design and also to assist candidates in preparing for oral board examinations. Moreover, the adaptability of ChatGPT-4 suggests its potential role in teaching and preparing medical professionals for real-world clinical scenarios, thereby enhancing their communication and decision-making skills. These facets are new frontiers in the application of AI in medical education and examination, paving the way for further advancements in this rapidly evolving field.

## Additional Information

### Author Contributions

All authors have reviewed the final version to be published and agreed to be accountable for all aspects of the work.

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### Disclosures

**Conflicts of interest:** In compliance with the ICMJE uniform disclosure form, all authors declare the following: **Payment/services info:** All authors have declared that no financial support was received from any organization for the submitted work. **Financial relationships:** Kokila Thenuwara, MD declare(s) support for travel and an honorarium have been provided for the service as a board examiner from American Board of Anesthesiology (ABA). Kokila Thenuwara, MD, is a written and applied board examiner for the ABA. The contents, opinions, and conclusions in this article are those of the authors and do not represent those of the ABA. Satoshi Hanada, MD, FASE declare(s) support is provided for attending the ABA Winter 2024 Item Writing Workshop from American Board of Anesthesiology (ABA). Satoshi Hanada, MD, FASE, is a member of the Maintenance of Certification in Anesthesiology Minute Adult Cardiac Anesthesiology Committee for the ABA. The contents, opinions, and conclusions in this article are those of the authors and do not represent those of the ABA. **Other relationships:** All authors have declared that there are no other relationships or

activities that could appear to have influenced the submitted work.

## Acknowledgements

The authors used ChatGPT for this article.

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