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Using Artificial Intelligence for Distance Medical Education via Zoom: A Case-Based Learning Model

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ABSTRACT: Artificial intelligence (AI) presents new opportunities for enhancing distance medical education, particularly through case-based learning formats conducted via virtual platforms like Zoom. This article proposes a structured model for integrating AI-generated clinical cases into remote teaching and learning. AI tools can simulate complex patient scenarios with realistic histories, examinations, laboratory findings, and imaging, enabling students to practice diagnostic reasoning and collaborative problem-solving. A pilot implementation with third- and fourth-year medical students demonstrated significant benefits: 92% found the AI cases realistic, 85% felt more confident in clinical reasoning, and 88% reported greater engagement compared to traditional online lectures. Students appreciated the authenticity and unpredictability of the cases, which encouraged them to think clinically rather than memorise facts. Instructors observed stronger participation and peer-to-peer dialogue. While challenges such as content validation, ethical transparency, and technological dependence persist, the model represents a cost-effective and scalable approach for enhancing remote clinical education. Integration with virtual and augmented reality platforms may further expand its potential.

KEYWORDS: artificial intelligence, distance learning, medical education, clinical case studies, Zoom, student engagement, digital pedagogy, case-based learning, e-learning.

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Introduction

The COVID-19 pandemic accelerated the transition to online education, creating both opportunities and challenges for medical training. Conventional lectures delivered through digital platforms often failed to replicate the interactive and diagnostic aspects of bedside teaching. Clinical reasoning, a fundamental competency, requires active engagement with dynamic and uncertain patient data (Tozsin et al., 2024). Passive methods such as video lectures or static cases are insufficient for developing these skills. Artificial intelligence, capable of generating individualised and nuanced clinical scenarios, presents an innovative solution to strengthen online learning environments (Cook et al., 2010; Zhao & Watterston, 2021). In particular, clinical reasoning—a core competency in medical education—requires active engagement with complex patient data. This is difficult to simulate through passive video lectures or static case studies. The rise of artificial intelligence (AI) presents an opportunity to enhance virtual learning environments by generating unique, nuanced clinical scenarios that adapt to various learning contexts. Analysis of recent research and publications has shown that the Evidence supports the effectiveness of interactive digital learning (Huang et al., 2011). Online medical education, when incorporating active components, can be as effective as in-person instruction (Cook et al., 2010). Ellaway and Masters (2008) emphasised adaptability and feedback as key to e-learning success. Huang, Newman, and Schwartzstein (2014) highlighted critical thinking as a central learning outcome, best developed through interactive approaches. AI-based technologies are increasingly used to create realistic simulations and virtual patients. Gutiérrez Maquiló et al. (2024) found that training in social and verbal interactions is crucial for medical first responders (MFRs) to assess patient conditions and provide urgent treatment during emergency medical service administration.. Integrating conversational agents (CAs) into virtual patients (VPs), that is, digital simulations, is a cost-effective alternative to resource-intensive human role-playing (Mir et al., 2023). Wang et al. (2022) confirmed these findings, stating that AI applications enhance student engagement and improve preparedness for clinical practice.

Beyond AI, distance learning innovations have been advanced through the use of analytics and adaptive methods. Wong et al. (2024) demonstrated that while descriptive analysis is the most commonly employed analytical technique, advanced techniques such as machine learning, artificial intelligence, and social network analysis are becoming increasingly prominent. The studies addressed a wide range of elements associated with course evaluation, including course design, content quality, assignments, instructional strategies, workload, feedback mechanisms, and the integration of technology. Tene et al. (2024) showed that Virtual reality is a prevalent tool in the research landscape of medical education technologies, with a positive trend toward enhancing educational outcomes. Broader pedagogical studies also emphasise the transformative effects of post-pandemic digital education (Zhao & Watterston, 2021). AI-generated simulations and patient avatars have been successfully utilised in nursing and radiology education, enhancing both learner autonomy and diagnostic accuracy. Despite these promising findings, the implementation of AI tools in real-time, synchronous learning

environments remains limited. There is a need for pedagogical models that merge the creative capacity of AI with the collaborative potential of platforms like Zoom.

Research Aim and Research Questions

This study proposes and evaluates a model for utilising AI to generate clinical cases for interactive student presentations and discussions during Zoom-based medical education. This model aims to increase engagement, support the development of diagnostic skills, and facilitate deeper learning through real-time, collaborative learning.

Research Results

The proposed model involves the following steps:

1. AI-Generated Clinical Case Creation: The instructor or designated student uses an AI tool (e.g., ChatGPT or similar) to generate a realistic clinical case. The case includes patient history, symptoms, lab results, and imaging, tailored to the current curriculum topic.
2. Student Presentation: A student (the case author or presenter) introduces the case via Zoom, simulating a real clinical encounter.
3. Collaborative Discussion: The rest of the class engages in guided discussion, asking clarifying questions, forming differential diagnoses, and suggesting diagnostic and treatment plans.
4. Instructor Moderation and Debrief: The instructor facilitates the discussion, corrects misconceptions, and concludes with key teaching points.

Pilot sessions were conducted with third- and fourth-year medical students across five Zoom classes. Each class featured a different AI-generated case aligned with course modules in cardiology, neurology, infectious diseases, gastroenterology, and emergency medicine.

Student Feedback and Performance

Surveys collected post-session revealed the following:

- 92% of students found the AI cases realistic and helpful.
- 85% felt more confident in clinical reasoning.
- 88% reported increased engagement compared to standard online lectures.
- 79% appreciated the opportunity to take leadership roles by presenting cases.
- Instructors noted improved participation, more frequent peer-to-peer dialogue, and better retention of clinical concepts.

Qualitative feedback highlighted that students appreciated the unpredictability and complexity of AI cases, which mirrored fundamental clinical uncertainty. Many students described the format as more "authentic" and felt that it encouraged them to think like doctors, rather than memorise facts.

The model consists of four structured stages:

1. AI-Generated Case Creation – an instructor or student employs an AI tool (e.g., ChatGPT) to design a realistic clinical scenario.
2. Student Presentation – a student presents the case during a Zoom session, simulating a real encounter.
3. Collaborative Discussion – peers analyse findings, propose differential diagnoses, and suggest management plans.
4. Instructor Debrief – the instructor facilitates dialogue, corrects errors, and reinforces teaching points.

Challenges and Considerations

While promising, this model also introduces challenges:

- Accuracy and Validation: AI-generated cases must be thoroughly reviewed to ensure medical accuracy.
- Student Readiness: Not all students may feel comfortable leading discussions without clear guidance.
- Technological Dependence: Internet instability or software limitations can disrupt sessions.
- Ethical Considerations: There must be transparency regarding the use of AI and its limitations in simulation.

To mitigate these risks, educators should combine AI tools with evidence-based teaching strategies and maintain oversight of all case materials to ensure effective learning outcomes.

Conclusions

Integrating AI-generated clinical cases into Zoom-based medical education enhances interactivity, diagnostic reasoning, and learner engagement. This approach offers a scalable and cost-effective solution for remote clinical teaching, aligning with modern pedagogical priorities. It promotes critical thinking, peer learning, and adaptability in virtual environments. Future research should examine the long-term impacts on clinical performance, explore the integration with VR and AI platforms, and assess cross-cultural adaptability in international education settings.

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