Past Present and Future of Simulation in Internal Medicine: An Artificial Intelligence Focus

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Introduction

Simulation training has a long history in the aviation industry and has since expanded to other fields, including medicine. Medical simulation utilizes various modalities, including standardized patients, task trainers, and high fidelity mannequins, to teach learners in internal medicine. Debriefing is a key aspect of learning in medical simulation, allowing for self-reflection and uncovering approaches to medical problems. Simulation is expanding in the future, with medical boards using simulation to assess clinical competency and virtual reality providing an immersive world for learners to develop clinical skills. Artificial intelligence can also play a role in simulation, potentially providing more accurate and personalized training experiences.

Curriculum Development

Simulation is becoming increasingly popular in internal medicine programs for training and competency assessment, with the potential to improve patient outcomes. Thoughtful planning is critical for successful simulation exercises, and instructors should consider factors such as learning objectives, group size, and duration of the simulation. New curricular innovations can be tested in simulation, such as using senior residents as facilitators for first-year residents, which can be an effective educational model and benefit both the teacher and learner. Artificial intelligence has the potential to improve simulation by providing personalized training experiences and enhancing assessment tools. AI can enhance simulation training through intelligent tutoring systems that analyze learner performance and provide personalized feedback for improvement. AI can also improve assessment tools by using machine learning algorithms to analyze learner performance data and identify areas of weakness for targeted feedback.

Clinical Clerkships

Simulation training is an effective way to prepare internal medicine residents for their clinical clerkships. For example, the Mayo Clinic Internal Medicine Program uses a simulation center to train residents on various medical procedures and emergencies. Additionally, the simulation center is used to assess and remediate resident competency throughout their three-year residency. AI can play a role in enhancing simulation training for internal medicine residents by providing personalized feedback and recommendations for improvement based on their individual performance. Machine learning algorithms can analyze resident performance data to identify areas of weakness and suggest specific simulations for targeted practice. Additionally, AI-powered assessment tools can accurately evaluate resident performance and provide objective feedback, facilitating remediation and ensuring that residents are adequately prepared for clinical clerkships.

AI generated art for book chapter.

Decision Making and Leadership

Simulation-based training and debriefing can be used to improve medical decision-making, leadership skills, and interpersonal and communication skills among medical professionals. Debriefing allows learners to self-reflect and understand their performance, and it is the part of the simulation where most learning occurs. Simulation-based leadership training can significantly improve performance in crisis resource management and communication skills. Standardized patients can also improve communication skills, with debriefing sessions on how to improve communication One potential application of AI in simulation training could be in the debriefing process. Natural language processing (NLP) and sentiment analysis techniques could be used to analyze audio or video recordings of simulation sessions to identify the types of feedback and communication patterns that occur during debriefing. This could provide valuable insights for instructors to improve their debriefing techniques and identify areas where learners may need additional support or remediation. Additionally, AI-powered virtual standardized patients could be used to simulate difficult ethical situations or complex medical cases that would be difficult to recreate in traditional simulations. This could provide a more realistic and immersive learning experience for learners, while also allowing instructors to track learner performance and provide personalized feedback..

The world's first clinical simulation technology powered by AI.
Source: osce.ai

Pearls

- Simulation can also be used to assess clinical competency, particularly the ACGME milestones.
- Although there are limitations to medical simulation, innovative solutions can be used to overcome challenges related to cost, resource requirements, and personnel.
- Simulation can be further enhanced with the integration of AI technologies such as intelligent tutoring systems and machine learning algorithms to personalize feedback and assessments.
- Simulation has the potential to transform CME and the board certification process by capturing the interplay of medical knowledge, decision making, and communication that impact patient outcomes.
- It is important to note that simulation is not a replacement for clinical learning but is designed to address educational gaps and improve patient safety.
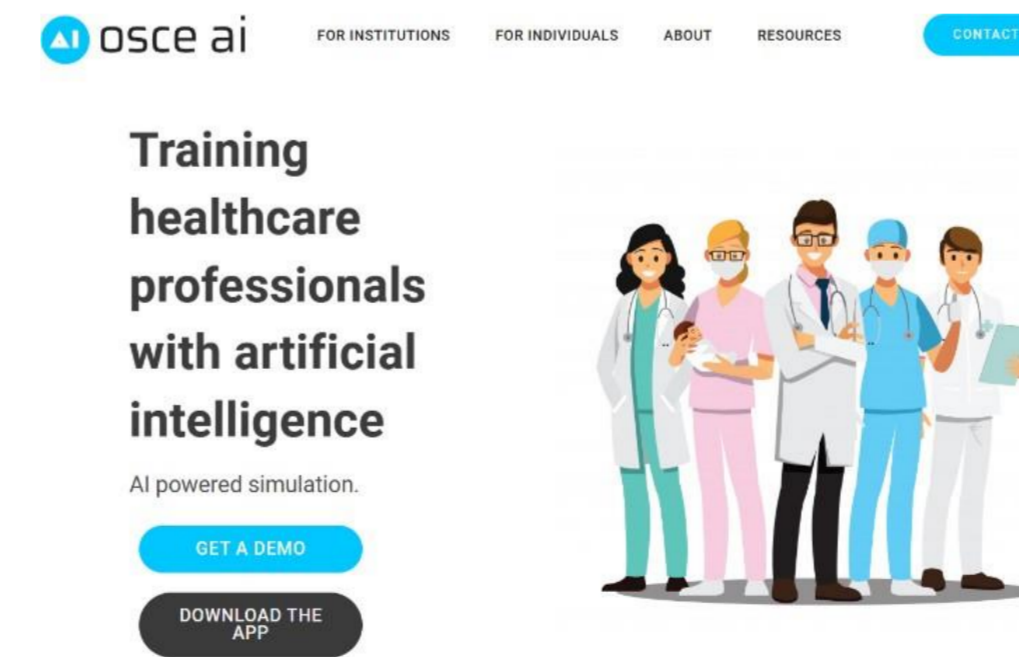

OSCE AI: Janet, chatbot based patient. An example of an AI powered simulation tool.

References

Oman SP, Magdi Y, Simon LV. Past Present and Future of Simulation in Internal Medicine. [Updated 2022 Jul 25]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2023 Jan-. Available from: https://www.ncbi.nlm.nih.gov/ books/NBK549883/

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