The Right Kind of Reps: An AI-based Virtual Patient Simulator to Support the Development of Clinical Reasoning

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ABSTRACT

Researchers at the University of California, Davis and Stanford have developed an AI-driven virtual patient platform designed to enhance clinical reasoning skills in emergency medicine learners through dynamic, interactive, and adaptive case simulations.

FULL DESCRIPTION

The simulator integrates large language models to generate diverse, open-ended emergency medicine patient cases in real-time, enabling learners to engage in realistic clinical reasoning workflows. Unlike traditional static case libraries, this platform creates unlimited unique scenarios tailored by difficulty and chief complaint. It supports free-text interaction, structured clinical documentation, and delivers detailed transcripts of learner decisions for enriched feedback and research. The system bridges the gap between textbook learning and real-world emergency medical decision making, preparing trainees for complex, uncertain clinical environments.

APPLICATIONS

- Self-directed emergency medicine training and continuous professional development.
- Faculty-facilitated learner feedback and assessment sessions using detailed clinical reasoning transcripts.
- Educational research on clinical reasoning, adaptive expertise, and learning deficiencies.
- Oral board exam preparation for emergency medicine trainees.
- Expansion into training for early medical learners, advanced practice providers, and other medical specialties.

FEATURES/BENEFITS

- Generates unlimited, diverse, unique patient cases to maintain an ever-expanding case library.
- Guides learners through structured clinical reasoning tasks—documentation, differential diagnosis, and decision-making notes—to mirror emergency-care thinking.
- Enables immersive, free-text interaction for simulated patient dialogue, physical exams, and specialist consultations.
- Adapts challenge level by adjusting difficulty to support beginners through advanced learners.
- Visualizes end-to-end reasoning transcripts to improve targeted faculty feedback and strengthen self-regulated learning.
- Supports both education and research by capturing data suitable for studying clinical reasoning development.
- Eliminates reliance on fixed, "single-best-answer" case banks by replacing them with dynamically generated scenarios.
- Overcomes passive, non-immersive case learning by introducing real-time, interactive decision-making and dialogue.
- Reduces one-size-fits-all training by tailoring cases to different skill levels and variable clinical presentations.
- Improves longitudinal evaluation by making clinical reasoning growth easier to assess and support over time.
- Closes the authenticity gap by replicating emergency department workflow and documentation practices more realistically.

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OTHER INFORMATION

KEYWORDS

adaptive expertise, artificial intelligence, clinical reasoning, emergency medicine, interactive simulation, large language models, medical education, self-regulated learning, virtual patients, workforce training

CATEGORIZED AS

- **Medical**
  - Software

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