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TECHNOLOGY FOR DEVELOPING CLINICAL REASONING COMPETENCY AMONG MEDICAL UNIVERSITY STUDENTS

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Abstract

This article explores the technology-driven strategies for developing clinical reasoning competency among medical university students. Emphasis is placed on simulation-based education, digital case libraries, problem-based learning, and reflective teaching methods as key tools for fostering critical thinking and diagnostic skills. The integration of virtual patients, e-learning platforms, and structured assessment tools is discussed in relation to their pedagogical value and impact on clinical preparedness. The study highlights the necessity of adopting modern technologies and interactive methodologies to cultivate future physicians' ability to make evidence-based, patient-centered decisions in dynamic clinical environments.

Keywords: clinical reasoning, medical education, simulation technology, digital learning, diagnostic thinking, medical students, problem-based learning, virtual patient, reflective practice, competency development

In contemporary medical education, developing clinical reasoning competency is one of the key indicators of a student's readiness for independent professional activity. Clinical reasoning refers to a complex cognitive process that enables future physicians to interpret patient data, identify relevant symptoms, construct differential diagnoses, and select appropriate management strategies. This competency forms the foundation of evidence-based decision-making and is essential for safe, effective, and personalized healthcare delivery [1, 3].

Technological innovations in education have opened new horizons for fostering clinical reasoning skills. Among the most effective approaches are problem-based learning (PBL), case-based discussions, interactive simulations, and diagnostic algorithms delivered through digital platforms. These strategies shift the focus from

passive learning to active knowledge construction, requiring learners to analyze complex clinical situations, engage in reflective practice, and develop decision-making strategies in real-time [2, 4].

Simulation-based education has become a cornerstone of competency-oriented medical training. The use of standardized patients, virtual clinical scenarios, and high-fidelity manikins allows students to practice diagnostic and therapeutic decision-making in a risk-free environment. Moreover, virtual patient platforms and AI-supported diagnostic simulations offer individualized learning paths and formative feedback, enabling learners to track their progress and correct reasoning errors [5, 6].

Digital technologies such as e-learning platforms (Moodle, MedCram, Lecturio), clinical case libraries, mobile applications, and 3D interactive models enhance students' exposure to diverse clinical problems. They also support blended learning models that combine theoretical instruction with digital simulation exercises, helping students transfer their anatomical, physiological, and pathological knowledge into clinical reasoning contexts [1, 6].

An essential pedagogical factor in this process is the instructor's role as a facilitator of reasoning, rather than a transmitter of information. By guiding students through structured questioning, prompting reflection, and encouraging differential diagnosis formulation, educators create a learning environment that supports the internalization of clinical logic and judgment. Moreover, technologies that support peer collaboration—such as case-based forums and small-group digital discussions—enhance students' ability to verbalize and justify their clinical decisions [2, 5].

Assessment methods are also evolving to better measure clinical reasoning competency. Tools such as the Objective Structured Clinical Examination (OSCE), Script Concordance Tests (SCT), and digital case assessments allow for the evaluation of students' thought processes and their ability to apply knowledge in unfamiliar clinical contexts. These assessments, when aligned with technology-enhanced teaching methods, provide a feedback-rich environment that strengthens students' clinical cognition [4].

In conclusion, the integration of pedagogical and technological innovations in medical education provides a powerful means for developing clinical reasoning competency among students. Simulation technologies, problem-based approaches, and digital platforms work synergistically to foster critical thinking, diagnostic accuracy, and decision-making under uncertainty. Therefore, universities must adopt a strategic, evidence-informed model that embeds these technologies into the medical curriculum to better prepare future physicians for real-world clinical challenges

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