EFFECTIVENESS OF USING SIMULATORS IN DEVELOPING CLINICAL PRACTICAL SKILLS IN TEACHING INTERNAL DISEASES

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Abstract

The modernization of medical education requires the introduction of innovative pedagogical technologies aimed at improving the quality of professional training of future physicians. One of the most effective approaches in teaching internal diseases is the use of simulation technologies, which provide opportunities for safe and repetitive practice of clinical skills in conditions close to real clinical situations. This review article analyzes the role of simulators in the development of clinical practical competencies among medical students studying internal diseases. The advantages of simulation-based education, including the formation of diagnostic thinking, improvement of communication skills, enhancement of clinical decision-making, and reduction of medical errors, are discussed. Special attention is paid to the effectiveness of high-fidelity simulators, standardized patients, virtual technologies, and hybrid simulation methods in teaching therapeutic disciplines.

Keywords: internal diseases, simulation training, clinical skills, medical education, simulators, practical competencies, standardized patients, therapeutic disciplines, clinical thinking, simulation technologies.

Introduction. The rapid development of modern medicine and increasing requirements for the quality of healthcare services necessitate continuous improvement of medical education systems. Traditional methods of teaching

internal diseases often fail to provide sufficient opportunities for students to repeatedly practice clinical manipulations and decision-making skills in a safe environment. In this regard, simulation technologies have become one of the leading innovative approaches in medical education.Simulation-based learning allows students to acquire and improve practical skills without risk to patient safety. The use of mannequins, computerized simulators, standardized patients, and virtual reality systems creates realistic clinical scenarios that facilitate the development of professional competencies. According to Bradley, simulation education enhances experiential learning and bridges the gap between theoretical knowledge and clinical practice [1].

The Role of Simulation Technologies in Medical Education. Simulation technologies are educational tools that imitate real clinical situations to train healthcare professionals. They can vary from simple anatomical models to highly sophisticated computer-controlled patient simulators.

Modern simulation education includes: low-fidelity simulators; high-fidelity patient simulators; standardized patients; virtual simulation platforms; hybrid simulation methods.

High-fidelity simulators can reproduce physiological parameters such as pulse, blood pressure, respiratory sounds, and electrocardiographic changes. This enables students to practice diagnostic and therapeutic interventions in realistic conditions [2]. The use of standardized patients also plays a crucial role in teaching communication skills and clinical interviewing. Barrows emphasized that standardized patients improve students' interpersonal competencies and patient-centered communication [3].

Advantages of Simulation-Based Teaching in Internal Diseases

Improvement of Clinical Competence. Simulation training significantly contributes to the development of practical clinical skills. Students can

repeatedly perform procedures such as auscultation, percussion, venipuncture, electrocardiography interpretation, and cardiopulmonary resuscitation without fear of harming patients.

Repeated practice increases students' confidence and helps develop automated professional actions. McGaghie et al. reported that deliberate practice using simulation improves long-term retention of clinical skills [4].

Development of Clinical Thinking. Simulation scenarios stimulate analytical and diagnostic thinking. During simulated cases, students learn to collect patient history, interpret laboratory and instrumental data, formulate differential diagnoses, and select appropriate treatment strategies. Simulation-based education promotes active learning and critical thinking, which are essential for future internists. Through realistic clinical situations, students develop decision-making abilities under stressful conditions.

Patient Safety Enhancement. One of the main benefits of simulation technologies is the reduction of medical errors. Students acquire practical experience before encountering real patients, thereby minimizing risks associated with inadequate preparation. The World Health Organization emphasizes that simulation education contributes to patient safety by improving healthcare workers' competencies and teamwork skills [5].

Formation of Communication Skills. Internal medicine specialists must possess strong communication abilities. Simulation training involving standardized patients helps students improve empathy, professionalism, ethical behavior, and patient counseling techniques.

Types of Simulators Used in Teaching Internal Diseases

Low-Fidelity Simulators. These simulators are primarily used for mastering basic procedural skills such as injections, catheterization, and physical

examination techniques. They are affordable and widely available in medical institutions.

High-Fidelity Simulators. High-fidelity simulators imitate complex physiological responses and emergency conditions. They are especially useful in teaching acute cardiovascular, respiratory, and metabolic disorders commonly encountered in internal medicine.

Studies indicate that high-fidelity simulation improves students' clinical performance and confidence levels [6].

Virtual Reality and Digital Simulation. Recent advances in digital technologies have introduced virtual patients and immersive learning environments. Virtual simulation enables remote education and individualized learning pathways. Virtual reality technologies are increasingly integrated into therapeutic education due to their accessibility and ability to reproduce rare clinical cases.

Challenges of Simulation Education. Despite numerous advantages, simulation-based education also has several limitations: high financial costs of advanced simulators; need for trained instructors; technical maintenance requirements; limited availability in some educational institutions;

Difficulty in fully reproducing emotional aspects of real clinical encounters. Nevertheless, continuous technological development and institutional support are gradually overcoming these barriers.

Institutions in the United States, Canada, the United Kingdom, and European countries have established specialized simulation centers for clinical education. Research by Issenberg et al. demonstrated that simulation-based learning is superior to traditional teaching methods in acquiring complex clinical skills [7]. Modern accreditation systems in medical education increasingly require simulation-based competency assessment.

Conclusion. Simulation-based education represents an effective and innovative approach to teaching internal diseases. The use of simulators significantly improves students' practical skills, clinical thinking, communication abilities, and professional confidence. Simulation technologies provide safe and controlled learning environments that enhance patient safety and reduce medical errors.

The integration of simulation methods into medical curricula contributes to the modernization of medical education and the preparation of highly qualified healthcare professionals. Continuous development of simulation centers and educational technologies will further strengthen the quality of clinical training in therapeutic disciplines.

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