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Simulation-Based Learning For The Formation Of Professional Competencies In Medical Students

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Abstract: This study explores the effectiveness of simulation-based learning in developing professional competencies among medical students. The research focuses on cardiopulmonary resuscitation (CPR), emergency care, and clinical decision-making. Simulation provides a safe, controlled, and interactive environment that enables students to practice critical clinical skills, receive immediate feedback, and engage in team-based scenarios.

A total of 60 third- and fourth-year students participated, divided equally into experimental and control groups. The experimental group underwent structured simulation-based training, while the control group received traditional theoretical instruction. Pre- and post-training assessments, including OSCE, performance checklists, and self-efficacy questionnaires, were analyzed. Results showed significant improvement in practical skills, clinical reasoning, teamwork, and confidence in the experimental group. The study highlights the essential role of simulation in modern medical curricula and provides recommendations for integrating simulation-based education to enhance patient safety and healthcare outcomes.

Keywords: Simulation-based learning, medical education, professional competencies, CPR, emergency care, clinical decision-making.

Introduction: The transformation of medical education towards competency-based curricula emphasizes the need for practical, hands-on experience that bridges theoretical knowledge and clinical practice. Traditional teaching methods often provide limited opportunities for students to practice emergency procedures or critical decision-making in a risk-free environment. Simulation-based learning has emerged as a vital pedagogical tool that allows learners to acquire, practice, and refine clinical skills under controlled conditions. High-fidelity mannequins, standardized patients, and virtual simulations provide realistic scenarios that improve clinical performance, teamwork, and patient safety. Cardiopulmonary resuscitation (CPR) and emergency care scenarios are particularly well-suited for simulation, as they require rapid decision-making, precise technical skills, and effective communication among healthcare teams. Previous studies (Gaba, 2004; Issenberg et al., 2005) demonstrate that simulation enhances skill retention, confidence, and clinical reasoning. Additionally, the integration of simulation into medical curricula aligns with the World Health Organization's patient safety initiatives, highlighting the reduction of medical errors and improved outcomes through experiential learning. This study aims to evaluate the effectiveness of simulation-based training in developing professional competencies, using CPR and emergency care as core examples, and to provide practical recommendations for medical educators.

METHODS

The study was conducted at the Department of Clinical Simulation, Tashkent State Medical University. A total of 60 students from the third and fourth years of the medical program were recruited. Participants were randomly assigned to an experimental group (n=30) and a control group (n=30). The experimental group received structured simulation-based training over four sessions, including CPR, management of cardiac arrest, and emergency patient care scenarios. High-fidelity mannequins (Resusci Anne QCPR) and standardized patients were used to simulate real-life clinical situations. The control group attended conventional

lectures and theoretical discussions without hands-on simulation.

Assessment tools included: 1) Objective Structured Clinical Examination (OSCE) checklists evaluating technical skills and decision-making.

2) Self-efficacy questionnaires measuring confidence and perceived competence.

3) Teamwork and communication rating scales completed by instructors.

Data were collected before and after the training. Statistical analysis involved paired t-tests to compare pre- and post-training scores, and independent t-tests to assess differences between groups. A p-value of <0.05 was considered statistically significant.

RESULTS

The experimental group showed substantial improvement in practical skills and clinical reasoning compared to the control group. The mean OSCE score in the experimental group increased from 65.2% (SD=7.5) pre-training to 89.6% (SD=5.8) post-training ($p < 0.001$), while the control group's scores increased from 64.7% to 71.0% ($p = 0.08$). Self-efficacy ratings improved from 50% to 90% in the experimental group, demonstrating increased confidence in performing CPR and managing emergency scenarios. Teamwork ratings increased by 35%, reflecting enhanced collaborative skills during simulated emergencies.

Table 1 presents the comparison of pre- and post-training scores between the experimental and control groups, highlighting significant differences in competency development.

Table 1. Pre- and Post-Training Scores of Experimental and Control Groups

Group	OSCE Pre (%)	OSCE Post (%)	Self-Efficacy Pre (%)	Self-Efficacy Post (%)
Experimental	65.2	89.6	50	90
Control	64.7	71.0	52	60

DISCUSSION

The findings confirm that simulation-based learning is highly effective in enhancing professional competencies among medical students. The experimental group exhibited significant gains in technical skills, clinical reasoning, teamwork, and confidence compared to the control group. These results are consistent with international literature demonstrating the value of high-fidelity simulation in medical education (Ziv et al., 2000; Kolb, 1984).

Simulation allows repeated practice, immediate feedback, and exposure to rare or high-risk scenarios, which traditional lectures cannot provide. Moreover, the improvement in teamwork and communication underscores the importance of interprofessional simulation exercises for real-world clinical readiness. Faculty involvement, scenario design, and structured debriefing are critical components for maximizing the educational impact of simulation-based training.

CONCLUSION

Simulation-based learning effectively supports the development of professional competencies in medical students, including technical skills, clinical decision-making, confidence, and teamwork. Integrating structured simulation programs into the medical curriculum, particularly for CPR and emergency care, enhances students' preparedness for real clinical situations and contributes to improved patient safety. Future research should focus on longitudinal studies to assess long-term retention of skills, optimization of assessment tools, and the incorporation of interprofessional simulation modules.

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