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EFFECTIVENESS OF SIMULATION-BASED TRAINING IN DEVELOPING CLINICAL COMPETENCIES OF MID-LEVEL MEDICAL PERSONNEL: A QUASI-EXPERIMENTAL STUDY

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ABSTRACT. This study investigated the effectiveness of simulation-based training in developing clinical competencies among mid-level medical personnel, utilizing both quantitative and qualitative methodologies. The sample comprised 150 participants. Changes in clinical reasoning, practical skills, and communication competencies were evaluated using statistical analyses, including percentage analysis, mean values, and pre-test/post-test comparisons. The findings revealed a statistically significant advantage of simulation-based training over traditional teaching methods ($p < 0.05$).

Keywords: simulation-based training, clinical competence, OSCE, skills development, statistical analysis.

INTRODUCTION. The development of clinical competencies is a strategic priority in contemporary healthcare systems. The World Health Organization reports that a substantial proportion of medical errors result from inadequate clinical training. Consequently, simulation-based training is widely regarded as a "gold standard" in medical education [3]. This approach allows for the replication of authentic clinical scenarios within a controlled and safe environment, thereby facilitating the comprehensive development of clinical decision-making, practical skills, and communication competencies among mid-level medical personnel [4].

METHODS. This study employed a quasi-experimental pre-test and post-test design within a quantitative research framework. The aim was to evaluate the impact of simulation-based training on the clinical competencies of mid-level medical personnel. The study was conducted from January to April 2026 at the Guliston branch of the Republican Center for the Professional Development and Specialization of Mid-Level Medical and Pharmaceutical Personnel. The study population consisted of approximately 150–190 trainees per month, from which a total of 150 participants were selected using purposive and consecutive sampling techniques. Participants were actively practicing healthcare professionals enrolled in continuing education programs and were recruited on a voluntary basis. The educational intervention was designed and implemented according to the principles of the Jeffries Simulation Theory.

RESULTS. The results regarding the clinical competencies of mid-level medical personnel were analyzed based on pre-test and post-test data. The overall clinical competence index increased from 61.2 ± 6.4 to 87.6 ± 5.0, indicating a mean improvement of 26.4 points (approximately 43.1%). The observed differences between the pre-test and post-test results were statistically significant in all competency components ($p < 0.05$).

Table 1.1. Results by clinical competencies (pre-test and post-test).

№	Indicator	Pre-test	Post-test	Growth
1	Clinical reasoning	62%	80%	+18 % percentage points
2	Practical clinical skills	58%	85%	+27 %

				percentage points
3	Communication competence	60%	88%	+28 % percentage points

Table 1.2. Overall Clinical Competency Index (pre-test and post-test).

№	Indicator	Pre-test (Mean ± SD)	Post-test (Mean ± SD)	Growth
1	Overall clinical competence index	61.2 ± 6.4	87.6 ± 5.0	+26.4 (≈43.1%)

The study results demonstrated significant positive changes in clinical competencies. Comparison of pre-test and post-test scores showed that clinical reasoning increased from 62% to 80% (+18 percentage points), practical clinical skills from 58% to 85% (+27 percentage points), and communicative competence from 60% to 88% (+28 percentage points). These improvements indicate that the educational intervention was effective in developing all core clinical competencies among the participants (Figure 1).

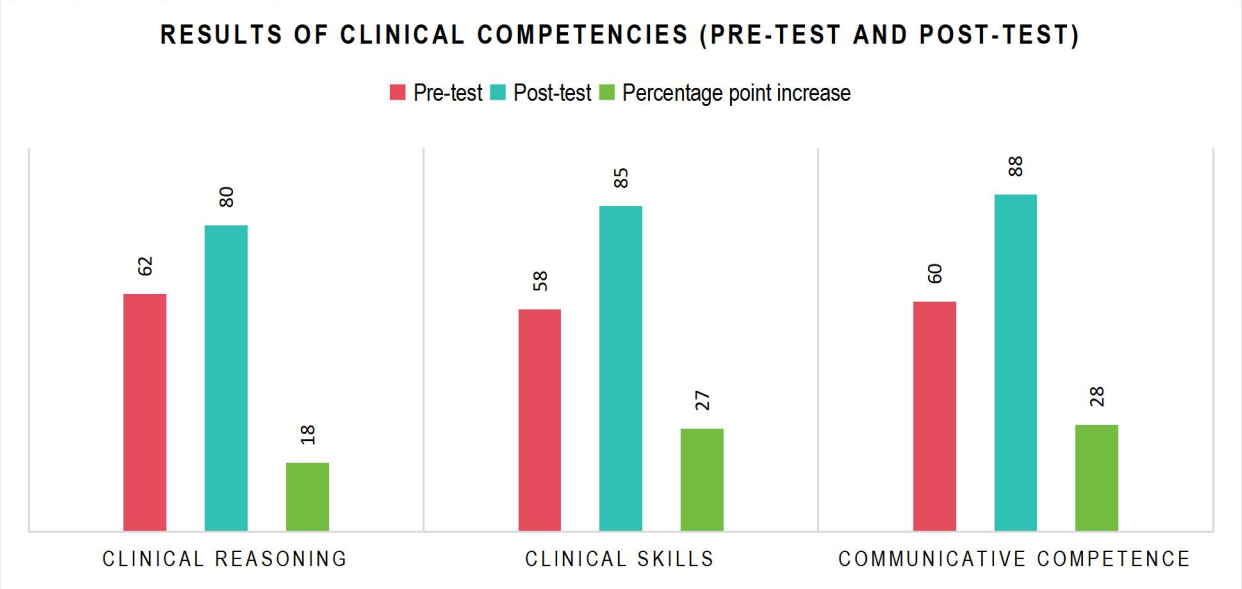


Figure 1. Results of Clinical Competencies (Pre-test and Post-test).

Table 2. OSCE results (Objective Structured Clinical Examination).

№	Indicator	Pre-test	Post-test	Difference
1	OSCE score	61 %	87 %	+26 percentage points (42.6 % increase)

The results also demonstrated a significant positive trend in OSCE assessment scores. The mean score increased from 61% in the pre-test to 87% in the post-test, representing an improvement of 26 percentage points. In relative terms, this corresponds to a 42.6% increase. These

findings confirm that the educational intervention aimed at developing and assessing practical clinical competencies significantly enhanced participants' readiness for clinical practice (Figure 2).

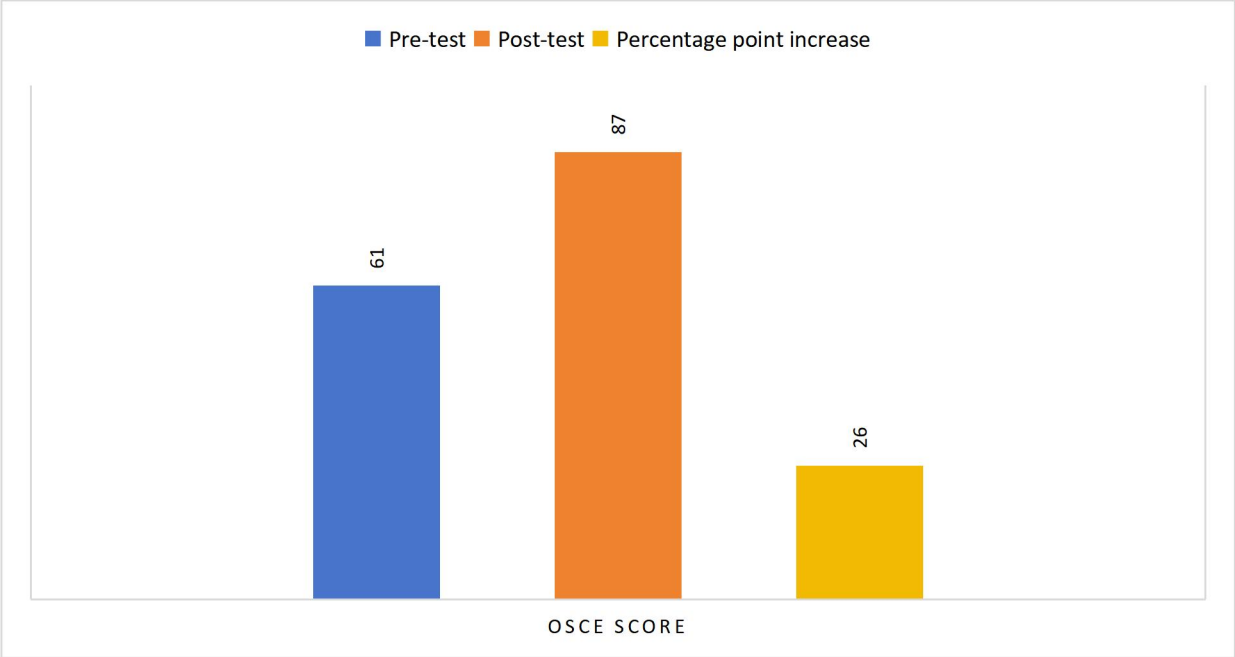


Figure 2. OSCE score

Table 3. Statistical analysis.

№	Indicator	Value
1	Effect size (Cohen's d)	1.25
2	Statistical significance	$p < 0.001$
3	Confidence level	95% CI

The effectiveness of a pedagogical intervention aimed at developing clinical competencies among mid-level medical personnel was evaluated through statistical analysis. The results revealed significant positive changes in clinical competencies following the intervention. The effect size (Cohen's $d = 1.25$) indicated a large practical effect. The differences were highly statistically significant ($p < 0.001$), confirming that the observed improvements were unlikely to be due to chance and leading to the rejection of the null hypothesis. Furthermore, the 95% confidence interval supported the stability and reliability of the findings and suggested their potential generalizability to a broader population. Overall, the results demonstrate that the pedagogical intervention is both statistically and practically effective in enhancing the clinical competencies of mid-level medical personnel (Figure 3).

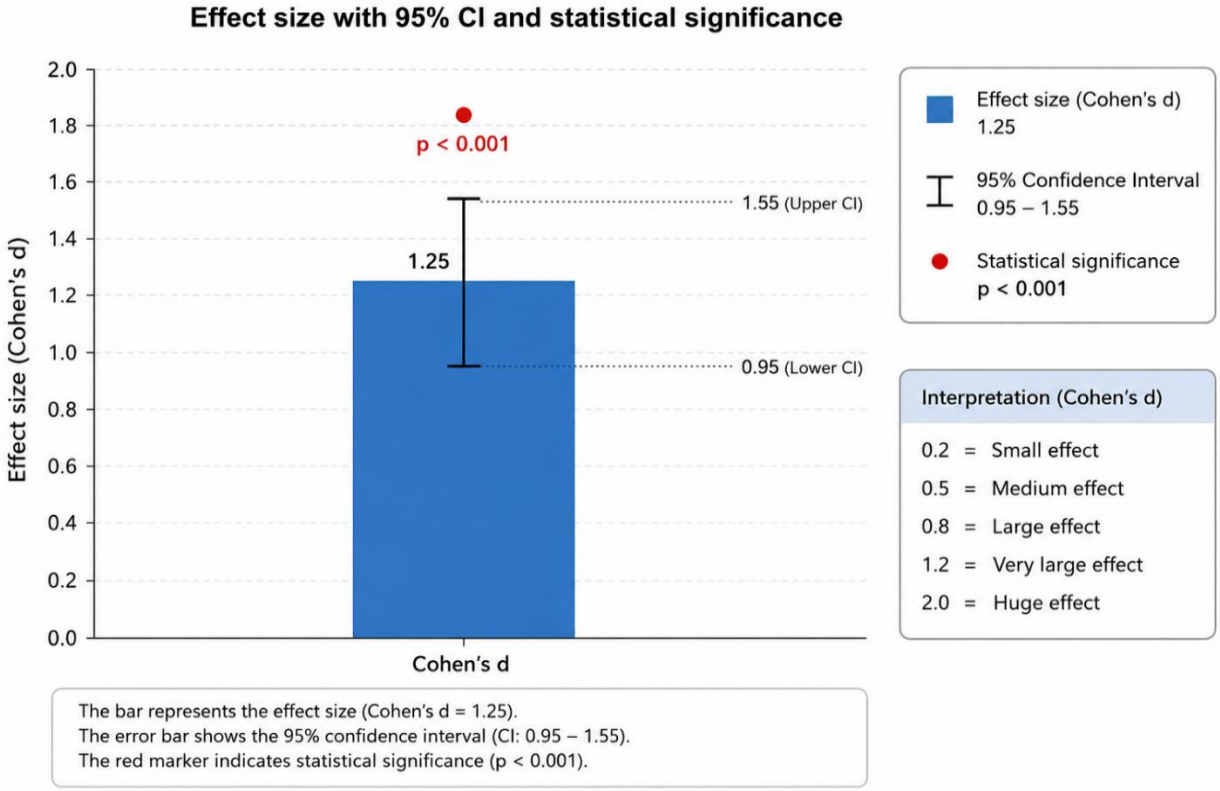


Figure 3. Statistical analysis.

DISCUSSION. The findings of this study indicate that simulation-based training is highly effective in developing clinical competencies among mid-level medical personnel. The results demonstrated significant improvements in the clinical competence index, practical skills, and communication competencies. In particular, the 42.6% increase in OSCE scores highlights the important role of simulation-based approaches in enhancing clinical preparedness. This positive development in clinical competencies can be explained by several pedagogical factors. First, simulation-based education provides a learning environment that closely replicates real clinical situations [2]. This facilitates the integration of theoretical knowledge with practical application and supports the development of clinical reasoning skills [5]. According to INACSL standards, debriefing is a critical component of simulation-based education [3]. It enables participants to reflect on their performance, identify errors, and make necessary improvements. Such a reflective process strengthens clinical thinking and transforms learning into an active and analytical process [6]. The structured implementation of simulation training based on the Jeffries Simulation Theory also plays a key role [4]. This model ensures alignment between learning objectives, instructional design, the learning environment, and expected outcomes. Evidence from meta-analyses further confirms the effectiveness of simulation-based training in significantly improving clinical competencies [1]. In addition, McGaghie and colleagues emphasize that simulation-based deliberate practice is more effective in developing clinical skills than traditional educational methods [5]. In the present study, the significant improvement in OSCE performance suggests that participants' ability to make evidence-based clinical decisions was enhanced [7]. The literature also supports simulation-based education as an effective pedagogical strategy for strengthening clinical decision-making processes [7]. Improvements in practical clinical skills further demonstrate the

effectiveness of simulation-based training in developing technical competencies. Through repeated practice in a safe and controlled environment, participants were able to refine their skills and reduce the likelihood of clinical errors [1,5]. The observed increase in communication competencies is particularly significant, as effective communication and teamwork are essential components of modern healthcare practice [6]. The debriefing process also serves as a key reflective mechanism in strengthening these competencies. Overall, the findings confirm that simulation-based education is a highly effective pedagogical approach for the comprehensive development of clinical competencies. It not only enhances knowledge and skills but also integrates clinical reasoning, decision-making, and communication abilities into a unified competency framework [4]. Therefore, the broader implementation of simulation-based education within continuing professional development systems represents an important pedagogical priority.

CONCLUSION. This study demonstrated that simulation-based training is effective in developing clinical competencies among mid-level medical personnel. The results confirmed significant positive improvements in clinical reasoning, practical skills, and communication competencies. The substantial increase in the overall clinical competence index and OSCE scores indicates that the simulation-based approach is an important pedagogical tool for enhancing clinical preparedness ($p < 0.001$). Therefore, the broader implementation of simulation-based training within continuing professional development systems is expected to contribute to the improvement of clinical competencies and the overall quality of healthcare services.

FOYDALANILGAN ADABIYOTLAR

1. Cook D.A., Hatala R., Brydges R., et al. Technology-enhanced simulation for health professions education: a systematic review and meta-analysis. *JAMA*. 2011;306(9):978–988.
2. Issenberg S.B., McGaghie W.C., Petrusa E.R., et al. Features and uses of high-fidelity medical simulations that lead to effective learning: a BEME systematic review. *Medical Teacher*. 2005;27(1):10–28.
3. INACSL Standards Committee. Healthcare Simulation Standards of Best Practice. *Clinical Simulation in Nursing*. 2021.
4. Jeffries P.R. “Simulation in Nursing Education: From Conceptualization to Evaluation”. NLN; 2016.
5. McGaghie W.C., Issenberg S.B., Cohen E.R., et al. Simulation-based medical education with deliberate practice. *Academic Medicine*. 2011;86(11):1365–1372.
6. Zigmont J.J., Kappus L.J., Sudikoff S.N. The essential debriefing skills of simulation instructors. *J Contin Educ Health Prof*. 2011;31(1):52–58.
7. Motola I., Devine L.A., Chung H.S., et al. Simulation in healthcare education: a best evidence practical guide. *Medical Teacher*. 2013;35(10):e1511–e1530.