

Effectiveness of Simulation-Based Learning on Clinical Competency among Undergraduate Nursing Students: A Quasi-Experimental Study

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Abstract—Clinical competency is a critical outcome of undergraduate nursing education. Traditional clinical placements alone often provide limited opportunities for deliberate practice of high-risk procedures. This quasi-experimental study examined the effectiveness of high-fidelity simulation-based learning (SBL) integrated with conventional clinical training on the clinical competency of final-year Bachelor of Science in Nursing (B.Sc. Nursing) students. A total of 120 students from two nursing colleges were assigned to either an experimental group (n = 60) that received structured SBL sessions in addition to routine clinical posting or a control group (n = 60) that received routine clinical posting only. Clinical competency was measured using a validated Objective Structured Clinical Examination (OSCE) checklist and a self-efficacy scale before and after the intervention. Results indicated a statistically significant improvement in mean OSCE scores in the experimental group (pre-test: 52.4 ± 8.1 ; post-test: 78.6 ± 7.3 ; $p < 0.001$) compared with the control group (pre-test: 51.9 ± 7.8 ; post-test: 61.2 ± 8.5 ; $p < 0.001$). Self-efficacy scores also improved significantly in the experimental group. The findings support the integration of structured high-fidelity simulation into undergraduate nursing curricula to enhance clinical competency and student confidence before real-world practice.

Index Terms—Clinical competency, high-fidelity simulation, nursing education, Objective Structured Clinical Examination, self-efficacy, undergraduate nursing students

I. INTRODUCTION

Nursing education aims to prepare graduates who can deliver safe, evidence-based, and patient-centered care in complex clinical environments. Clinical

competency—encompassing knowledge, psychomotor skills, clinical judgment, and professional attitudes—is therefore a primary educational outcome. However, traditional clinical placements face increasing constraints, including limited patient availability, shorter hospital stays, higher patient acuity, and ethical concerns about novice students practicing high-risk procedures on real patients.

Simulation-based learning (SBL) has emerged as a powerful pedagogical strategy that allows students to practice clinical skills in a controlled, risk-free environment. High-fidelity simulation, which uses computerized manikins capable of physiological responses, has been shown to improve knowledge retention, technical performance, and decision-making skills. Despite growing adoption in Indian nursing colleges, empirical evidence on the comparative effectiveness of structured SBL versus conventional clinical training alone remains limited in the local context.

This study was designed to evaluate the effectiveness of a structured high-fidelity simulation program, integrated with routine clinical postings, on the clinical competency and self-efficacy of final-year undergraduate nursing students. The research question guiding the study was: Does participation in structured high-fidelity simulation sessions significantly improve clinical competency scores and self-efficacy compared with conventional clinical training alone?

II. LITERATURE REVIEW

A substantial body of international research supports the use of simulation in nursing education. Studies have demonstrated that high-fidelity simulation improves performance on Objective Structured Clinical Examinations (OSCEs), enhances critical thinking, and reduces anxiety related to clinical practice. Meta-analyses indicate moderate to large effect sizes for skill acquisition when simulation is combined with deliberate practice and structured debriefing.

In the Indian context, several nursing colleges have introduced simulation laboratories, yet systematic evaluation of learning outcomes remains sparse. Prior studies have reported improvements in knowledge and selected procedural skills after simulation exposure; however, few have employed rigorous quasi-experimental designs with validated competency measures and adequate sample sizes. Self-efficacy, an important mediator of clinical performance, has also been under-examined in Indian nursing education research. The present study addresses these gaps by employing a controlled design, standardized OSCE assessment, and measurement of self-efficacy.

III. METHODOLOGY

A. Study Design and Setting

A quasi-experimental pre-test–post-test control group design was adopted. The study was conducted at two affiliated nursing colleges in Gandhinagar, Gujarat, India between February 2026 and July 2026. Both institutions offered a four-year B.Sc. Nursing program and maintained comparable clinical posting schedules.

B. Participants

Final-year B.Sc. Nursing students (N = 120) who had completed foundational clinical skills courses were recruited. Inclusion criteria were enrollment in the final year, willingness to participate, and no prior formal high-fidelity simulation training. Students with prior simulation exposure or incomplete attendance were excluded. Participants were assigned to the experimental group (College A, n = 60) or control group (College B, n = 60) based on institutional affiliation to avoid contamination of the intervention.

C. Intervention

The experimental group received six structured high-fidelity simulation sessions (each lasting 90–120 minutes) over eight weeks, in addition to their routine clinical postings. Scenarios focused on common acute care situations: management of a patient with acute respiratory distress, post-operative hemorrhage, hypoglycemic crisis, cardiac arrhythmia, septic shock, and medication error recovery. Each session followed the International Nursing Association for Clinical Simulation and Learning (INACSL) standards and included pre-briefing, scenario execution, and structured debriefing using the PEARLS framework. The control group continued with routine clinical postings without additional simulation.

D. Instruments

Clinical competency was assessed using a 25-item OSCE checklist covering assessment, intervention, communication, and safety domains (content validity index = 0.92; inter-rater reliability ICC = 0.88). Self-efficacy was measured with a 15-item Clinical Self-Efficacy Scale adapted for nursing students (Cronbach's α = 0.89). Demographic data were collected via a structured questionnaire.

E. Data Collection and Analysis

Pre-test assessments were conducted one week before the intervention; post-tests were administered within two weeks after completion of the simulation series. Data were analyzed using SPSS version 28. Independent t-tests and paired t-tests examined between-group and within-group differences. Effect sizes (Cohen's d) were calculated. Statistical significance was set at $p < 0.05$.

F. Ethical Considerations

Ethical approval was obtained from the Institutional Ethics Committees of both participating colleges. Written informed consent was obtained from all participants. Confidentiality was maintained, and students were assured that participation would not affect academic grades.

IV. RESULTS

Baseline characteristics of the two groups were comparable with respect to age (mean 21.4 ± 1.2 years), gender distribution (approximately 85%

female), and prior clinical exposure hours. No significant differences were found in pre-test OSCE or self-efficacy scores between groups ($p > 0.05$).

Post-intervention, the experimental group demonstrated a marked increase in mean OSCE scores from 52.4 ± 8.1 to 78.6 ± 7.3 (paired $t = 24.7$, $p < 0.001$, Cohen's $d = 3.41$). The control group showed a smaller but statistically significant improvement from 51.9 ± 7.8 to 61.2 ± 8.5 (paired $t = 9.8$, $p < 0.001$, Cohen's $d = 1.14$). The between-group difference in post-test scores was highly significant (independent $t = 12.1$, $p < 0.001$).

Self-efficacy scores followed a similar pattern. The experimental group improved from a mean of 48.3 ± 6.9 to 71.5 ± 7.1 ($p < 0.001$), while the control group improved from 47.8 ± 7.2 to 55.4 ± 6.8 ($p < 0.01$). Domain-level analysis of OSCE performance indicated the largest gains in the experimental group for clinical judgment and safety-related behaviors.

V. DISCUSSION

The findings of this study provide robust evidence that structured high-fidelity simulation, when integrated with conventional clinical training, produces substantially greater gains in clinical competency than clinical training alone. The large effect size observed in the experimental group aligns with previous international meta-analyses and supports the transferability of simulation pedagogy to Indian nursing education settings.

Several factors may explain the superior outcomes. First, simulation offered repeated opportunities for deliberate practice of high-acuity scenarios that students rarely encounter during routine clinical postings. Second, structured debriefing facilitated reflective learning and identification of cognitive and technical gaps. Third, the psychological safety of the simulation environment likely reduced performance anxiety and encouraged active participation.

Improvements in self-efficacy are particularly noteworthy because self-efficacy beliefs influence willingness to engage in challenging clinical tasks and persistence in the face of difficulty. Enhanced confidence may therefore contribute to safer and more proactive clinical practice after graduation.

Limitations of the study include the non-randomized allocation of groups (necessitated by institutional constraints), the relatively short follow-up period, and

the use of a single post-test measurement. Future research should examine long-term retention of skills and the impact of simulation dose and fidelity level on learning outcomes across multiple institutions.

VI. CONCLUSION

Structured high-fidelity simulation-based learning significantly enhances clinical competency and self-efficacy among final-year undergraduate nursing students when added to conventional clinical training. Nursing educators and curriculum planners are encouraged to integrate regular, standards-based simulation experiences into the undergraduate program to better prepare graduates for the demands of contemporary clinical practice. Investment in simulation faculty development and infrastructure is recommended to sustain high-quality implementation.

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