



Assessing the Efficacy of Low-Fidelity Simulation: Hands-On Training for Basic Neonatal Resuscitation Among Nursing Officers

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Abstract: The objective of this study was to evaluate the efficacy of hands-on training using simulation-based techniques in basic neonatal resuscitation for nursing officers, employing a quasi-experimental pretest-posttest design. A non-probability purposive sampling method was utilized to select a sample of 39 nursing officers. The data analysis included both descriptive and inferential statistics, revealing a noteworthy improvement from the pretest assessment (33.2%) to the posttest assessment (75.38%). Sociodemographic data were collected to characterize the participants. The results of the paired t-test demonstrated a significant difference in the mean scores before ($M = 6.6$, $SD = 3.5$) and after ($M = 15.1$, $SD = 2.5$) the training intervention, with a p-value of less than .001, indicating a substantial enhancement in the participants' competency. These findings underscore the positive impact of the simulation-based training program on the nursing officers' proficiency in neonatal resuscitation. The study contributes to the understanding of simulation-based training effectiveness among nursing officers, underscoring the need for further research to explore diverse competencies and simulation methods in nurse training. A related systematic review on military nurses supports the efficacy of simulation-based interventions in enhancing various competencies. The conclusion emphasizes the necessity for additional research to expand the scope of simulation-based training for nurses and tailor methods to specific competency requirements.

Keywords: Low fidelity simulation , Hands on training, Nursing officers.

Background:

The significance of education in empowering nurses to identify and address clinical deterioration has been understood. simulation is progressively gaining traction as an instructional approach within both academic and clinical environments aimed at enhancing nurses' proficiency in identifying and effectively handling instances of clinical deterioration. This study is relevant in the present scenario as it quantitatively demonstrates the impactful efficacy of simulation-based education in enhancing the aptitude of healthcare professionals to identify and manage cases of clinical deterioration.¹

Simulation in nursing education offers a practical and safe environment for students to apply classroom knowledge to clinical scenarios. Despite initially appearing as an additional challenge for nursing students, understanding the pros and cons of simulation is crucial. Pros include a realistic setting, a safe learning environment, and the application of theoretical knowledge. Cons involve resource intensity, potential emotional impact, and time constraints. Success in simulations requires active participation, effective debriefing, collaboration, adaptability, and an awareness of various simulation types such as standardized patients, role-playing, high-fidelity and low-fidelity mannequins, unfolding case studies, partial-task simulators, virtual reality, and e-learning. Overall, navigating the complexities of simulation enhances a

nursing student's ability to seamlessly integrate theory into clinical practice.²

Simulation-Based Learning (SBL) is an essential and adaptable pedagogical approach in diverse clinical settings, ensuring effective trainee learning while prioritizing patient safety. This review, conducted until March 2021, assessed SBL's impact on cognitive, affective, and psychomotor learning domains. A comprehensive search across databases, including PubMed, Embase, Cochrane Library, and Clinical Trial Database, was undertaken. Two authors independently analyzed data from selected studies involving 364 nursing students, revealing the positive effects of SBL. The combined subgroup analysis demonstrated significant improvements in students' understanding, self-confidence, learning satisfaction, skill development, and proficiency in psychological care. Notably, the analysis indicated some heterogeneity ($I^2 = 54\% - 86\%$). Overall, the study's findings strongly support simulation as an effective teaching method for enhancing cognitive, affective, and psychomotor skills in nursing education.³

A study addressed the dearth of documentation on the impact of simulation-based training on obstetric management in low and middle-income countries. The research aimed to assess the efficacy of a low-fidelity simulation-based training intervention in enhancing nurses' knowledge and skills in Active Management of the Third Stage of Labor (AMTSL). The quasi-experimental study

involved 172 randomly selected nurses, conducting baseline, immediate, and retention assessments. The results demonstrated a substantial improvement in overall knowledge and skills related to AMTSL following simulation training. Importantly, the acquired skills were retained even after six months. The study concludes that the low-fidelity simulation intervention positively and sustainably impacted the knowledge and skills of nurses in AMTSL.⁴

A significant challenge in nursing education globally is the lack of seamless integration between theoretical knowledge and practical application. Nursing students consistently face difficulties in translating theoretical concepts into practical skills. This issue of a gap between theory and practice is widespread and impacts nursing education on an international level.⁵

Review Literature:

This study systematically reviews the effectiveness of medium to high-fidelity simulation using manikins in nursing education compared to other educational strategies. Although human simulation is endorsed in nursing curricula as a safe clinical practice replication, its overall efficacy remains uncertain. The review, spanning studies from 1999 to January 2009, utilized databases such as CINAHL Plus, ERIC, Embase, Medline, SCOPUS, ProQuest, and ProQuest Dissertation and Theses Database, focusing on 'simulation' and 'human simulation.' Twelve studies with experimental or quasi-experimental designs confirmed simulation as a valid teaching/learning strategy. Six of these studies demonstrated additional benefits in knowledge, critical thinking, satisfaction, or confidence compared to control groups (range 7–11%). However, variations in study design and assessment methods affected result validity and reliability. The conclusion highlights the efficacy of medium to high-fidelity simulation with manikins when following best practice guidelines, potentially offering advantages over other teaching methods in specific contexts. The article recommends further research, particularly exploring the impact of team size on learning and establishing a universal outcome measurement method.⁶

This study explored student and faculty perceptions regarding the use of the Laerdal™ SimMan™ Universal Patient Simulator in simulated clinical scenarios. Baccalaureate program students, engaged in clinical simulation activities over two consecutive semesters, were surveyed using a 20-item tool on a 4-point Likert scale. Four faculty members were also surveyed with a 17-item tool using the same response scale. Survey items addressed realism, scenario pace, skill transferability to clinical settings, and perceived value of simulated experiences. Descriptive statistics revealed that most students and faculty found the simulations realistic and valuable. However, only about half of the students believed in the transferability of skills to real clinical settings, contrasting with the unanimous view of the faculty. Faculty members indicated that implementing simulated scenarios demanded additional time and resources.⁷

This study aimed to evaluate the efficacy of technology-enhanced simulation training in health professions education by comparing outcomes with no intervention. A systematic search across various databases and sources identified 609 eligible studies involving 35,226 trainees. The pooled effect sizes, analyzed using random effects, indicated significant positive impacts of simulation training on knowledge outcomes (1.20, 95% CI 1.04-1.35), time skills (1.14, 95% CI 1.03-1.25), process skills (1.09, 95% CI 1.03-1.16), and product skills (1.18, 95% CI 0.98-1.37). Furthermore, moderate effects were observed for patient-related outcomes (0.50, 95% CI 0.34-0.66). Subgroup analyses did not reveal consistent statistically significant interactions between simulation training and instructional design features or study quality. In summary, technology-enhanced simulation training consistently demonstrated positive effects on knowledge, skills, and behaviors in health professions education, with moderate effects on patient-related outcomes when compared to no intervention.⁸

This study explored nurse educators' beliefs regarding the indirect teaching of caring, emphasizing that students acquire these values through faculty role-modeling and interactions. The objective was to investigate whether nursing students perceive learning caring behaviors through faculty role-modeling and to explore additional avenues for learning about caring. To address the unpredictable nature of faculty opportunities to demonstrate caring in clinical settings, a simulated patient care scenario, featuring professional actors, was presented to 137 BSN and ADN students through a videotaped scenario. Students then shared their perceptions on caring through a researcher-created two-page open-ended questionnaire. The findings confirmed that students learn about caring from faculty role-modeling and encounters with healthcare staff, often in paradoxical ways. The research approach also uncovered unexpected and intriguing results.⁹

Aim: To Assess hands-on training on simulation-based basic neonatal resuscitation among nursing officers

Methodology:

This study employed a quantitative approach with a quasi-experimental pretest-posttest design. The sample included 39 participants selected through non-probability purposive sampling. Ethical committee approval was obtained, and all participants provided informed consent. The assessment tool was a modified checklist, incorporating elements from the Navjat Shishu Suraksha Karyakram (NSSK) and National Neonatal Forum (NNF) modules, along with selected demographic data. A low-fidelity simulator was utilized in the simulation. To ensure reliability, the test-retest method was employed, demonstrating a high level of reliability.

Institutional permission was secured before the commencement of data collection and the data collection period spanned from October 4th to November 6th, 2021. Demographic data were collected initially, followed by a pretest. Subsequently, participants underwent simulation training, and a post-test was administered after 15 days of the training.

Results:**Table: 1 Demographic data with frequency and percentage****N=39**

Demographic Characteristics		Frequency (f)	Percentage (%)
Age in Years	Less than 25	16	41.02
	26 to 30	12	30.76
	31 to 35	6	15.38
	More than 35	5	12.82
Educational Qualification	B.Sc. Nursing	28	71.79
	General Nursing and Midwifery	8	20.51
	Post Basic B.Sc. Nursing	3	7.69
Work Experience in Labour room	Less than 5 years	22	56.41
	5 to 10 years	5	12.82
	More than 10 years	12	30.76
Number of deliveries conducted	Less than 25	22	56.41
	25 to 50	6	15.38
	More than 50	11	28.2
Working area	Tertiary health center (District Hospital)	14	35.89
	Community health center	5	12.82
	Primary health center	20	51.28
Any training session attended concerning Neonatal care/Neonatal resuscitation	Yes	8	20.51
	No	31	79.48

As illustrated in the table, the majority (41.02%) of nursing officers are in the age group under 25 years. The predominant educational qualification is a B.Sc. Nursing, with 71.79% having completed this degree. A significant portion (56.41%) of nursing officers work in the labor room, and the same percentage have conducted less than 25 deliveries in their professional experience. Furthermore, a substantial majority (79.48%) have not undergone any Neonatal care or Neonatal resuscitation training.

Dr. Patricia Benner, a renowned nursing theorist, is credited with originating a model delineating the stages of clinical competence in her seminal work, "From Novice to Expert: Excellence and Power in Clinical Nursing Practice." Her model stands as a valuable framework for evaluating nurses' requirements at various points in their professional development.¹⁰

Stage 1 - Novice: Typically, a nursing student in the beginning year of clinical education, displays limited and inflexible behavior in the clinical setting.

Stage 2 - Beginner: Encompasses new graduates in their initial jobs, where nurses have gained more experience in recognizing recurring, meaningful components of a situation. They possess knowledge and know-how but lack extensive experience.

Stage 3 - Competent: Nurses in this stage may lack the speed and flexibility of proficient counterparts but exhibit mastery, relying on advanced planning and organizational skills.

Stage 4 - Proficient: Nurses at this level can perceive situations as wholes rather than parts. They learn from experience about common occurrences and can adapt plans based on varying events.

Stage 5 - Expert: Nurses in this stage can recognize demands and resources in situations, effectively achieving their goals.

In the current study, stage 5 was not used. The current study has used Banner's model among the nurses.

The integration of individualized nursing care, a pivotal factor in determining the quality of nursing care, is essential in both nursing education and practice. Benner's novice-to-expert model stands as a guiding framework for nurses, providing a theoretical foundation for care practices. This article aims to emphasize the importance of acknowledging Benner's Novice to Expert Model as a valuable strategy for nurses to enhance their perceptions and practices of individualized care. Through this exploration, the article seeks to contribute to a more profound understanding of discipline-specific studies in nursing.¹¹

Benner's stages of clinical competence were used to decide the stages of clinical competence of Nursing officers. It was identified that none of them were proficient in demonstrating skills in neonatal resuscitation. But in the post-test, it was revealed that 21 out of 39 (53.84%) were in the proficient category.

Table: 2 Benner's Stages of Clinical Competence

Pre and Post-test	Novice	Beginner	Competent	Proficient	Total
	0 to 5	6 to 10	11 to 15	16 to 20	
Pre-test	17	18	4	0	39
Post-test	1	1	16	21	39

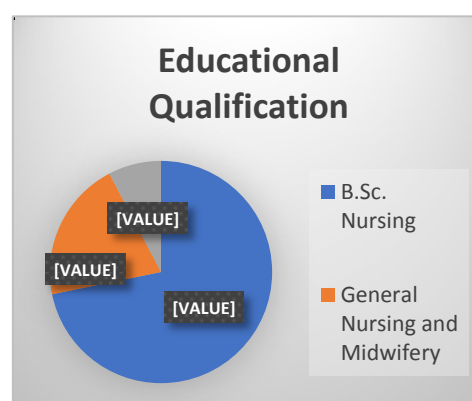
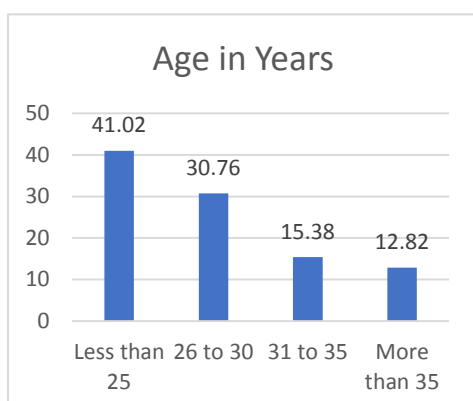
The study utilized descriptive and inferential statistics to analyze data based on its objectives. Demographic data were presented using frequency and percentage. For the Pre-test and Post-test, the Mean and standard deviation were 6.6410 ± 3.51304 and 15.0769 ± 2.50667 , respectively. The median and interquartile range for the Pre-test and Post-test were found to be 7(9) and 16(17), respectively. Given the unequal distribution of data (Pre-test: 0.572, Post-test: 0.000), the non-parametric Wilcoxon Signed Ranks test was employed at a 0.05 level of significance to evaluate the effectiveness of simulation-based hands-on training in neonatal resuscitation between the Pre-test and Post-test. The calculated score of $z = -5.458$ indicates a significant improvement in competence following the utilization of simulation-based hands-on training.

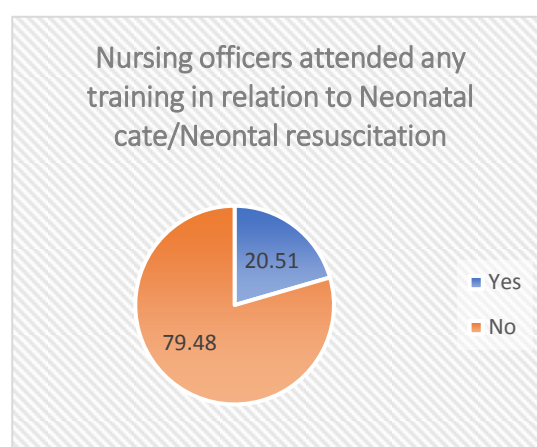
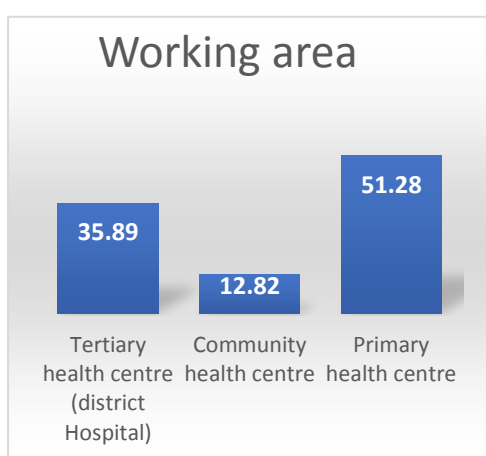
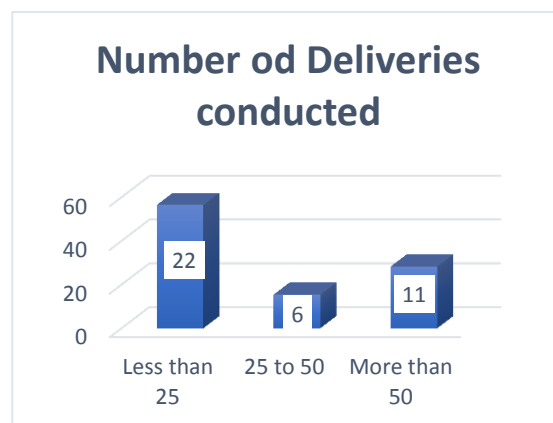
Table: 3: Association between demographic data and competency score

Demographic Characteristics		Competency			Total	χ^2	Critical value	df	p-value
		Novice	Beginner	Competent					
Age in Years	Less than 25	4	12	0	16	7.879	12.59	6	0.2471
	26 to 30	7	3	2	12				
	31 to 35	3	2	1	6				
	More than 35	3	1	1	5				
		17	18	4	39				
Educational Qualification	B.Sc. Nursing	15	11	2	28	6.183	9.49	4	0.1858
	General Nursing and Post Basic	1	6	1	8				
	B.Sc. Nursing	1	1	1	3				
		17	18	4	39				
Work Experience in Labour room	Less than 5	10	10	2	22	2.28	9.49	4	0.684
	5 to 10 years	3	1	1	5				
	More than 10 years	4	7	1	12				
		17	18	4	39				
Number of Deliveries conducted	Less than 25	10	10	2	22	0.874	9.49	4	0.928
	25 to 50	3	2	1	6				
	More than 50	4	6	1	11				
		17	18	4	39				
Working area	Tertiary health centre (district Hospital)	8	4	2	14	6.187	9.49	4	0.185
	Community health centre	3	1	1	5				
	Primary health centre	6	13	1	20				
		17	18	4	39				
Any training session attended in relation to Neonatal care/Neonatal	Yes	5	1	2	8	5.428	5.99	2	0.066
	No	12	17	2	31				
		17	18	4	39				

*0.05

The Chi-square test was employed at a significance level of 0.05 to examine the association between competence scores and selected demographic variables. The analysis revealed no significant association between demographic variables and competence scores.





DISCUSSION

In this study, both descriptive and inferential statistics were used for analysis. The socio-demographic data showed that a considerable percentage (42.02%) of the participants were under 25 years of age, the majority (71.79%) held a B.Sc. in Nursing, and most (56.41%) had experience in the Labor room. Interestingly, the mean percentage of the pretest was 33.2%, while post-test it significantly increased to 75.38%. The paired-t test results indicated a substantial and significant difference between the pretest ($M = 6.6$, $SD = 3.5$) and post-test ($M = 15.1$, $SD = 2.5$), $t(38) = 19.3$, $p < .001$.

On a related note, a systematic review that focused on simulation-based training for the competency of military nurses was conducted. The review included studies carried out between 2008 and 2021. As per the findings, simulation-based interventions were quite effective in enhancing the competency of military nurses. This improvement included individual knowledge, skills, abilities, and critical thinking, as well as team communication and collaboration abilities. Overall, the review highlighted the efficacy of simulation-based training in both enhancing and maintaining the competency of military nurses.

Conclusion:

The current study on simulation-based training among nursing officers not only helps to improve their skills in neonatal

resuscitation but also helps the investigator to use other simulation-based training methods to inculcate competency among the nursing officers related to other procedures.

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