Effect of Simulation-Based Training on Nurses' Performance and Attitude regarding Pediatric Cardiopulmonary Resuscitation

1 Nagafa Hafez Farag Elmahdy, 2 Ohoud Youssef El-Sheikh, 3 Magda Ahmed Abd El Aziz, 4 Marwa Samy Elsaieed Elsheikh, 5 Marwa Mohamed Ouda

1Assistant Professor of Pediatric Nursing, Faculty of Nursing, Tanta University
2Assistant Professor of Pediatric Nursing, Faculty of Nursing, Mansoura University
3Assistant Professor of Pediatric Nursing, Faculty of Nursing, Mansoura University
4Assistant Professor, Psychiatric and Mental Health Nursing, Al-Rayan Private Colleges, College of Health Sciences and Nursing, Al-Madinah Al-Munawarah, Saudi Arabia
5Assistant Professor, Pediatric Nursing Department, Faculty of Nursing, Damanhur University, Egypt

Abstract

Background: Both survival rates and neurologic outcomes have been demonstrated to be improved by cardiopulmonary resuscitation that is started within minutes of the arrest beginning. Simulation-based education facilitates the integration of clinical practice and classroom instruction. It helps nurses become more competent before working with newborns in a real-world setting, which enhances care quality and guarantees the safety of the babies. **This study aimed to** evaluate the effect of simulation-based training on nurses' performance and attitude regarding pediatric cardiopulmonary resuscitation. **Method**: A quasi-experimental research design was used. **Setting**: The study was conducted in clinical pediatric laboratory skills, Faculty of Nursing affiliated to Sohag University Hospitals. **Subjects**: all nurses (50) who are working in the neonatal intensive care unit. **Tools for data collection: (1)** A structured interviewing questionnaire that was constructed by the researcher including two parts, **tool (2)** observational checklist, and (3) tool (3) attitude of pediatric nursing student's regarding cardiopulmonary resuscitation was used to collect data. **Results**: There was a highly statistically significant difference between the studied nurses' knowledge, practice, and attitude. The study result revealed that more than three quarters of studied nurses had a poor level of knowledge, and more than half of them had an unsatisfactory level of practice, and most of them had negative attitude about pediatric cardiopulmonary resuscitation before implementation of the simulation-based training. The vast majority of the studied nurses had a good level of knowledge and most of them had a satisfactory level of practice, and most of them had positive attitude after implementing simulation-based training**.** There was a highly statistically significant difference and improvement in nurses' performance and attitude after simulation-based training than pre-training. **Conclusion**: The present study concluded that simulation-based training had a positive effect on improving nurses' performance and attitude regarding pediatric cardiopulmonary resuscitation. **Recommendations**: The study recommended that simulation-based training should be integrated as an effective method in nurses' training about pediatric cardiopulmonary resuscitation.

Keywords: Nurses' Performance and attitude, Pediatric cardiopulmonary resuscitation, Simulation-based training.

Introduction:

Cardiopulmonary resuscitation (CPR), which is defined as the coordinated integration of rescue breathing, airway management, and chest compression-induced circulation, is a vital skill for all medical professionals, but especially nurses. When performed by a qualified and experienced individual, CPR can save a life **(Al Hadid & Suleiman, 2022).**

Rapidly initiating advanced life care and doing CPR and defibrillation within the first three to five minutes following CA can boost the survival rate by more than 50%. For every minute that defibrillation was delayed, the survival rate from cardiac arrest decreased by 7–10%. Children who experience cardiac arrest and receive high-quality CPR have a higher survival rate since the survival

rate is still poor due to ineffective CPR delivery. Additionally, timely CPR has a significant influence on better results. The quality of CPR in clinical settings is low because doctors and nurses lack resuscitation skills, which results in poor outcomes for children who are arrested **(Alshonee, 2024).**

The most frequent causes of cardiac arrest in children are respiratory distress and failure. Respiratory failure can result from any disorder that affects breathing and oxygenation. These comprise infections of the respiratory or extrapulmonary tract, obstruction of the upper or lower airways, tension pneumothorax, pulmonary edema, chest wall abnormalities, malfunction of the central nervous system (CNS), metabolic disorders, endocrine disorders, and hematologic disorders. Conditions include viral myocarditis, pericarditis, dysrhythmias, and congenital heart disease are most frequently linked to primary pediatric cardiac arrest (**Pacheco & Leetch, 2020).**

The term "simulation-based clinical training" in nursing refers to a range of activities that include pediatric patient simulators and involve not only handling mannequins but also gadgets, skilled experts, realistic virtual environments, and role-playing. A crucial component of nursing education is clinical simulation, which the National Council of State Boards of Nursing (NCSBN) defines as "an activity or event replicating clinical practice using scenarios, high-fidelity manikins, medium-fidelity manikins, standardized patients, role-playing, skills stations, and computer-based critical thinking simulations" **(Alexander et al., 2022).**

Rapid feedback, repeated practice learning, the ability to modify the level of difficulty, and the potential to personalize learning are examples of the benefits of simulation-based clinical training. (11). However, the research indicates that undergraduate degrees usually offer few opportunities to practice nursing techniques on actual patients. This fact may affect the competency of upcoming, recently qualified healthcare professionals, raising the possibility of mistakes and endangering patient safety **(Cant & Cooper, 2019).**

Through practical situational experiences, simulation-based clinical education offers nursing students the chance to hone their clinical and decision-making abilities without endangering the health of the pediatric patient. Effective technical skills development, practice of uncommon emergency scenarios like CPR, and the capacity to give prompt feedback are some benefits of simulation-based training interventions for nursing staff. The types of simulation include low-fidelity simulation (LFS) and simulation. Various simulation techniques can be applied based on particular educational levels and learning objectives (**Kim and associates, 2022).**

A method of experiential learning that uses manikins that mimic the real physiological and pharmacological response is called simulation. Errors in pediatric patient care can be made, identified, and corrected by nursing students without having detrimental effects. Simulation is regarded as a cutting-edge adjunctive teaching-learning technique to improve nursing students' confidence and competency transfer from the classroom to the practical nursing setting. One of the reasons for utilizing simulation is the challenge of locating a safe clinical nursing setting that can give nursing students clinical experience during their training and education **(Gamal el-deen et al., 2020).**

Significance of the study

Targeted education and training regarding treatment of cardiac arrest has significantly increased cardiac arrest survival rates, and it has been demonstrated that cardiopulmonary resuscitation, carried out within minutes of the onset of arrest, improves both neurologic outcomes and survival rates **(Bon & Bechtel, 2019).**

Furthermore, resuscitation abilities can be effectively taught through simulation. There is increasing evidence that greater fidelity training scenarios and methodologies help nursing students meet better training goals. Recent research has demonstrated that simulation-based

instruction leads to better care during real-world resuscitation situations **(Sutton et al., 2022).** So, this study was done to evaluate the effect of simulation-based training on nurses' performance regarding pediatric cardiopulmonary resuscitation.

Aim of the study

To evaluate the effect of simulation-based training on nurses' performance and attitude regarding pediatric cardiopulmonary resuscitation.

Research Hypotheses

Simulation-based training is anticipated to improve nurses' attitudes, practices, and knowledge of pediatric cardiopulmonary resuscitation.

Subject and methods

Research design

A quasi-experimental design (one group pre/ post-test design) was used.

Settings

The study was conducted in clinical pediatric laboratory skills, Faculty of Nursing affiliated to Sohag University Hospitals.

Subjects

All nurses (50) who are working in the previously mentioned setting during the study period regardless of their age, education, or years of experience

Tools for data collection

Three tools were used for collecting data in this study.

Tool (1): A structured interviewing questionnaire: Under the guidance of supervisors, the researcher created it in Arabic after studying relevant material. It was divided into two parts:

Part I:

It concerned with the personal characteristics of the nurses under study (age, sex, education, and years of experience), prior high-fidelity simulation CPR training, the nurses' ability to apply what they learned during hospital practical training, and the reasons why they were unable to do so. There are five questions in it.

Part II:

Pediatric nurses' pre- and post-test knowledge of CPR: was changed to fit the study by the researcher after being adopted from **Almesned et al. (2014).** It was evaluated using it. This tool has 20 questions in total. Pediatric nurses' understanding of arrest and resuscitation (including what cardiac and pulmonary arrest are, their causes, symptoms, warning signs, prevention, the proper depth of chest compression for children, the proper chest compression: ventilation ratio for a neonate, nursing action, etc.) was covered in the **first part:**

The second part:

Knowledge of oxygen therapy was covered, including the technique for administering oxygen, oxygen concentration, complications, etc.

The third part:

It contained information concerning the suction procedure, such as the suction time, safety measures, nursing care, etc.

Scoring system of the knowledge

- The model key answer, which assigns two points for a fully accurate response, one point for an incompletely correct response, and zero points for an incorrect or unknown response, was compared to the responses of the nurses under study. The nurses' overall degree of knowledge was classified as follows based on their responses:
  - Poor level (less than 50%) (Less than 29 points)
  - Average level (50% to less than 75%) (From 29 point to less than 43 point)
  - Good level (75% to 100%) (From 43 point to 58 point).

Tool (2): Observational check list

It was taken from American Heart Association (2011) and adjusted by the researcher to fit the study (evaluation of unconscious child, chest compression steps, opening airway, breathing, and defibrillations). Pediatric nurses' practical skills in cardiopulmonary resuscitation were evaluated using a Sim-Baby mannequin simulator (pre-test and post-test). There are 28 steps in all.

Scoring system of the practice

The observational check list was used to compare the practices of the nurses under study. Each item on the checklist was assigned two points for completion, one point for erroneous completion, and zero points for not completing it. The following categories were used to classify the nurses' overall level of practice based on their responses:

- Unsatisfactory (less than 80%) (44 point or less)

- Satisfactory (more than 80%) (More than 44 point)

Tool (3): Attitude of pediatric nursing student regarding cardiopulmonary resuscitation:

It was modified Källestedt et al. (2012). It was used to evaluate the pre- and post-test attitudes of pediatric nurses about cardiopulmonary resuscitation. There were eleven statements in all.

Scoring system of the attitude

Three categories were used to categorize the nurses' attitudes: disagree (0), neutral (1), and agree (2). The attitude scores were split into two tiers, which are as follows:

- Negative attitudes (< 80%) (17 point or less)

- Positive attitudes (80 % ≤ 100%) (More than 17 point)

Data collection procedure:

Validity and reliability:

Five pediatric nursing specialists reviewed the instruments for comprehensiveness, application, clarity, and relevance before evaluating the content validity. The Cronbach's alpha coefficient test revealed the following results on the reliability of internal consistency: tool I was 0.942, tool II was 0.892, and tool III was 0.94.

Ethical considerations

An official letter from the dean of Sohag University's faculty of nursing was used to acquire authorization. In order to explain the study's goal and obtain their consent and cooperation, the researchers visited with the NICU's managers. After nurses were informed of the purpose and advantages of the current trial, their oral consent to participate was obtained. It was made clear to the nurses who were being studied that they might leave the study at any moment. They were also given the assurance that the information they provided would remain private.

Pilot study

The pilot study was conducted. Five nurses, or 5% of the sample, participated in the test to evaluate the generated tools' usability, simplicity, clarity, and applicability. The required adjustments were made. The study's overall sample did not include the pilot study.

Field of work

To get the faculty of nursing at Sohag University's clearance to perform the study, permission was sought. The actual fieldwork took place between the beginning of March 2023 and the end of August 2023, a span of six months. Nurses were interviewed by the researcher. The interview started with the researchers welcoming each nurse, introducing themselves, and outlining the purpose and design of the study.

Phases of the study: The study was conducted through the following four phases:

I-Assessment Phase

To gather the nurses' personal characteristics, instrument (I) component (1) was used to interview each nurse prior to the program. "-" A preliminary evaluation of nurses' attitudes, practices, and knowledge in pediatric cardiopulmonary resuscitation was conducted using tools I, II, and III before training sessions.

II. Planning phase:

Based on the results of the previous phase, the goals, priorities, and expected results were developed to address the practical needs, knowledge gaps, practices, and attitudes of the nurses with relation to pediatric cardiopulmonary resuscitation. For the nurses under study, the researchers organized five sessions: two theoretical and three practical.

The educational program

A training program based on simulation was created and updated. Pediatric cardiopulmonary resuscitation was covered in both theoretical and practical training.

The general objective of simulation-based training sessions:

The nurses were supposed to leave the workshops with information and techniques that would help them feel more positive about pediatric cardiopulmonary resuscitation.

Specific objectives of the program:

- What does cardiopulmonary resuscitation mean?
- The goal of cardiopulmonary resuscitation should be identified.
- List all of the cardiopulmonary resuscitation indications.
- Show how to perform cardiopulmonary resuscitation with care.
- Completing the necessary documentation

III. Implementation phase:

- Two theoretical and three practical sessions were used in the simulation-based training program to enhance nurses' performance and attitudes toward pediatric cardiopulmonary resuscitation. The researchers began each session by gathering input regarding the one before it, and they provided a summary at the conclusion of each session. "-" Three days a week, from nine in the morning until one in the afternoon, the researchers were on hand in the study locations. The study techniques stated above were used to conduct individual interviews with each nurse. "-" The nurses under study were divided into different groups, each consisting of five to six nurses.
- All students were given a theoretical introduction to pediatric CPR at the beginning of the course. It took two hours to complete the theoretical portion in the third-year pediatric department classroom, but the practical portion was carried out at the department's connected laboratory.

  The practical portion of the exercise began with establishing the goal of the simulation-based training, creating the content that explained the rationale for the sessions, and using the Sim Baby mannequin simulator, a wireless life-size infant manikin that can speak and make both normal and abnormal breath sounds, as well as produce heart sounds, palpable pulses, and unilateral or bilateral chest movements.
- A monitor that shows data like blood pressure, heart rate, oxygen saturation, and an ECG tracing is attached to it. Signs of cardiac and pulmonary arrest were intended to be displayed. A training automated external defibrillator, oxygen, emergency drugs, an oropharyngeal airway, a bag-mask manual ventilator, and other items from the clinical pediatric skills lab were placed on a typical hospital bed with monitoring and a simulated oxygen supply.
- Clinical pediatric laboratory skills were demonstrated and re-demonstrated in two sessions for each group, two sessions per day for 20 days, or roughly two to three days per week. The duration of each session was 45 to 50 minutes, depending on the students' comprehension and responses. To make it easier for them to train on the Sim Baby in accordance with the scenario, the students were separated into groups of five. About 15 to 20 minutes are spent on each pupil. In the faculty clinical pediatric laboratory skills, each student was permitted to carry out the pediatric cardiopulmonary resuscitation procedures on a Sim Baby mannequin simulator while being watched over by a researcher. This was done again until the pupil was proficient in these abilities.

- After reviewing the relevant literature and assessing the actual needs of the nurses under study, the simplified booklet was used as supportive material and distributed to nurses in Arabic. It covered every topic pertaining to pediatric cardiopulmonary resuscitation

knowledge, attitude, and practice.

- For a simulated education program, many teaching techniques were used, including lectures, small group discussions, brainstorming, photographs, demonstration, re-demonstration, and the use of simulation manikins that were available in a hospital teaching class faculty clinical lab. A variety of instructional resources were employed, including PowerPoint, handouts, figures, flipcharts, and animated films regarding PICCs.

IV-Evaluation phase:

To assess the impact of the simulated-based training program, nurses' performance in pediatric cardiopulmonary resuscitation was reviewed using the aforementioned methods after the program was implemented (posttest).

Statistical analysis:

The statistical software for social sciences (SPSS) version 20 was used to organize, tabulate, and analyze the data that was gathered. The data's descriptive statistics were computed as follows: frequency and distribution for qualitative data, and mean and standard deviation for quantitative data. The chi square test (X2-value) was also used in analytical statistics to compare categorical data between groups. The test of the Pearson correlation coefficient was also employed. In all analyses, a P value <0.05 was deemed statistically significant (*), a P value >0.05 was deemed statistically insignificant, and a P value <0.001 was deemed very significant (**).

Results:

Table 1 reveals that 76% of the nurses in the study were female, and 62% of them were older than 25, with a mean age of 26.5 ± 4.3 years. 34% of the nurses in the study had a baccalaureate degree in nursing, whereas 66% had a technical institute degree. Half of them had between five and ten years of experience, while twenty-eight percent had more than five years. The majority of nurses (90%) have never had prior CPR training using simulation. Additionally, the table shows that during practical training in hospitals, the majority of nurses (96.0%) are unable to apply what they have learnt in CPR training.

The total knowledge score of the nurses under study before and after the implementation of simulation-based training differed significantly (P value <0.001), as indicated by Table (2).

The distribution of the studied nurses' CPR knowledge level before and after simulation-based training implementation was shown in Figure (1), which also showed that 90% of the nurses had good knowledge levels after simulation-based training implementation, while 76% of the nurses had poor knowledge levels before and after training compared to 0% post-training.

A highly statistically significant difference (P value <0.001) was seen between the overall practice score of the nurses under study before and after the deployment of simulation-based training, as indicated by Table (3).

As shown in Figure (2), the distribution of the practice level related to CPR for the nurses under study before and after the implementation of simulation-based training showed that 96% of the nurses had a satisfactory practice level after the implementation of simulation-based training, while 98% of the nurses had an unsatisfactory practice level before the training compared to 4% after implementation.

Table (4) demonstrated that the total attitude score of the nurses under study before and after the implementation of simulation-based training differed significantly (P value <0.001). The distribution of the attitude level of the nurses under study with regard to CPR before and after simulation-based training implementation was shown in Figure (3). It showed that 98% of the nurses had a positive attitude level after simulation-based training, while 96% of them had a negative practice level before and 2% after.

Table 5: Showed that nurses' overall knowledge, practice, and attitude were positively correlated before and after the implementation of simulation-based training (p value <.001).

Table (1): Percentage distribution of the studied nurses regarding their personal characteristics (n. =50)

Demographic characteristics	No.	%
Age (Years)		
< 25 years	31	62
25 - ≥ 36 years	19	38
Mean ± SD	**26.5 ± 4.3**	
Gender:		
Male	12	24
Female	38	76
Qualifications:		
Technical Institute of nursing	33	66
Baccalaureate degree in nursing	17	34
Years of experience:		
< 5 years	14	28
5 – <10 years	25	50
10 - ≥15 years	11	22
Previous CPR training with simulation - Yes -No	10 45	10.0 **90.0**
Ability to implement what learned in CPR training during practical training in hospital -Yes -No	2 48	4.0 **96.0**

Table (2) Total mean score knowledge of studied nurses regarding CPR pre and post simulation based training implementation (No= 50)

Topic	Pre-training implementation	post training implementation	Chi square test	P value
Total knowledge score	**21.44± 2.7**	**36.55± 4.20**	142.8	.001

(**)is highly significant at the <0.001

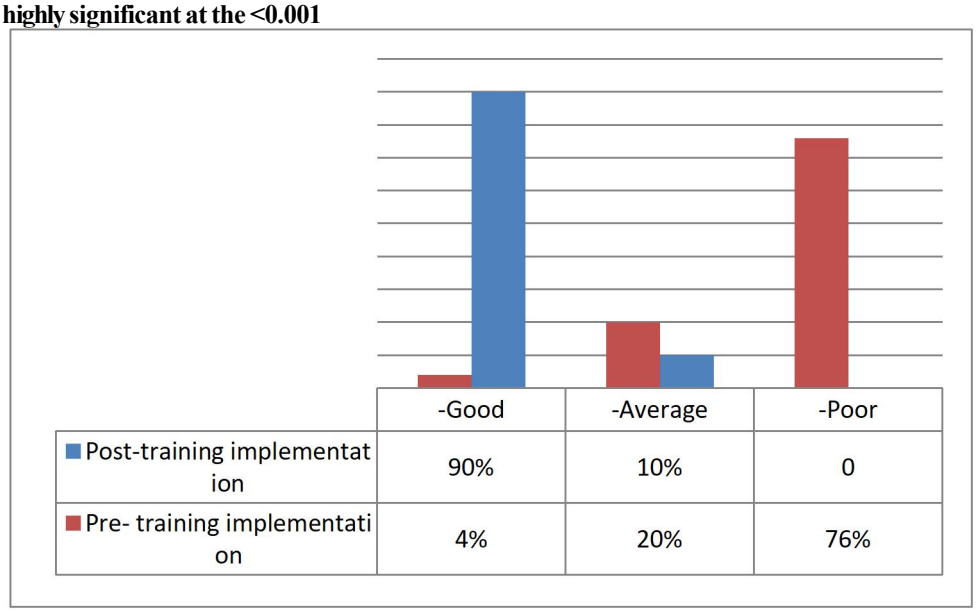

Figure (1) Total knowledge level among the studied nurses regarding CPR pre and post simulation based training implementation (No= 50)

Table (3) Total mean score practice of studied nurses regarding CPR pre and post simulation based training implementation (No= 50)

Topic	Pre-training implementation	post training implementation	Chi square test	P value
Total practice score	17.06± 5.77	42.87± 3.89	152.5	.001

(**)is highly significant at the <0.001

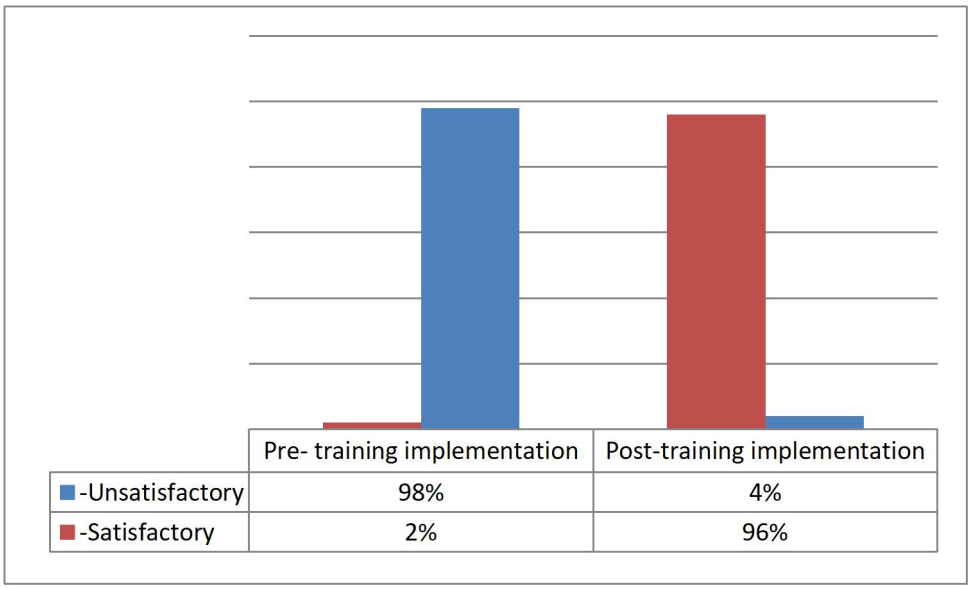

Figure (2) Total practice level among the studied nurses regarding CPR pre and post simulation based training implementation (No= 50)

Table (4) Total mean score attitude of studied nurses regarding CPR pre and post simulation based training implementation (No= 50)

Topic	Pre-training implementation	post training implementation	Chi square test	P value
Total attitude score	2.88± 1.22.	8.33± 2.44	142.8	.001

(**)is highly significant at the <0.001

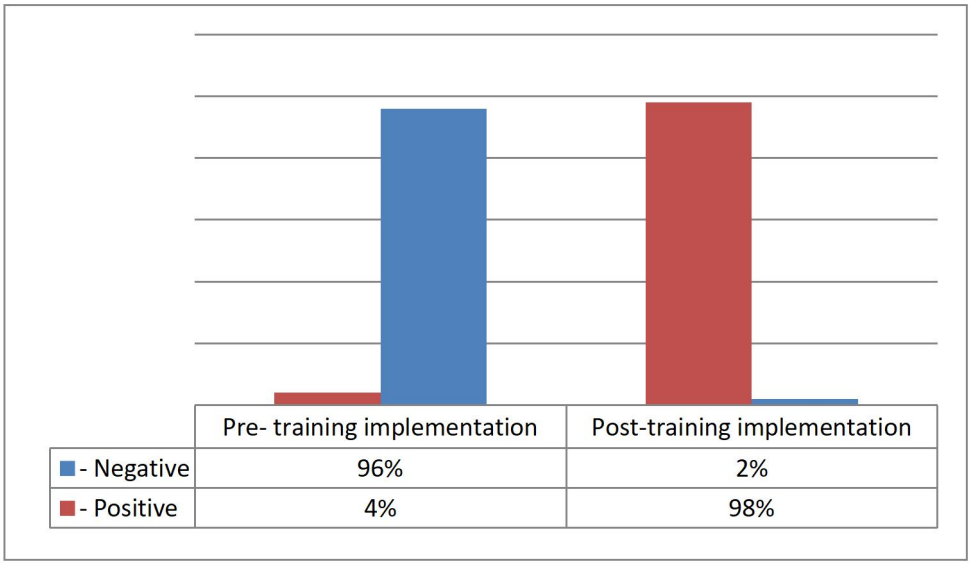

Figure (3) Total attitude level among the studied nurses regarding CPR pre and post simulation based training implementation (No= 50)

Table (5): Correlation between among the studied nurses regarding CPR pre and post simulation based training implementation (No= 50)

Items	Pearson correlation coefficient					
	Knowledge		Practice		Attitude	
	Pearson	Sig	Pearson	Sig	Pearson	Sig
Knowledge	1	-	.875**	< .001	.944**	< .001
Practice	.877**	< .001	1	-	.926**	< .001
Attitude	.942**	< .001	.925**	< .001	1	-

** Correlation is significant at the 0.01 level (2- tailed)

Discussion:

The accomplishment of a particular task as evaluated against established standards of accuracy, completeness, cost, and speed is referred to as performance. A growing body of research indicates that inadequate nurse knowledge preparation and poor skill are linked to poor outcomes, especially in the critically ill newborn. One method that nursing educators can use to help future nurses prepare for real-world practice is simulation **(McGaghie et al., 2019).** Hence, this study aims to evaluate the effect of simulation-based training on nurses' performance regarding pediatric cardiopulmonary resuscitation.

According to the study's findings, the majority of nurses were female, and less than two-thirds of them were under 25. **Xu et al. (2020**) found that the average age group was 25 years old, which is in line with a cross-sectional study. About two-thirds of the nurses had a technical nursing education, according to the current findings regarding the educational background of nurses. The results of this study may be explained by the fact that, until recently, nursing was only offered to girls at Egyptian colleges; this may account for the large proportion of female students.
Deshnukh and Shinde (2024) found that the majority of the participants had less than five years of clinical experience, while I**ssa et al. (2018**) found that nearly one-third of the nurses under investigation had one to five years of experience. Additionally, **Mohammed and Abdel Fattah (2018**) found that more than half of the participants had between one and five years of experience. In terms of years of experience, it was found that half of the studied nurses had more than five and less than ten years of working in the NICU.

The results of the current study showed that nearly all nurses were unable to use the knowledge they had gained from CPR training during their practical training in hospitals. According to the experts, it might have something to do with intense work and inadequate training.

The current study revealed that the majority of the nurses under investigation had never received simulation-based CPR training before. Due to time constraints, faculty members' lack of training, and the high expense, this might be the result of a lack of experience with high fidelity simulation techniques. The results of a study by **Burns et al. (2020**) titled "High-fidelity simulation in teaching problem solving" corroborated these findings. They found that over half of the nurses in the study had never used a simulation, while roughly one-third had done so one or two times.

The present results demonstrated a highly statistically significant difference in the total knowledge score of the nurses under study before and after the implementation of simulation-based training.

This may have something to do with the fact that the use of Sim-Baby as a teaching tool was enhanced, allowing nurses to restore and gasp their knowledge. The results of the study "The Effect of High-fidelity Cardiopulmonary Resuscitation (CPR) Simulation on Athletic Training Student Knowledge, Confidence, Emotions, and Experiences" by **Tivener and Gloe (2020)** corroborated these findings. They found that students' knowledge acquisition significantly improved in the post-test.

According to the current findings, the majority of the nurses in the study had good knowledge levels after simulation-based training was implemented, although over three-quarters of them had poor knowledge levels before and after the training.

This shows how successful the simulation-based training implementation was, according to the researchers. This demonstrated the critical requirement to comprehend the goal of the deployment of simulated-based education, which is to increase knowledge. **Cerra et al.'s (2019**) study, "Effects of high-fidelity simulation-based on life-threatening clinical condition scenarios on learning outcomes of undergraduate and postgraduate nursing students," supports this finding by indicating that simulation training improved nursing students' performance and knowledge.

Regarding nursing practice, the findings showed that the total practice score of the nurses under study before and after the deployment of simulation-based training differed in a highly statistically significant way. According to the researcher, nurses' abilities need to be improved, and the success of simulation-based training before and after deployment was demonstrated. The results of a study by Pfitzinger and Heather (2019) titled "improving attitudes and perceived competence in caring for dying patients: an end of life simulation" corroborated these findings, showing that the study participant's practice level significantly improved following the simulation training.

The current study's findings demonstrated that the majority of the nurses under investigation had a good degree of CPR practice following the implementation of simulation-based training. According to the researchers, this demonstrated the beneficial impact of implementing simulation-based training in nursing practice improvement and was successful in raising the nurses' clinical practice level ratings.

This was consistent with earlier research by N**uraini et al. (2019)**, who examined the effect of simulation-based education on nursing students' practical accomplishments and discovered that simulation-based education enhanced their performance, and Gomes et al. (2020), who investigated "Clinical simulation for the teaching of wound evaluation and treatment." Additionally, **Beal et al. (2019)** discovered that clinical simulation was an effective method for raising the performance of the students under study when contrasted with alternative training methods.

According to the current study's findings, the total attitude score of the nurses under study before and after simulation-based training was implemented differed in a highly statistically significant way. These conclusions were corroborated by the findings of a study conducted by **Dame and Hoebeke (2020)** titled "Effects of a Simulation Exercise on Nursing Students' End-of-Life Care Attitudes." The study found that after training, students who participated in an end-of-life care simulation had more positive attitudes toward caring for patients who were dying.

The results of the current study showed that nearly all of the nurses under study had a positive attitude level after the implementation of simulation-based training, while nearly all of them had a negative practice level prior to the implementation of the training, compared to 2% after. **Burns et al. (2020)** found that all students demonstrated a significant positive change for several attitudinal variables following training, which corroborated these findings. This result is consistent with the findings of **Zapko et al. (2019),** who found that participants felt confidence in their practice, were satisfied with the simulated education experience, and believed the simulations were essential for learning and based on sound educational techniques.

Additionally, **Saied's (2019**) study, "The impact of simulation on pediatric nursing students' knowledge, self-efficacy, satisfaction, and confidence," found that students were happy with the simulation experience and after the simulation session, their self-confidence scores increased. Additionally, **Mattson (2023)** reported that the simulated learning exercise left the pupils feeling quite satisfied.

Following the implementation of training, the current study found positive relationships between students' overall knowledge, practice, and attitude. These findings were in line with those of a study by **Pinar et al. (2021)** titled "The Effects of High fidelity Simulation on Nursing Students' Perceptions and Self-Efficacy of Obstetric Skills," which found that participants' perceptions and self-efficacy of obstetric skills after training were positively correlated.

The current study's findings are in line with those of **Abd Elbaky (2018)**, who conducted a study on the "Impact of a simulated education program on nurses' performance of invasive procedure at intensive care units" and found that knowledge, procedural intervention, and overall performance all improved following the simulation exercise.

Furthermore, these outcomes were consistent with the research conducted by **Gamal el-deen et al. (2020),** which found that students' overall knowledge and performance changed statistically significantly following simulation-based learning (SBL). After SBL, most students' responses were accurate. Every student expressed satisfaction with SBL, and the majority of them gained confidence and self-efficacy as a result.

Conclusion

The present study's findings led to the conclusion that simulation-based training improved nurses' effectiveness in administering pediatric cardiopulmonary resuscitation.

Recommendations

Based on the current study findings, it can be recommended that:

- In order to improve nurses' performance and knowledge acquisition of pediatric cardiopulmonary resuscitation, the study suggested incorporating simulation-based training as an efficient technique. More nurses should participate in this study's replication in order to measure the simulation's

effects and produce findings from a varied sample of nurses.

Regular training on the latest developments in pediatric cardiopulmonary resuscitation is advised for nurses.

A It is necessary to carry out research to determine whether simulation affects the transfer of learning to the clinical setting and to completely comprehend the function of simulation in nursing education.

References

- AbdElbaky, M.M. (2018): Impact of Simulated Education program on Nurses' Performance of Invasive Procedure at Intensive Care Units: Evidence-Based Practice. *International Journal of Nursing Didactics*; 08(12): 13–20. https://doi.org/10.15520/ijnd.v8i12.2392
- Al Hadid, L., & Suleiman, K., (2022): Effect of boost simulated session on CPR competency among nursing students: A pilot study. *Journal of education and practice*, 3(16): 186-189. Available at: http:// www.iiste.org, accessed: 20/1/2017, 3:00 P.M.
- Alexander, M., Durham, C. F., Hooper, J. I., Jeffries, P. R., Goldman, N., Kardong-Edgren, S., & Kesten, K. NCSBN (2022): Simulation Guidelines for Prelicensure Nursing Programs. *Journal of Nursing Regulation*; 6(3): 39- 42. https://doi. org/ 10.1016/ S2155- 8256(15)30783-3
- Almesned, A., Almeman , A., Alakhtar, A. , AlAboudi , A. , Alotaibi, A. , AlGhasham, Y., and Aldamegh, M., (2014): Basic life support knowledge of healthcare students and professionals in the Qassim University, *International journal health science*, 8 (2): 141– 150.available at: http://www.ncbi.nlm.nih.gov, accessed: 7/11/2015, 9:00 P.M.
- Alshonee, S, (2024): Effect of educational training of cardiopulmonary resuscitation among pediatric nurses' practice. Published master thesis. Faculty of Nursing, Tanta University. PP 5-14.
- American Heart Association, (2011): Skill check sheets all, Available at: https://www.evms.edu, accessed: 10/11 /2015, 8:00 A.M.
- Beal, M. D., Kinnear, J., Anderson, C. R., Martin, T. D., Wamboldt, R., & Hooper, L. (2019): The Effectiveness of Medical Simulation in Teaching Medical Students Critical Care Medicine. Simulation in Healthcare: *The Journal of the Society for Simulation in Healthcare*; 12(2): 104–116.
- Bon, C., & Bechtel, K. (2019): Cardiopulmonary resuscitation (CPR). P.1. Available at: http://emedicine.medscape.com, accessed: 25/8/2019, 10:45 A.M.
- Burns, H., O'Donnell, J. & Artman, J., (2020): High-fidelity simulation in teaching problem solving to 1st-year nursing students. University of Pittsburgh school of nursing, Pittsburgh, USA, 6(3): PP 87-95. Available at: http://www.nursingsimulation.org , accessed: 1/1/2017, 8:45 P.M.
- Cant, R.P. & Cooper, S. J. (2019): Simulation-based learning in nurse education: Systematic review. In *Journal of Advanced Nursing*; 66, (1), 3–15). https://doi.org/ 10.1111/j. 1365-2648.2009.05240.x
- Cerra, C., La, Dante, A., Caponnetto, V., Franconi, I., Gaxhja, E., Petrucci, C., Alfes, C. M., & Lancia, L. (2019): Effects of high-fidelity simulation-based on life-threatening clinical condition scenarios on learning outcomes of undergraduate and postgraduate nursing students: a systematic review and meta-analysis1; 2(2): 103–117.
- Dame, L., & Hoebeke, R., (2020): Effects of a simulation exercise on nursing students' end-of-life care attitudes. *Journal of nursing education*, 55(12): 701-705. Available at: http://www.healio.com,accessed: 15/12/2016, 8:45 P.M
- Deshmukh, M., & Shinde, M. (2024): Impact of Structured Education on Knowledge and Practice Regarding Venous Access Device Care among Nurses. *International Journal of Science and Research (IJSR);* 3(5): 895-901, Education and Practice, 5(4). https:// doi.org/10.5430/jnep.v5n4p52.
- Gamal el- deen, A., Bahgat, R. & Khalil, A., (2020): Impact of using simulation based learning on nursing student's performance, self – efficacy, satisfaction and confidence during pediatric injection administration. *Tanta scientific nursing journal* 9(2): 184-205.
- Gomes, J. L., Railka De Souza, A., Kumakura, O., Zanchetta, C, Dias Coutinho, R., & Helena, M., (2020): Lima, M. Clinical Simulation for Teaching ofWound Evaluation and Treatment; 15(1):55-77. https://doi.org/10.1016/j.ecns.09.003
- Issa, S., AL Madwah, K., & Al Mosawi, H. (2018): Evaluation of Nurse's Knowledge in Management of Premature Baby in Neonatal Units, The Basics of Nursing, Basrah Nursing College, Basrah University, Basrah, Iraq, *American Journal of Nursing Research*; 6, (5), 291-295.

- Källestedt, M., Berglund, A., Herlitz, J., Leppert, J., & Enlund , M.,(2012): The impact of CPR and AED training on healthcare professionals' self-perceived attitudes to performing resuscitation, *Scandinavian Journal of Trauma*, Resuscitation and Emergency Medicine. 20-26. Available at: http://www.ncbi.nlm.nih.gov, accessed: 7/12/2015, 9:00 P.M.
- Kim, J., Park, J. & Shin, S., (2022):Effectiveness of simulation-based nursing education depending on fidelity: a meta-analysis. P.1. Available at: https://bmcmededuc.biomedcentral.com, accessed: 14/11/2016, 10:45 P.M.
- Mattson, R. (2023): Effects of High Fidelity Simulation on Knowledge Acquisition, Self-Confidence, and Satisfaction with Baccalaureate Nursing Students; 14(1):55-76
- McGaghie, W. C., Issenberg, S. B., Cohen, E. R., Barsuk, J. H., & Wayne, D. B. (2019): Does simulation-based medical education with deliberate practice yield better results than traditional clinical education? A meta-analytic comparative review of the evidence. Academic Medicine; 86(6): 706– 711. https: // doi. org/ 10. 1097/ ACM. 0b013e3 18217e119
- Mohammed, A., & Abdel Fattah, S. The effect of educational program on nurse's knowledge and practices about nasogastric tube feeding at neonatal intensive care units Ain Shams University, Cairo, Egypt, *Journal of Nursing Education and Practice*, 2018; 8 (8):79.
- Nuraini, T., Afifah, E., Agustini, N., Pujasari, H., Masfuri, M., & Milanti, A. (2019): Human patient simulation to improve the attitude of the nursing students. *Journal of Nursing Education and Practice*. *5*(4): 52.
- Pacheco, D., & Leetch, D., (2020): Critical concepts in pediatric emergency medicine, pediatric cardiopulmonary arrest and post-arrest care.P.1. Available at: https:// https://www.ahcmedia.com, accessed: 14/ 10/ 2016, 9:45 P.M.
- Park, G., (2019): The Effect of applying basic CPR training by AHAguideline to nursing students. *International journal of bioscience and bio-technology*, 8(1): 191-198. Available at: http://dx.doi.org, accessed: 14/8/2016, 12:45 P.M.
- Pfitzinger, L. & Heather, B. (2019): Improving attitudes and perceived competence in caring for dying patients: an end of life simulation. *Nursing education perspectives journal*, 36(6): 372-378. Available at: http://journals.lww.com/, accessed: 15/1/2017, 10:45 P.M.
- Pinar, G., Knight, C., Gaioso, V., Watts, P. & Dailey, K., (2021): The effects of high fidelity simulation on nursing students' perceptions and self-efficacy of obstetric skills. *International archives of nursing and health care research article*. Available at: https://clinmedjournals.org, accessed: 13/1/2017, 12:00 A.M.
- Saied, H. (2019): The Impact of Simulation onPediatric Nursing Students' Knowledge, Self-Efficacy, Satisfaction, and Confidence. *Journal of Education and Practice*; 8(11): 95–102. http:// ezproxy. lib. uconn. edu/ login?url=https://search.ebscohost.com/logi n.aspx?direct=true&db=eric&AN=EJ1139 780&site=ehost-live
- Sutton R., Nadkarni, V. & Abella, B., (2022): Putting it all together" to improve resuscitation quality, Emergency Medicine Clinics of North America. 30(1): 105–122. Available at: http://www.ncbi.nlm.nih.gov . accessed: 10/1 /2016 , 1:00 A.M.
- Xu B., Zhang J., Hou J., Ma M., Gong Z., & Tang S. (2020): Nurses' knowledge of peripherally inserted central catheter maintenance and its influencing factors in Hunan province, China: a cross-sectional survey. *BMj Open*; 10:e033804. Doi: 10.1136/bmjopen—033804.
- Zapko, K. A., Ferranto, M. L. G., Blasiman, R., & Shelestak, D. (2019): Evaluating best educational practices, student satisfaction, and self-confidence in simulation: A descriptive study. *Nurse Education Today*; 60, 28–34. https:// doi. org/ 10. 1016/ j. nedt. 2019.09.00