# EFFECT OF GUIDELINES ABOUT SURFACTANT ADMINISTRATION FOR PRETERM INFANTS ON NURSES' KNOWLEDGE AND PRACTICES

## GANNAT ALAA MOHAMMED EL SAYED

Clinical Instructor, Abbassia Fever Hospital Technical Nursing Institute, Egypt.
Email: gannatalaa22@gmail.com

## HANAN MOHAMED RASHAD AHMED

Emeritus Assistant Professor, Pediatric Nursing, Faculty of Nursing, Cairo University, Egypt.

## WAFAA MOHAMED ABDULLAH

Professor of Pediatrics and Neonatology, Faculty of Medicine, Cairo University, Egypt.

**Abstract**

**Background:** While surfactant administration therapy significantly reduces respiratory distress syndrome mortality among preterm infants. Studies indicate persistent variations in nursing knowledge and practices across neonatal units, including inconsistent adherence to administration protocols, gaps in monitoring post- surfactant administration therapy complications, and limited training on emerging minimally invasive techniques. **Aim:** to evaluate the effect of guidelines about surfactant administration for preterm infants on nurses' knowledge and practices. **Methods:** A quasi-experimental design has been conducted at two neonatal intensive care units of El Manial University Hospital (Kaser Al Aini) and Cairo University Children's Hospital (El Monira) from December 2024 to May 2025. A convenient sample of fifty bedside nurses who are working in previous mentioned setting was included using two tools: structured questionnaire and observation checklist regarding surfactant administration. **Results**: the current study findings revealed that nurses' level and total mean scores knowledge and practice of surfactant administration significantly improved following intervention of guidelines compared to pre intervention. There was moderate positive correlation between nurses' knowledge and practice scores across all study phases and educational qualification only demonstrated a strong positive correlation with both knowledge and practice scores. **Conclusion:** Nurses who receive guidelines had a higher mean post- test scores of surfactant administration knowledge and practices compared to pretest. The findings strongly support the effectiveness of the guidelines in improving neonatal nurses' knowledge and practices regarding surfactant administration for preterm infants **Recommendation**: Implementing periodical instructional guideline for nurses working in neonatal intensive care units regarding surfactant administration for preterm infants.

**Keywords:** Guidelines, Surfactant Administration, Preterm Infants, Nurses' Knowledge & Practices.

## 1. INTRODUCTION

While surfactant administration therapy significantly reduces respiratory distress syndrome mortality among preterm infants. Study indicates persistent variations in nursing knowledge and practices across neonatal units, including inconsistent adherence to administration protocols, gaps in monitoring post- surfactant administration therapy complications, and limited training on emerging minimally invasive techniques [1]. Surfactant replacement therapy is a lifesaving management for high-risk premature with RDS and the most effective standard treatment in developing countries [2]. In the moments following delivery, surfactant plays an important role in helping the newborn breath independently as fluid is cleared from the lungs. If a fetus is born prematurely before it has not the chance to develop appropriate amounts of surfactant, neonatal

respiratory distress syndrome (NRDS) is likely to occur [3].There are numerous randomized clinical trials have established the efficacy of SRT in reducing mortality and morbidity in RDS so neonatal survival improved more in high-risk neonates and low birth weights and associated problems undergoing surfactant replacement therapy [2]. Respiratory distress syndrome is a significant contributor to neonatal mortality in developing nations. Worldwide, 70% of babies born at less than 33 weeks of gestation have RDS. The prevalence of RDS is 1% of all newborns, but it rises to 50% at 30 weeks, 75% at 28 weeks, and 90% at 26 weeks of gestation. In Egypt, a survey of neonatal mortality in NICUs at children's hospitals conducted by Cairo University found that mortality from RDS among neonates accounted for 9.6% of all neonatal deaths and 26.7% of all deaths overall, making it one of the major reasons for admission to the NICUs. The most effective method for reducing RDS and its mortality worldwide is SRT [4]. Meanwhile, total number of high-risk neonates admitted to NICUs of Benha University Hospital was 549 high-risk neonates; nearly 70% of them were RDS, while more than one quarter (30%) of they were preterm with RDS [5].

Neonatal nurses play a crucial role in caring for newborns, especially those requiring surfactant replacement therapy (SRT) for RDS. Their responsibilities include managing ventilation whether through CPAP or mechanical ventilation and ensuring proper endotracheal tube placement. Close monitoring of oxygen levels, blood gases, and vital signs (e.g., heart rate, SpO2, blood pressure) are essential for timely ventilator adjustments. Additionally, nurses must assess respiratory function, including air entry, breath sounds, chest expansion, and secretions, as well as track ventilator metrics like pressures, tidal volumes, and transcutaneous PCO2 (TcPCO2).[6&7]. Preterm infant with RDS require careful handling to maintain oxygenation and reduce metabolic strain. Excessive stimulation, such as crying, can worsen hypoxia, increase pulmonary pressure, and disrupt breathing. Proper temperature control is crucial to minimizing oxygen demand. While suctioning helps clear airway secretions, it must be performed cautiously to avoid complications like tracheal damage, bradycardia, or low oxygen levels. It should only be done, when necessary, guided by clinical signs such as abnormal breath sounds, oxygen desaturation, or infant distress. [8].Neonatal nursing has become more complex, significantly impacting infant survival. Nurses must possess sharp observation skills, make accurate clinical decisions, and promptly recognize complications to ensure the best outcomes for critically ill newborns. Optimal nursing care is critical for newborns with respiratory distress syndrome (RDS), particularly regarding surfactant replacement therapy (SRT) - a lifesaving intervention that remains underutilized in some clinical settings. [9].While SRT significantly reduces RDS mortality; study indicates continuous professional development and structured educational programs are essential to maintain competent neonatal nursing practice in neonatal intensive care units. [10]. However, SRT is one of new evidence treatment modalities for RDS and become available universally. Therefore, it's important for the nurses to understand that Evidence-Based Practices (EBP) improves the quality of high-risk neonate's outcomes and provide an assessment for them to integrate the best evidence and using an actual clinical example which cause

an improvement in nurses' knowledge and clinical practices. So, this study will be conducted.

## 2. METHODS

### 2.1 Aim

The aim of the current study is to evaluate the effect of guidelines about surfactant administration for preterm infants on nurses' knowledge and practices.

To achieve the aim of the current study the following research hypotheses were postulated:

**H1.** Nurses who receive guidelines will have higher mean post- test scores of surfactant administration knowledge compared to pretest.

**H2.** Nurses who receive guidelines will have higher mean post- test scores of surfactant administration practices compared to pretest.

### 2.2 Design

A quasi-experimental (one-group pre/post-test) research design was utilized in the current study.

### 2.3 Setting

The current study was conducted in two NICUs. The first NICU is located on the fourth floor of El Manial University Hospital (Kasr Al Ainy). The second NICU is located on the third floor of Cairo University Children Hospital (El Monira). Capacity of each unit includes 64 incubators, well equipped to provide care for high-risk neonates all over Egypt. Both units follow the same medical care protocols in providing care for neonates.

### 2.4 Participants

A convenience sample of 50 bedside nurses who are working in both mentioned NICUs and responsible for providing direct care to preterm infants, regardless of their age, educational levels, years of experience and gender. Under-graduated students who were under training in both NICUs were excluded. Of the total sample, 20 nurses were recruited from El Manial University Hospital (Kasr Al-Ainy), and 30 nurses were recruited from El Monira Children's Hospital.

### 2.5 Data Collection Tools:

Data was collected through using the following tools:

**Tool (I): Structured Questionnaire:** It was designed by the research investigators based on updated related literatures to assess the nurses' knowledge regarding surfactant administration, it consists of two parts:

**Part (1): personal characteristics of nurses:** It includes age, gender, years of experience in pediatric nursing practice, years of experience in the NICU and previous

attendance of training courses about care of high risk neonates with RDS and surfactant administration.

**Part (2): Nurses' knowledge regarding RDS and surfactant administration:** It consists of (30) multiple-choice and true or false questions that includes: eight questions about RDS definition, etiology, pathophysiology, clinical pictures, complications and nursing care, and 22 questions about surfactant administration definition, origin and function of surfactant in human body, indications, sources of exogenous surfactant, route of administration, optimal time, criteria for administration, needed investigation medication and dosing, adverse effect and its complications and nursing intervention before, during and after surfactant administration.

**Scoring system of nurses' knowledge:**

The scoring system for evaluating the nurses' level of knowledge was guided by recent Egyptian study carried out by [11]. One score was given for correct answer and zero for incorrect answer. The total score of 30 grades was given for total knowledge (equal 100%). The nurses' answers were checked using a model key answer and accordingly, their knowledge total score level was classified into;

- Satisfactory knowledge level: ≥ 60% = ≥ 18 score
- Unsatisfactory knowledge level < 60 = < 18 score

**Tool (II): An Observational checklist of surfactant administration:**

The observational checklist was adopted from [12] .It was used to assess the nursing care for the high risk neonates undergoing surfactant administration. It included 28 steps, 8 before, 14 during, and 6 after surfactant administration.

**Scoring system of nurses' practice:**

The scoring system for evaluating the nurses' level of practice was guided by recent Egyptian study carried out by [11] .One score was given for each correct step and zero for incorrectly or not done. A total score of 28 grades (equal 100%). Accordingly, the total practice score level was classified into:

- Satisfactory practice level ≥ 80% = ≥ 22.4 grade
- Unsatisfactory practices level < 80 % =<22.4 grade

**Surfactant administration Guidelines:**

It was developed by the research investigator after extensive reviewing of the recent literature on surfactant administration. It is prepared in the form of handout and includes colorful pictures and simple statements in Arabic Language. The main goal of the instructional guidelines is to maximize the nurses' knowledge and practice related to surfactant administrant, It includes: causes and types of RDS, clinical manifestations of RDS, medical management of RDS, definition, origin and function of surfactant in human body, indications, and sources of exogenous surfactant, route of administration, optimal time, and criteria for administration, needed investigation, medication and dosing, nursing

intervention before, during and after surfactant administration, adverse effects and complications. It also includes instructions to improve the nurses' practices about surfactant administration before, during and after.

## Validity and reliability

Tools were evaluated by a panel of three experts in high-risk neonates and pediatric nursing to test the content validity. Reliability of part 2 of tool I and tool II using Cronbach's alpha coefficient test to ensure their reliability test for knowledge and practice , it was 90.3% and 92.0% respectively.

## 2.6 Procedure

The study conducted through three phases: Preparatory and assessment, implementation and evaluation phase.

## Preparatory and assessment phase:

Before conducting the current study, the research investigators reviewed the related materials, recent medical textbooks, literature extensively and relevant studies, for constructing tools. The instructional guidelines developed and supported by an illustrated Arabic booklet prepared by the research investigators. Official permission to conduct the study is obtained from the authorized personnel. The research investigators met the head nurse of these units and explained the aim of the study. After that, they introduced themselves to the nurses and provided a simple explanation of the nature of the study and its benefits for both the nurses and for pre-term infants. The nurses were interviewed either individually or in groups in groups of three to five nurses, depending on their readiness and the nature of the work conditions in the NICUs, the interview was done in nurse's room in El Manial University Hospital (Kaser Al Aini) and in the educational room inside the NICU in El Monira Hospital.

Assessment of the nurses knowledge through self –administrated (tool I) was obtained and it took about 20 -30 minutes, and assessment of nurse practices was done by the research investigators using observational checklist (tool II) through observing the nurses individually. It took about 10-15 minutes for each nurse throughout procedure on manikin in the time of absence of preterm infants undergoing surfactant administration and some of them during their actual work.  During the assessment phase, two and four nurses were observed during actual clinical practice, 28 and 16 observed using a simbad manikin at both NICUs of El-Monira and El-Kasr Al-Ainy Hospitals respectively. Following pretest, a soft and hard copy of the booklets provided to the participated nurses.

## Implementation phase:

The guideline was prepared by the researchers according to nurses' needs and deficiencies in their performance. The teaching methods and materials including interactive sessions, group discussion, guiding soft and hard booklet with colored pictures, power point presentation, simbad manikin, Preterm Baby Package: Surfactant administration video that developed by[13], Ambu bag, mask with oxygen supply, neonatal laryngoscope with Miller blades size zero, neonatal endotracheal tube size  2,5

mm ID , suction catheter, sterile gloves, betadine ,alcohol ,5 and 10ml sterile syringe, small feeding tube size 5 Fr, tape measure ,sterile blade and surfactant in appropriate dose .The guidelines were provided through two sessions, one for theoretical part and one for practical part. The first session focused on theory, providing participants with scientific and theoretical information about RDS and surfactant therapy for pre-term infants. It took about 30-45 minutes. The second session was focused on practice through demonstration following by watching video that explained and clarified by researchers in Arabic language for some nurses as they needed and redemonstration. Demonstration was done by the research investigators using simbad manikin of preterm infant, it took about 10-15 minutes. Redemonstration was done by each nurse individually and it took about 10-15 minutes. Data collection was conducted on four consecutive days per week in the day shift (from 8am: 7pm) for six months between December 2024 and May 2025.

**Evaluation phase:**

Immediate and follow up posttest done by using the same tools that utilized in the pre-test. All nurses were observed using a simbad manikin except one was observed during actual clinical practice at El-Kasr Al-Ainy Hospital NICU.

**2.7 Statistical Analysis**

The data analyzed with SPSS statistical software version 20. Descriptive statistics used to present data as frequencies and percentages for qualitative variables, means and standard deviations, for quantitative ones. The internal consistency approach used to assess the reliability of the tools, with the estimation of Guttman split-half coefficient. Analytic statistics included chi-square tests for comparing categorical variables. Quantitative continuous data were compared using the non-parametric  ANOVA tests. Spearman's rank correlation used to assess the relations among quantitative and ranked variables. The level of statistical significance was set at p-value <0.05.

## 3. RESULTS

### 3.1 Description of Participants

Table (1) shows that more than half of the nurses (58%) were younger than 25 years, with a mean age of 26.1 ± 5.4 years. Male nurses constituted 62% of the sample. Regarding educational level, two-thirds of the nurses (66%) held a bachelor's degree or higher, while 34% had a diploma qualification. The majority of nurses (72%) had less than five years of pediatric nursing experience, and 54% had less than one year of experience in NICU settings. Notably, only 10% of nurses had attended training courses related to respiratory distress syndrome (RDS) and surfactant administration.

### 3.2 Tests of Hypotheses

Table (2) revealed that at baseline, satisfactory total knowledge was observed in only 6% of nurses, which increased to 100% immediately post-intervention and was maintained at follow-up. Similar patterns were observed across all knowledge domains related to RDS

and surfactant, with statistically significant differences between pre-test and both post-test and follow-up phases (p < 0.001).

Table (3) indicates that none of the nurses demonstrated satisfactory practice levels before the intervention. Immediately after the intervention, 100% of nurses achieved satisfactory practice levels in all phases of care (before, during, and after surfactant administration), with sustained improvement at follow-up. All differences between pre-test and both post-test and follow-up assessments were statistically significant (p < 0.001).

Table (4) shows statistically significant improvements in both knowledge and practice mean scores following the intervention. Nurses' knowledge mean scores increased from 15.5±2.0 out of 29 pre-intervention to 27.9±1.6 post-intervention, with slight decline at follow-up 25.8±1.3, though remaining significantly higher than baseline (p < 0.001). Similarly, practice scores showed significant improvement post-intervention and at follow-up (p < 0.001).

Table (5) reveals a moderate positive correlation between nurses' knowledge and practice scores across all study phases (p < 0.01). Educational qualification demonstrated a significant strong positive correlation with both knowledge and practice scores. However, age and years of experience did not show statistically significant correlations with either knowledge or practice scores

### Table (1): Distribution of nurses' Characteristics (n=50)

| Nurses characteristics | No | % |
|---|---|---|
| Age: | | |
| <25 | 29 | 58.0 |
| 25+ | 21 | 42.0 |
| Mean±SD | 26.1±5.4 | |
| Gender: | | |
| Male | 31 | 62.0 |
| Female | 19 | 38.0 |
| Nursing qualification: | | |
| Diploma | 17 | 34.0 |
| Bachelor/higher | 33 | 66.0 |
| Experience years in pediatric nursing practice (total): | | |
| <5 | 36 | 72.0 |
| 5+ | 14 | 28.0 |
| Experience years in NICU: | | |
| <1 | 27 | 54.0 |
| 1+ | 23 | 46.0 |
| Training courses about RDS and surfactant administration: | | |
| No | 45 | 90.0 |
| Yes | 5 | 10.0 |
| No. of courses (n=5): | | |
| 1 | 4 | 80.0 |
| 3 | 1 | 20.0 |

**Table (2): Distribution of nurses' satisfactory knowledge regarding respiratory distress syndrome and surfactant throughout study phases (n=50)**

| Nurses' satisfactory knowledge (60%+) of : | Study Phases | | | | | | P1 Pre-post | P2 Pre-FU |
|---|---|---|---|---|---|---|---|---|
| | Pre | | Im.p | | FU | | | |
| | No. | % | No. | % | No. | % | | |
| RDS: Causes, etiology pathophysiology | 10 | 20.0 | 50 | 100.0 | 45 | 90.0 | <0.001* | <0.001* |
| Management &nursing care | 28 | 56.0 | 50 | 100.0 | 45 | 90.0 | <0.001* | <0.001* |
| Total : Satisfactory | 28 | 56.0 | 50 | 100.0 | 49 | 98.0 | <0.001* | <0.001* |
| Surfactant: Function | 10 | 20.0 | 47 | 94.0 | 48 | 96.0 | <0.001* | <0.001* |
| Indications/Criteria/Timing/Investigations | 26 | 52.0 | 47 | 94.0 | 50 | 100.0 | <0.001* | <0.001* |
| Dose/Route | 26 | 52.0 | 50 | 100.0 | 47 | 94.0 | <0.001* | <0.001* |
| Adverse effects/ Complications | 10 | 20.0 | 48 | 96.0 | 40 | 80.0 | <0.001* | <0.001* |
| Nursing Care before ,during and after surfactant administration | 21 | 42.0 | 50 | 100.0 | 50 | 100.0 | <0.001* | <0.001* |
| Total surfactant: Satisfactory | 5 | 10.0 | 50 | 100.0 | 50 | 100.0 | <0.001* | <0.001* |
| Total knowledge: Satisfactory | 3 | 6.0 | 50 | 100.0 | 50 | 100.0 | <0.001* | <0.001* |

**Table (3): Distribution of nurses' total practice level throughout study phases (n=50)**

| Practice level | Study phases | | | | | | p-value Pre-post | p-value Pre-FU |
|---|---|---|---|---|---|---|---|---|
| | Pre | | Im.p | | FU | | | |
| | No. | % | No. | % | No. | % | | |
| Before: Satisfactory (80%+) | 0 | 0.0 | 50 | 100.0 | 50 | 100.0 | 100.0 | 100.0 |
| Unsatisfactory (<80%) | 50 | 100.0 | 0 | 0.0 | 0 | 0.0 | <0.001* | <0.001* |
| During: Satisfactory (80%+) | 34 | 74.0 | 50 | 100.0 | 50 | 100.0 | 14.94 | 14.94 |
| Unsatisfactory (<80%) | 13 | 26.0 | 0 | 0.0 | 0 | 0.0 | <0.001* | <0.001* |
| After: Satisfactory (80%+) | 0 | 0.0 | 50 | 100.0 | 46 | 92.0 | 100.0 | 85.19 |
| Unsatisfactory (<80%) | 50 | 100.0 | 0 | 0.0 | 4 | 8.0 | <0.001* | <0.001* |
| Total practice: Satisfactory (80%+) | 0 | 0.0 | 50 | 100.0 | 50 | 100.0 | 100.0 | 100.0 |
| Unsatisfactory (<80%) | 50 | 100.0 | 0 | 0.0 | 0 | 0.0 | <0.001* | <0.001* |

**Table (4): Comparison of nurses' total mean scores of knowledge and practices throughout study phases**

| Scores of: | Study phases | | | p-value |
|---|---|---|---|---|
| | Pre | Im.P | FU | |
| Knowledge: Raw score (0-29) | 15.5±2.0 | 27.9±1.6 | 25.8±1.3 | <0.001* |
| Standardized (0-100) | 51.7±6.8 | 93.1±5.5 | 85.9±4.3 | <0.001* |
| Practice: Raw score (0-29) | 20.6±0.7 | 28.0±1.1 | 26.1±0.9 | <0.001* |
| Standardized (0-100) | 71.0±2.4 | 96.5±3.8 | 90.2±3.1 | <0.001* |

### Table (5): Correlation between nurses' knowledge and practice scores and their characteristics throughout the study phases

| Item | | Spearman's rank correlations | | | | | |
|---|---|---|---|---|---|---|---|
| | | Pre | | Im.p | | FU | |
| | | Knowledge | Practice | Knowledge | Practice | Knowledge | Practice |
| Practice | R | 0.50 | — | 0.46 | — | 0.45 | — |
| | p- value | < .001** | — | < .001** | — | 0.001** | — |
| Age | R | -0.22 | 0.09 | -0.10 | -0.19 | -0.19 | -0.16 |
| | p- value | 0.134 | 0.524 | 0.502 | 0.197 | 0.182 | 0.271 |
| Qualification | R | 0.63 | 0.43 | 0.43 | 0.60 | 0.42 | 0.59 |
| | p- value | < .001** | 0.002** | 0.002** | < .001** | 0.003 | < .001** |
| Experience (pediatric) | R | -0.13 | 0.07 | -0.04 | -0.02 | -0.19 | -0.09 |
| | p- value | 0.365 | 0.615 | 0.777 | 0.88 | 0.199 | 0.521 |
| Experience in surfactant administration | r | -0.15 | -0.02 | 0.03 | -0.12 | -0.12 | -0.06 |
| | p- value | 0.289 | 0.914 | 0.846 | 0.406 | 0.395 | 0.684 |

## 4. DISCUSSION

The present study revealed that the majority of nurses were young, with more than half aged below twenty five years and a mean age of 26.1 ± 5.4 years. This finding reflects the predominance of newly graduated nurses working in neonatal intensive care units, which may explain the limited clinical exposure observed among the study sample. Similar age distributions were reported in previous studies conducted in NICUs, where younger nurses constituted the core workforce due to high turnover and workforce demand [11] [14].Regarding educational level, two-thirds of the nurses held a bachelor's degree or higher.

Higher educational qualifications are known to enhance nurses' cognitive abilities, critical thinking, and adherence to evidence-based practice, which may positively influence their performance in complex neonatal care situations such as RDS [15].Despite this, most nurses had limited experience in pediatric nursing and NICUs setting, and the vast majority had not received prior training related to RDS or surfactant administration. This lack of specialized training highlights a significant educational gap that may negatively affect the quality of neonatal care and emphasizes the necessity for structured in-service educational programs.

The findings of this study demonstrated a statistically significant improvement in NICUs nurses' knowledge regarding RDS and surfactant administration following the educational intervention. At baseline pre intervention of instructional guidelines, total nurses' knowledge level was generally unsatisfactory, particularly in areas related to causes, etiology and pathophysiology of RDS, adverse effects, complications and nursing care before, during and after surfactant administration, also nurses' knowledge scores were relatively low ,reflecting inadequate baseline knowledge regarding surfactant therapy and its administration. This may be attributed to limited exposure to updated evidence-based guidelines and lack of continuous educational programs in neonatal intensive care units.

Following the implementation of the educational guidelines, a marked improvement in knowledge scores and total satisfactory level were observed during the immediate post-intervention phase. This significant increase confirms the effectiveness of guideline-based education in enhancing nurses' understanding of surfactant therapy. The observed improvement in knowledge reflects the instruction effectiveness in enhancing the nurses' understanding of key guidelines relevant to surfactant administration. Also, the guidelines content designation and delivery successfully addressed the nurses' specific educational needs, enabling them to acquire new knowledge and apply it in their daily practices.

Similar findings were reported by [11] in a study about "Effect of evidence-based guideline on nurses' performance regarding care of high-risk neonates undergoing surfactant replacement therapy." which demonstrated a significant improvement in nurses' knowledge and practice following the educational program. Also these results are consistent with previous studies that emphasized the positive impact of structured educational interventions on nurses' knowledge in neonatal respiratory care and surfactant replacement therapy [16], [2], [17], [18], [19] and [20].

Although a slight reduction in knowledge levels was detected at the current study results after one month follow-up phase, but it significantly higher than in the pre-intervention phase. These findings support the necessity of periodic refresher courses, ongoing in-service training, and continuous professional development programs to maintain competency among NICU nurses. This result agree with the finding of the study [21]in a study " Improving nursing knowledge and care for neonates with respiratory distress in Jordan." ,who examined the improvement in nursing knowledge and care for neonates with respiratory distress in Jordan and found that the mean scores for knowledge and practice were significantly higher immediately after the intervention, however there was a slight drop in the follow-up 4 weeks after the intervention, however the difference between baseline knowledge, nursing practice scores, and follow-up scores is still significant. It may be that the drop in the follow-up knowledge score is due to the tendency for some knowledge to slip from memory.

Concerning total mean and level nurses' practice regarding surfactant administration, the current study revealed that there was a highly statistically significant improvement in total nurses' practices immediately post  and after one month follow up compared to pre intervention. This improvement demonstrated the value of the instructional guidelines that assisted the nurses in enhancing their practices to care for preterm infants undergoing surfactant administration, and it supported the validity of the study hypothesis. This finding may be attributed to unsatisfactory baseline knowledge, limited NICU experience, and lack of hands-on training.

However, following the guidelines, all nurses achieved satisfactory practice levels, which were maintained at follow-up. This findings support the assumption that instructional guidelines can effectively bridge the gap between theoretical knowledge and clinical practice. This underscores the necessity for continuous supervision, clinical mentorship, and ongoing competency-based training to maintain high standards of neonatal care. The results supported by [22]who conducted a study about "Effect of instructional guidelines

on nurses' performance regarding care of high risk neonates undergoing surfactant replacement therapy." that displayed there was an improvement in the nurses practices post application compared to pre application of guidelines. Also the current study findings are consistent with those of [20], who reported that educational guidelines positively influence nurses' practices and help maintain acceptable performance levels over time.

The guidelines empowered the nurses with the necessary knowledge to provide evidence-based practices.The enhancement of nurses' knowledge and practices is crucial for ensuring the provision of high-quality surfactant administration. By equipping nurses with the necessary knowledge and practices, healthcare organizations can improve neonate outcomes and promote a culture of neonate safety within the NICUs. Along the same line, the study conducted in three hospitals in northern Jordan aimed to evaluate the effectiveness of an educational intervention in the area of nursing knowledge and practice relating to neonatal respiratory distress syndrome and found that the educational interventions effectively enhanced nursing knowledge and practice relating to the care of neonates with respiratory distress.

Regarding correlation between total nurses' knowledge and practices in pre/post-intervention of guidelines the results of the current research, reflected that, there was a positive correlation between total nurses' knowledge and actual practice of providing care for high-risk neonates undergoing SRT pre and post the adoption of guidelines, suggesting that nurses with higher theoretical knowledge scores also demonstrated better practical skills. This result was consistent with a study by [23] and [24] which revealed a strong relationship between nurses' knowledge and practice.

Concerning correlations between nurses' knowledge and practice scores and their characteristics, nursing qualification demonstrated a strong positive correlation with both knowledge and practice scores throughout the study phases. Nurses with higher educational qualifications achieved better knowledge and practice scores compared to those with lower qualifications, emphasizing the importance of formal education in enhancing cognitive and clinical competencies. These findings are consistent with studies by [25], [11] and [24] which declared a strong positive association between nurses' knowledge and practice and qualification. From the researcher's point of view, only licensed professionals and nurses should apply SRT. The ability to acquire new skills and knowledge is something that nurses should have access to in order to be successful in their careers.

## 5. CONCLUSION AND RECOMMENDATIONS

### 5.1 Conclusion

Nurses who receive guidelines had a higher mean post- test scores of surfactant administration knowledge and practices compared to pretest. The findings strongly support the effectiveness of the guidelines in improving neonatal nurses' knowledge and practices regarding surfactant administration for preterm infants.

## 5.2 Recommendation

Based on the findings of the current study, the following recommendations are suggested:

- Implementing periodical instructional guideline for nurses working in neonatal intensive care units regarding surfactant administration for preterm infants.

- Regular in-service training programs should be conducted for nurses working in NICUs to update their knowledge and enhance their practical skills regarding surfactant administration and related neonatal care.

- Continuous evaluation of nurses' knowledge and practices through periodic assessments and observational checklists is recommended to maintain high standards of nursing performance.

- Availability of written and visual guideline materials, such as manuals, posters, and checklists, should be ensured in NICUs to support nurses during actual clinical practice.

- Integration of surfactant administration guidelines into nursing curricula is recommended to prepare nursing students with adequate knowledge and competencies before clinical practice.

- Encouraging a culture of evidence-based practice among nurses through workshops, seminars, and access to updated scientific resources is essential for improving neonatal outcomes.

- Further studies are recommended on a larger sample size and in different healthcare settings to generalize the findings and evaluate the long-term impact of guideline implementation on neonatal outcomes.

### LIMITATIONS

There were no limitations in the current study.

### ABBREVIATIONS

| | |
|---|---|
| ANOVA | Analysis of Variance |
| CPAP | Continuous Positive Airway Pressure |
| Fr | French gauge (French size) |
| FU | Follow Up |
| IP | Immediate Post |
| mm ID | Millimeter internal diameter |
| NICUs | Neonatal Intensive Care Units |
| NRDS | Neonatal Respiratory distress syndrome |
| SA | Surfactant administration |
| SPSS | Statistical Package for Social Science |
| SRT | Surfactant Replacement Therapy |
| WHO | World Health Organization |

## DECLARATIONS

### Ethical Considerations

This study was part of a Master thesis; primary approval was attained from the research ethical committee in the Faculty of Nursing, Cairo University. All nurses who participated in the study were informed about the aim, procedure, benefits, and nature of the study and the written consent was obtained by the research investigators. The research investigators emphasized that participation in the study was voluntary, and nurses can refuse to participate in the study without any reason and obtained data was only used for the research purpose. The confidentiality of information was assured, and the nurses had the right to withdraw from the study at any time during the study without any effect on their job.

### Availability of data and materials

The data that support the findings of this study are available from the corresponding author upon reasonable request.

### Competing Interests

The authors declare that they have no competing interests.

### Funding

### Acknowledgment

### Reference

1) Elbilgahy, A. A., Jothirajan, D., Alanazi, L. O., Alanazi, F. A., Alanazi, M. G., & Alanazi, A. S. (2025). Nursing practices and risk factors in neonates with respiratory distress syndrome undergoing surfactant replacement therapy: A cross-sectional study in Saudi Arabia. *Journal of Multidisciplinary Healthcare, 18*, 4903–4918. https://doi.org/10.2147/JMDH.S532177

2) Joseph, J. (2017). Knowledge regarding surfactant therapy among student nurses. *American Journal of Advances in Nursing Research, 4*(2), 54–56.

3) Van Kaam, A. H., Niemarkt, H. J., & Onland, W. (2023). Timing of surfactant treatment in respiratory distress syndrome. *Seminars in Fetal and Neonatal Medicine, 28*(4), 101495. https://doi.org/10.1016/j.siny.2023.101495.

4) Abou-Faddan, H., & Abdelaziz, N. (2018). Respiratory distress and its outcome among neonates admitted to neonatal intensive care unit of Assiut University Children Hospital, Egypt. *The Egyptian Journal of Community Medicine, 36*(2), 69–78. https://ejcm.journals.ekb.eg/article_11052.html.

5) Benha University Hospital Statistics Department. (2020). *Statistical report of high-risk neonates with respiratory distress syndrome*. Benha University Hospital.

6) Reynolds, P., Bustani, P., Darby, C., et al. (2021). Less-invasive surfactant administration for neonatal respiratory distress syndrome: A consensus guideline. *Neonatology, 118*(5), 586–592. https://doi.org/10.1159/000518396.

7)  Mohamed, B. M., El Dakhakhny, A. M., Bassam, S. E. A., & El Sayed, L. M. (2019). Assessment of nursing care provided to premature neonates at neonatal intensive care unit at Zagazig University Children Hospital. *Zagazig Nursing Journal, 7*(2), 1–14.

8)  Wang, Y. (2017). The advance treatment on neonatal respiratory distress syndrome. *Journal of Pediatric and Neonatal Care, 6*(5), 78–98. https://doi.org/10.15406/jpnc.2017.06.00262.

9)  World Health Organization. (2017). *Maternal, newborn, child and adolescent health: What is quality of care and why is it important?* https://www.who.int/maternal_child_adolescent/topics/quality-of-care.

10) Ibrahim Abd El-Galil, N., Mohamed Adly, R., Elsayed AbdelHady, H., et al. (2019). Effect of staff development program on nurses' performance regarding quality standards of neonatal care. *Egyptian Journal of Health Care, 10*(4), 261–284. https://doi.org/10.21608/ejhc.2019.65535.

11) Samir, E. A., Mahmoued, F. S., & Bayoumi, M. H. (2023). Effect of evidence-based guideline on nurses' performance regarding care of high-risk neonates undergoing surfactant replacement therapy. *Benha Journal of Applied Sciences, 8*(4), 23–32. https://doi.org/10.21608/bjas.2023.194800.1079.

12) Eda, E. (2021). *Surfactant administration in the NICU*. The Royal Children's Hospital Melbourne.https://www.rch.org.au/rchcpg/hospital_clinical_guideline_index/Surfactant_Administration_in_the_NICU/.

13) Preterm Baby Package. (2020). *Surfactant administration* [Video]. YouTube. https://www.youtube.com/watch?v=DD_K-nqx2A8.

14) Mamo, J. R., & Shaker, N. Z. (2024). Quality of nursing care for neonates with respiratory distress syndrome at neonatal intensive care unit in teaching hospitals in Erbil City. *Erbil Journal of Nursing and Midwifery,7*(1),10–22. https://doi.org/10.15218/ejnm.2024.02

15) Hockenberry, M. J., & Wilson, D. (2021). *Wong's nursing care of infants and children* (11th ed.). Elsevier.

16) Elsayed, L. A., El-Nagger, N. S., & Aly, S. M. (2013). Nursing care provided for neonates with respiratory distress syndrome in the neonatal intensive care units at Makkah Al-Mukarramah in Saudi Arabia. *Life Science Journal, 10*(1), 3403–3412.

17) Loutfy, A., Mohamed, A. R., & Abed Ella, N. H. (2014). Quality of nursing care provided for preterm infants suffering from respiratory distress syndrome. *Port Said Scientific Journal of Nursing, 1*(2), 281–295. https://doi.org/10.21608/pssjn.2014.35072.

18) Refat, N. H., Zak, N. A., Sayed, E. H., & Ahmed, M. K. (2020). Impact of an educational program on improving nurses' knowledge and practice concerning caring for neonates with respiratory distress syndrome. *Assiut Scientific Nursing Journal, 8*(22), 145–152. https://doi.org/10.21608/asnj.2020.38850.1032.

19) Said Hendy, A., Saad Al-Sharkawi, S., & Abd Al-Moniem, I. I. (2020). Nursing competency for caring of high-risk neonates at neonatal intensive care unit. *Egyptian Journal of Health Care, 11*(2), 200–213.

20) Kunswa, M. A., & Mohamed, H. R. (2021). Effect of instructional guidelines on nurses' performance regarding care of high-risk neonates undergoing extubation of mechanical ventilator. *Egyptian Journal of Health Care, 12*(2), 1739–1756. https://doi.org/10.21608/ejhc.2021.234298

21) Ali, R. A., Obeisat, S. M., & Tarawneh, L. H. (2019). Improving nursing knowledge and care for neonates with respiratory distress in Jordan. *International Nursing Review, 66*(3), 338–345.

22) Mohammed, M. A. K., & Abou Zed, S. A. F. (2019). Effect of instructional guidelines on nurses' performance regarding care of high-risk neonates undergoing surfactant replacement therapy. *International Journal of Novel Research in Healthcare and Nursing, 6*, 323–342.

23) Elsobkey, F., & Amer, S. (2018). Effect of educational guidelines program about nursing care of neonates receiving continuous positive airway pressure. *IOSR Journal of Nursing and Health Science, 7*(3), 16–26.

24) Shehata, O. G., Rashed, H. M., Dabash, S, A., & Osman, Z. E. (2024). Effect of designed guidelines about oxygen therapy for neonates on nurses' knowledge and skills. *(ECB) Journal of Nursing and Health Science*, *12*(7), 3702-3706.

25) Dawoud Mostafa, N. S., Bahgat, R. S., & Dawood, B. M. (2023). Effect of educational guidelines program on nurses' performance for caring of neonates receiving continuous positive airway pressure ventilation. *Tanta Scientific Nursing Journal, 30*(3), 127–143.