Assiut Scientific Nursing Journal
http://asnj.journals.ekb.eg http://www.arabimpactfactor.com
DOI : 10.21608/asnj.2023.160863.1429 http://olddrji.lbp.world/indexedJournals.aspx
https://vlibrary.emro.who.int/journals/assiut-scientific-nursing-journal

Effect of Instructional Module Versus Simulation Based Endotracheal Suction Education on The Performance and Self-Efficacy of Neonatal Intensive Care Unit Nurses

Samya Hegazy [1] & Seham Eid Hashem Elhalafawy[2]
[1.] Assistant Professor of Pediatric Nursing, Faculty of Nursing, Tanta University, Egypt
[2.] Lecturer of Pediatric Nursing, Faculty of Nursing, Tanta University, Egypt

Abstract
Background: Endotracheal tube suctioning (ETS) is a crucial procedure that neonatal and pediatric nurses should perform in effective and efficient way through exposure to various teaching methods such as simulation and periodic training. **Aim:** to investigate effect of using instructional module (IM) versus simulation based endotracheal suction education on the performance and self-efficacy of Neonatal Intensive Care Unit (NICU) nurses. **Research design:** Quasi-experimental research design. **Sample:** all nurses working in the NICU (50) nurses at the time of data. **Setting**: Tanta University hospital. **Tools: Tool 1:** Nurses' Knowledge regarding endotracheal tube suctioning, **Tool 2:** Endotracheal Suction Observation Checklist and **Tool 3:** General Self-efficacy Scale. **Results:** levels and total mean scores of nurses' knowledge, practice, and self-efficacy about ETS were found to have significantly improved before, after, and eight weeks after the teaching intervention. **Conclusion:** Both methods were beneficial in enhancing nurses' knowledge, practice and self-efficacy in performing ETS but differences were higher in the total levels and mean scores among nurses who received simulation-based education. **Recommendations:** periodic and continuously supervised training should be provided for (NICU) nurses regarding ETS to improve the patient's outcome.

Keywords: ***Endotracheal Tube, Instructional module, Neonatal Intensive care Unit, Nurse's Performance, Self-efficacy, Simulation & Suctioning***

Introduction
Most neonates admitted to NICU require mechanical ventilation with an endotracheal tube or other artificial airway. Endotracheal tube suctioning is a necessary procedure carried out in NICU **(Mwakanyanga et al 2018).** Endotracheal suctioning (ETS) is defined by the American Association for Respiratory Care as the "mechanical aspiration of pulmonary secretions from a neonate's or infant's artificial airway to prevent its blockage"(**Kim et al 2019)**. Due to respiratory muscle weakness, they require ETS to avoid airway blockage, atelectasis, and lung infections. Risks associated with ETS include hypoxemia, heart rhythm abnormalities, trauma, and, in serious conditions, cardiac arrest and death (**Simes et al 2018**).

Staff members should be aware of these hazards and adhere to the recommendations made by the AARC in order to avoid these issues as well as improve the outcomes for newborns **(Mwakanyanga et al 2018).** Guidelines include employing high positive end-expiratory pressure in an isolated circuit, instilling no fluids into the trachea prior to ETS, and administering 100% oxygen before, during, and after ETS. According **(Jeet et al 2017)** nurses are unfamiliar of the current guidelines and practices for suctioning, and they frequently rely on ritual and tradition, which result in errors. In addition, the nurse's inability to commit to the aseptic technique may be a factor in infection transmission, extending the neonate's stay. Consequently, competent and well-informed nurses are extremely important and required to make appropriate patient clinical judgement to reduce the risks and improve health outcomes**.**

Nursing practice must be based on a solid body of scientific knowledge to maintain the highest standards of care, diminishing ventilator associated pneumonia (VAP)-related morbidity and mortality **(Haerling 2018)**. This can be accomplished by pursuing the evidence-based recommendations and receiving regular, strictly monitored endotracheal suctioning training. The field of nursing science is crucial to the functioning of the entire healthcare system. Nurses deserve special consideration because their ongoing education are crucial to the success of the system **(Lillekroken et al 2019 & Babenko et al 2015)**. Nursing education is inextricably linked to the development of new technologies, with the availability of various teaching aids having a direct impact on how nurses are educated **(Khan et al 2015).**

To boost their nurses' and students' satisfaction and confidence, several nursing teachers have turned to simulation rather than more conventional techniques. Those with higher levels of self-efficacy are more probable to be successful in their objectives. The

belief that one can successfully carry out one's nursing duties without direct supervision is called self-efficacy. It is crucial to delivering high-quality care and protecting patients from harm, making it an important goal of clinical education programs. To that end, simulation-based learning has proven to be an effective technique of education **(Ran et al 2011)**. The term "simulation" refers to a method that uses guided encounters that are a close copy of the real world to either supplement or fully replace real-world experiences. In other words, it is "the process by which we attempt to obtain findings as near as feasible to those obtained in actual practice" (**Mosser et al 2013**).

Healthcare professionals can learn and improve their knowledge, abilities, and mindsets through simulation, which is a teaching and training method **(Ahmed 2015)**. It strengthens health care systems by providing a safe space for interprofessional training and the practice of clinical skills. Training in a simulated environment is an effective way to build proficiency in a variety of areas, including conversation, teamwork, problem-solving, and interpersonal awareness **(Aarabi et al 2015)**.

Significance of the problem:

Airway management in intubated newborns relies heavily on efficient suctioning. So, it is essential to pay close attention throughout the entire suction process in order to minimize its difficulties. In order to enhance the outcomes for neonates, nurses must do thorough assessments, carefully prepare infants, and keep sterilization standards consistent. When results are better, neonates spend less time in the intensive care unit, spend less time in the hospital overall, and lower costs as a result **(Ghorbanpoor et al 2018 & Ebrahimi et al 2020).** This study will enable us to gain insight into the effect of using instructional module versus simulation based endotracheal suction education on the performance of intensive care unit nurses.

Aim of the study

The study was conducted to investigate effect of instructional module versus simulation based endotracheal suction education on the performance and self-efficacy of neonatal intensive care unit nurses.

Research hypothesis

Nurses who received simulation based endotracheal suction education expected to have higher performance and self-efficacy than those who received instructional module.

Subjects and Method

Study design: Pretest and posttest quasi-experimental research design was utilized in this research

Subjects and setting: the study population include All nurses (50) working in (NICU) at Tanta University Hospital, Egypt September to December 2022. After exclusion of 5 nurses involved in the pilot study. The unit consisted of one large room included 12 incubators and 5 mechanical ventilators, the second room included 8 incubators and 3 ventilators, finally small room included 4 incubators and 2 ventilators. There was room for meetings for nurses' and doctors' education. The nurses distributed randomly and equally into two groups:

Group one (simulation group): who received simulation-based education (n=25).

Group two (Instructional Module group IM): who received education through demonstration and re-demonstration (n=25).

Data collection tools:

The data were collected using face-to-face interviews. The following tools were used to collect the data.

Tool one: Nurses' Knowledge regarding endotracheal tube suctioning: The researcher used this tool to determine the level of knowledge about ETS that included two parts: structured interview schedule created by the researcher in accordance with the study's goals and extensive literature review (**Ebrahimi et al 2020**, **Alshammari et al 2017and Fallahinia et al 2018).**

Part one: Socio-demographic characteristics of the nurses that included age, gender, education level, experience in NICU and attendance of any training program about ETS.

Part two: Knowledge regarding endotracheal tube suctioning questionnaire sheet that covered the nurses' knowledge regarding ETS and composed of 19 multiple choice questions form (MCQ). Each correct answer scored one and each incorrect answer scored zero. There were 19 questions in all. The following classifications were made based on the overall scores of nurses' knowledge: <50 % (less than 10) was considered low knowledge, from 50- <75 % (ranged from 10-13) was considered moderate knowledge, and 75- 100 % (ranged from 14-19) was considered high knowledge.

Tool II: Endotracheal Suction Observational Checklist (Mwakanyanga et al 2018, Ahmed 2015 and Fallahinia et al 2018): It was developed by the investigators to assess practices regarding ETS performed by nurses. It included five items: assessment, equipment and patient preparation, application, post-procedure care, and documentation, which comprised the steps for each procedure. The researcher completed the observational checklist, which included (40) items. Each item of practice was evaluated as follows: The correct response received a score of one, and the wrong response received a score of zero for each point. The total for nursing practice

items was forty. Nursing practices were scored and categorized as follows:

- Practices scored less than 60% was unsatisfactory practices
- Practices scored equal or more than 60% were satisfactory practices.
- The Cronbach's alpha of the scale was 0.90.

Tool III: General Self-efficacy Scale (GSE): This scale was developed by (**Schwarzer and Jerusalem 1995)**. This scale provides a self-reported measure of self-efficacy. The nurses' general level of perceived self-efficacy was evaluated using ten items: The score of the scale varied from 10 - 40, with a higher score indicating greater self-efficacy. There were different score scales for each question: Not at all true scored 1, Hardly true scored 2, Moderately true scored 3 and exactly true scored 4. The total scale scores obtained by summing all the scores together. Perceived self-efficacy varied from (24 – 40) and not perceived self-efficacy varied from (0 – 23). The Cronbach's alpha of the scale of the current study was 0.89

Tools validity and reliability: the content validity of the study tools was assured by a panel of experts in pediatric nursing and a pediatrician. Reliability of the developed tools was tested for the internal consistency .and content validity index was 96%.

Methods:

1. An official permission was acquired from the supervisor of NICU of Tanta university hospitals. Nurses' oral consent to participate in the study was obtained after clarification of the study objective.
2. **Ethical considerations:** Every nurse was given the assurance that all information acquired would be treated confidentially Tanta University's Faculty of Nursing's Ethics Committee approved this study with code number 91-9-22.
3. **Pilot study:** was conducted on 10 % (5 nurses) of study population to test clarity, reliability, visibility and applicability of the study tools. The Pilot study was excluded from the study population because modifications was done on the tools.
4. **Data collection:** The researchers started to collect data from the selected setting and from the intended nurses after fulfilment of the administrative process. Data collection was conducted through the time period from September to December 2022. Four phases were used to complete the data collection process. The second researcher was available to gather the data Saturday through Wednesday, from 8:00 a.m. to 1:00 p.m.

Assessment Phase: Nurses' sociodemographic characteristics were assessed using tool I. Before the educational intervention, the researcher distributed the questionnaire to the sample after exclusion of the 5 nurses who were included in the pilot study.

Planning phase: Establishing goals and preparing content that addressed the motivations for the session's application. The researcher held a small group discussion with the morning shift nurses at the end of their shift and with the night shift in the early morning. Each group was divided into three small groups (9, 8,8). The nurses' responsibilities were structured to avoid any drop with training time. Sessions and time of the program were decided, and other facilities were checked, as core component of the program's planning.

Teaching location: The NICU seminar room where the study was done the time for instruction was determined by the timetable and in consultation with the head nurse, nurses, and researcher. Simple teaching techniques like lectures, discussions, demonstrations, and re-demonstrations were included in the teaching methods and resources. the visual, auditory, and printed media.

Implementation phase: The contents of the program broken down into four sessions:

The first session: After the pre-test data was collected, the researcher observed the NICU nurses' (n=50) ETS practices of intubated infants according on the checklist to determine their week points. Each nurse took the appropriate amount of time to complete the questionnaire, which took them 30 minutes to complete. Nurses' ETS practices were noted in the checklist.

The second session: Was done as follows: the researcher provided knowledge about definition, types of suction, endotracheal suction definition, purpose, indication, contraindication and potential hazards. This was done and achieved through interactive lectures and group discussions using audio-visual aids such as PowerPoint, illustrated pictures, and videos. Any questions answered by the researcher. This session lasted (40) minutes for each small group (6 small groups).

The third session and fourth session: Included the practical part, different sizes of catheter and common mistakes: This section described the ETS procedure's steps (pre, during, and post endotracheal suction).

Instructional Module group: It was carried out through demonstration and re-demonstration utilizing photos, videos, and a mannequin for training of nurses before carrying out the procedure on a real, intubated newborn. It lasted (90) minutes divided into two days of work. The second researcher was available for four days/week in the hospital. Nurses allowed asking questions and every nurse allowed to discuss and repeat by herself the steps to her colleges and at the end they evaluate each other and detect the mistakes or any dropped steps.

Simulation group: The unit provided a lecture hall for the administration of the teaching program, where the instructor performed suctioning on moulage and provided the required explanation. Their knowledge in all parts was scored 0 or 1 on the checklist. Nurses were instructed to perform the same procedure and then discuss and correct any errors. Nurses' performance and knowledge at the newborn's bedside were re-evaluated throughout all shifts. Education was also completed via simulation, and the procedure was later performed on an actual intubated neonate on the second day. In addition, the researcher provided feedback on the nurses' performance.

Evaluation Phase: Knowledge, practice and self-efficacy of the two groups were assessed before applying educational intervention, after 2 weeks and the third time, after eight weeks to collect post- test.

Data analysis

The data was analyzed using SPSS version 24 for Windows. Following the normality check, descriptive statistics were employed to analyze the percentages, mean scores, and standard deviation of the descriptive demographic data (SD). The t-test was employed to compare the means of two groups of parametric data from independent samples. The F value of the ANOVA test was computed to compare parametric data that had more than two means. The Pearson's correlation coefficient was used to investigate the correlation between the variables (r). Statistical significance was set at p-value 0.05. **(White 2019)**

Results:

Table (1): Percentage distribution of studied nurses related to their socio- demographic characteristics

Nurses' characteristics	Simulation group (n=25)		IM group (n=25)	
	No	%	No	%
Age (years):				
25<30	9	36.0	15	60.0
30-35	9	36.0	6	24.0
More than 35	7	28.0	4	16.0
Range	**26 – 44**		**25 – 43**	
Mean ± SD	**33.60 ± 5.492**		**30.88 ± 5.600**	
Sex:				
Female	25	100.0	25	100.0
Level of Education:				
Technical Institute of Nursing	12	48.0	7	28.0
Bachelor	12	48.0	17	68.0
Master	1	4.0	1	4.0
Years of experience				
Less than one year	3	12.0	5	20.0
1< 4 years	4	16.0	5	20.0
4 – 6 years	8	32.0	4	16.0
More than 6 years	10	40.0	11	44.0
Attending training programs on endotracheal suctioning				
Yes	12	52.0	16	64.0
No	13	48.0	9	36.0

Table (2): Levels and mean total score of studied nurses' knowledge regarding neonatal endotracheal suction before, after two- and eight-weeks following teaching intervention

Total knowledge	Simulation group						Sig. test P	Instructional module (IM) group						Sig. test P
	Before (n=25)		After 2 weeks (n=25)		After 8 weeks (n=25)			Before (n=25)		After 2 weeks (n=25)		After 8 weeks (n=25)		
	No	%	No	%	No	%		No	%	No	%	No	%	
Levels scores of knowledge							χ^2 P							χ^2 P
Low knowledge (less than 10)	24	96.0	0	0.0	0	0.0	**76.72**	22	88.0	0	0.0	0	0.0	**65.03**
Moderate knowledge (10 – 13)	1	4.0	0	0.0	4	16.0	**0.0001****	3	12.0	4	16.0	5	20.0	**0.0001****
High knowledge (14 – 19)	0	0.0	25	100.0	21	84.0		0	0.0	21	84.0	20	80.0	
χ^2 (Simulation *Vs* IM group) P	1.087 0297		**4.348 0.037***		**5.556 0.018***									
Range Mean ± SD	3 – 12 7.160±2.303		14 – 19 16.040±1.5593		12 – 19 14.960±2.030		**F value 147.09 0.0001****	4 – 13 8.320±2.444		13 – 18 15.520±1.734		12 – 16 14.320±1.069		**F value 110.16 0.0001****
t-test (Simulation Vs IM group) P	1.727 0.091		0.619 0.435		**9.121 0.004***									

**: Statistically significant at $p \leq 0.05$*

Table (3): Levels and mean total score of studied nurses' practice regarding neonatal endotracheal suction before, after two- and eight-weeks following teaching intervention

Total Practice	Simulation group						Sig. test P	Instructional module (IM) group						Sig. test P
	Before (n=25)		After 2 weeks (n=25)		After 8 weeks (n=25)			Before (n=25)		After 2 weeks (n=25)		After 8 weeks (n=25)		
	No	%	No	%	No	%		No	%	No	%	No	%	
Levels scores of practices							χ^2 P							χ^2 P
Satisfactory practice. (29 – 47)	0	0.0	25	100.0	25	100.0	**75.000**	5	20.0	25	100.0	23	92.0	**46.827**
Unsatisfactory practice (0 – 28)	25	100.0	0	0.0	0	0.0	**0.0001****	20	80.0	0	0.0	2	8.0	**0.0001****
χ^2 (Simulation Vs. IM group) P	**5.556 0.018***		-- --		2.083 0.149									
Range Mean ± SD	16 – 25 20.52±2.043		35 – 47 41.04±3.44		33 – 45 38.44±3.342		**F value 343.895 0.0001****	15 – 32 22.24±5.36		33 – 45 37.00±3.719		24 – 36 31.12±2.368		**F value 85.885 0.0001****
t-test (Simulation Vs IM group) P	1.498 0.144		**3.984 0.0001****		**8.934 0.0001****									

**: Statistically significant at $p \leq 0.05$*

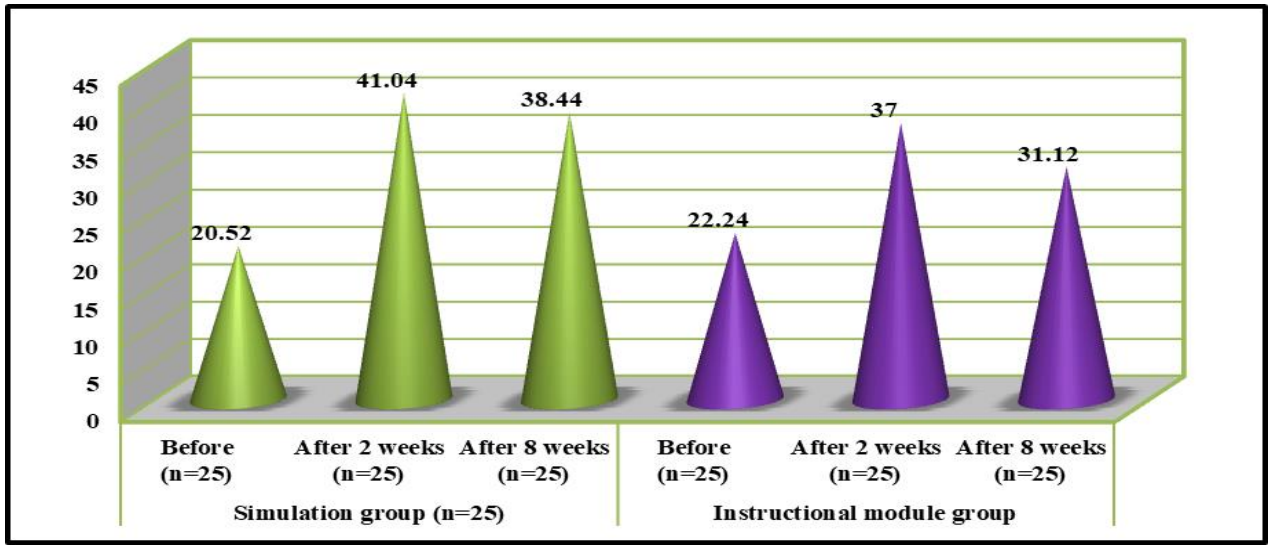

Figure (1): Mean of total score of studied nurses' practice regarding neonatal endotracheal suction before, after two- and eight-weeks following teaching intervention.

Table (4): Levels and mean total score of studied nurses' self-efficacy regarding neonatal endotracheal suction before, after two- and eight-weeks following teaching intervention

Total Self-efficacy	Simulation group						Sig. test P	Instructional module (IM) group						Sig. test P
	Before (n=25)		After 2 weeks (n=25)		After 8 weeks (n=25)			Before (n=25)		After 2 weeks (n=25)		After 8 weeks (n=25)		
	No	%	No	%	No	%		No	%	No	%	No	%	
Levels scores of self-efficacy							**χ^2 P**							**χ^2 P**
Perceived. (24 – 40) Not perceived (0 – 23)	0 25	0.0 100.0	25 0	100.0 0.0	25 0	100.0 0.0	**75.000 0.0001****	6 19	24.0 76.0	25 0	100.0 0.0	25 0	100.0 0.0	**50.893 0.0001****
χ^2 (Simulation *Vs* IM group) P	**6.818 0.009***		-- --		-- --									
Range Mean ± SD	9 – 18 14.36±2.899		30 – 40 33.48±3.029		30 – 39 33.52±2.694		**F value 377.287 0.0001****	10 – 30 19.64±5.544		29 – 40 33.44±2.567		29 – 35 31.32±1.547		**F value 104.270 0.0001****
t-test (Simulation Vs IM group) P	**4.219 0.0001****		0.050 0.960		**3.540 0.001***									

*: Statistically significant at $p \leq 0.05$

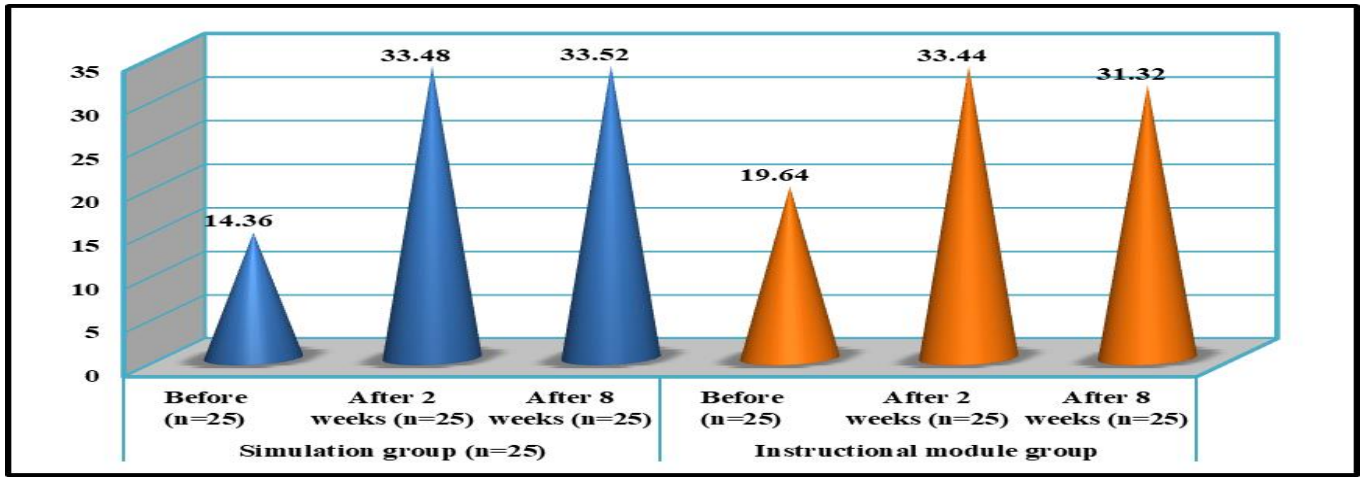

Figure (1): Mean of total score of studied nurses' self-efficacy regarding neonatal endotracheal suction before, after two- and eight-weeks following teaching intervention.

Table (5): Correlation between total scores of the studied nurses' knowledge, practice, and self-efficacy related to neonatal endotracheal suction before, after two and eight weeks of teaching intervention

Variables	Total knowledge scores (n=50)											
	Simulation group (n=25)						Instructional module group (n=25)					
	Before		After 2 weeks		After 8 weeks		Before		After 2weeks		After 8 weeks	
	r	P	r	P	r	P	r	P	r	P	r	P
Total practice scores	**0.424**	**0.035***	**0.107**	**0.612**	**0.540**	**0.038***	**0.397**	**0.049***	**0.039**	**0.6854**	**0.460**	**0.021***
Total self-efficacy scores	**0.159**	**0.449**	**0.021**	**0.919**	**0.449**	**0.023***	**0.010**	**0.964**	**0.253**	**0.223**	**0.036**	**0.863**

**: Statistically significant at p ≤ 0.05*

Table (6): Effect of socio–demographic characteristics of the simulation group on their knowledge, practice, self-efficacies mean scores before, post 2 and 8 weeks of teaching intervention

Socio–demographic characteristics	Simulation group (n=25)								
	knowledge score			Practice score			Self-efficacy score		
	Mean ± SD								
	Before	After 2 weeks	After 8 weeks	Before	After 2 weeks	After 8 weeks	Before	After 2 weeks	After 8 weeks
Age (in years)									
25<30	6.55±2.12	15.66±1.80	14.88±2.26	20.22±1.30	41.55±1.74	39.00±1.87	8.00±2.44	16.42±1.27	14.85±2.60
30-35	7.11±2.42	16.11±1.69	15.11±1.45	20.22±2.16	41.55±4.06	39.44±3.97	21.28±2.69	**39.71±4.30**	36.42±3.50
More than 35	13.87±2.59	37.53±2.85	13.87±2.59	14.00±3.16	35.66±3.57	33.22±2.22	12.71±2.81	32.42±2.07	33.85±2.26
F value, P	0.762, 0.479	0.442, 0.648	0.036, 0.96	0.663, 0.525	0.702, 0.507	1.941, 0.167	3.098, 0.065	**4.875, 0.018***	0.102. 0.903

Socio–demographic characteristics	Simulation group (n=25)								
	knowledge score			Practice score			Self-efficacy score		
	Mean ± SD								
	Before	After 2 weeks	After 8 weeks	Before	After 2 weeks	After 8 weeks	Before	After 2 weeks	After 8 weeks
Educational level									
Technical Institute of Nursing	7.75±2.41	16.25±1.71	14.58±2.19	20.50±2.31	41.52±3.86	38.25±3.51	14.00±3.35	32.75±2.95	33.25±2.62
Bachelor	6.58±2.23	16.00±1.47	15.41±1.92	20.16±1.33	40.33±2.67	38..08±2.81	14.41±2.69	33.66±2.60	33.66±3.22
Master	7.00±0.00	14.00±0.00	14.00±0.00	25.00±0.00	47.00±0.00	45.00±0.00	18.00±0.00	40.00±0.00	35.00±0.00
F value, P	0.756, 0.481	0.921, 0.413	0.601, 0.557	3.017, 0.070	1.904, 0.173	2.218, 0.133	0.874, 0.431	3.174, 0.061	0.214, 0.809
Years of experience:									
Less than one year	6.66±0.57	14.00±0.00	13.33±0.57	21.66±2.88	45.00±1.73	43.33±2.08	15.33±4.61	**37.33±4.61**	35.33±0.57
1<4 years	5.25±0.95	16.00±2.30	13.75±2.06	20.00±1.15	41.75±1.25	**38.75±2.06**	16.25±1.70	32.25±2.87	35.00±3.82
4 – 6 years	7.62±2.72	16.25±1.48	15.62±1.18	20.00±1.41	40.75±3.32	38.25±3.01	14.25±2.71	34.12±2.90	32.00±2.07
More than 6 years	7.70±2.40	16.50±1.26	15.40±2.50	20.80±2.52	39.80±3.82	37.00±3.16	13.40±2.83	32.30±1.70	33.60±2.63
F value, P	1.302, 0.300	2.277, 0.109	1.693, 0.199	0.605, 0.619	2.073, 0.134	**3.732, 0.027***	1.056, 0.389	**3.117, 0.048***	1.898, 0.161

Table (7): Effect of socio–demographic characteristics of the instructional module group on their knowledge, practice, self-efficacies mean scores pre and post intervention.

Socio–demographic characteristics	Instructional module group								
	knowledge score			Practice score			Self-efficacy score		
	Mean ± SD								
	Before	After 2 weeks	After 8 weeks	Before	After 2 weeks	After 8 weeks	Before	After 2 weeks	After 8 weeks
Age (in years)									
25<30	7.35±2.16	14.92±1.63	14.00±0.87	19.78±4.37	36.85±3.67	32.00±1.75	18.78±6.50	33.85±2.50	31.35±1.64
30-35	9.28±2.49	16.28±1.49	15.00±0.81	**26.42±5.34**	38.71±4.23	29.57±3.15	19.85±3.02	**34.28±2.05**	31.85±1.34
More than 35	10.00±2.16	16.25±2.06	14.25±1.70	23.50±4.35	34.50±1.00	30.75±1.50	22.25±5.61	30.50±1.73	30.25±1.25
F value, P	3.007, 0.070	2.004, 0.159	2.268, 0.127	**4.922, 0.017***	1.763, 0.195	2.911, 0.076	0.594, 0.561	**3.979, 0.033***	1.433, 0.260
Educational level									
Technical Institute of Nursing	9.28±2.13	16.00±1.52	14.42±1.27	22.71±5.46	36.00±2.69	29.42±3.51	19.42±5.68	33.14±3.93	31.42±1.98
Bachelor	8.00±2.57	15.47±1.77	14.35±0.99	22.29±5.54	37.05±3.61	31.52±1.66	19.41±5.66	33.47±1.97	31.17±1.38
Master	7.00±0.00	13.00±0.00	13.00±0.00	18.00±0.00	43.00±0.00	**36.00±0.00**	25.00±0.00	35.00±0.00	33.00±0.00
F value, P	0.825, 0.451	1.371, 0.275	0.792, 0.465	0.321, 0.729	1.639, 0.217	**5.840, 0.009***	0.465, 0.634	0.218, 0.806	0.661, 0.526
Years of experience:									
Less than one year	7.20±2.16	15.00±2.00	14.20±0.83	19.20±1.09	37.20±4.20	32.00±3.08	23.60±5.12	34.20±4.08	31.40±1.81
1<4 years	9.00±2.00	15.00±1.87	13.80±0.84	19.80±6.15	37.80±2.58	32.80±0.83	16.20±3.78	33.60±1.81	31.80±1.30
4 – 6 years	10.25±1.50	17.25±1.50	15.50±0.57	**29.25±0.95**	38.00±3.55	29.00±3.46	19.75±0.95	32.75±1.89	31.75±1.25
More than 6 years	7.81±2.75	15.36±1.43	14.18±1.16	22.18±5.09	36.18±4.26	30.72±1.42	19.36±6.59	33.27±2.49	30.90±1.70
F value, P	1.568, 0.227	1.826, 0.173	2.492, 0.088	**4.565, 0.013***	0.326, 0.807	2.718. 0.070	1.617, 0.215	0.239, 0.868	0.493, 0.691

Table (1): Shows that for the simulation and IM groups, mean ± SD of nurses' age was 33.60 ± 5.492 and 30.88 ± 5.600, respectively. In the IM group, 68 percent of the nurses had a bachelor's degree in nursing, compared to 48 percent of the nurses in simulation group. In terms of experience over the years, (40%) and (44%) had more than 6 years among nurses of simulation and IM groups respectively, and that one hundred percent of them were female. However, (48%) and (36%) of them had never attended a training course on the ETS procedure, respectively.

Table (2): Indicates that (96%) of the simulation group study participants had low level of knowledge of ETS before to intervention, comparable to (88%) of the nurses in the IM group. While all the studied sample of simulation group had high knowledge scores (100% and 84%), 2 and 8 weeks post-teaching intervention, respectively compared to (84% & 80%) in the IM group**.** This table showed that the total level of the nurses' knowledge in the simulation and IM groups was improved 2 and 8 weeks after the teaching intervention with statistically significant difference among two groups (P=0.037 and 0.018) respectively.

Moreover, following an 8-week educational intervention, there were statistically significant differences between two groups' nurses' mean knowledge scores (P=.0004). The table showed that 2 and 8 weeks following the instructional intervention, nurses in the simulation group had higher mean knowledge scores than nurses in the IM group.

Table (3): Clears that the level of the nurses' practice regarding ETS in the simulation and IM groups was improved 2 and 8 weeks after the teaching intervention with statistically significant difference among the nurses in each group, Moreover, there were statistically significant difference among nurses of the two groups 2 and 8 weeks after teaching intervention regarding the mean score of nurses practice (P = 0.0001). The table also showed that the mean score of nurses practice regarding ETS was higher among nurses of the simulation group than that of IM group 2 and 8 weeks after the teaching intervention.

Figure (1): Shows that mean of total score of studied nurses' practice regarding ETS in the simulation group improved from 20.52 before teaching to 41.04 and 38.44 after 2 and 8 weeks respectively after teaching. In relation to IM group, it was also improved from 22.24 before teaching to 37 and 31.12 respectively 2 and 8 weeks respectively after teaching.

Table (4): Represents that all nurses in the simulation group did not perceive self-efficacy compared to (24%) in the IM group regarding ETS prior to teaching. The table showed that all nurses of both groups perceived self-efficacy regarding ETS two and eight-weeks following teaching intervention and there was a statistically significant difference among nurses of each group regarding overall their self-efficacy and there was statically significance difference among nurses of both groups before the teaching intervention with (P=0.009). Also, it was revealed that there was statistically significant difference in the total mean score of self-efficacy between nurses regarding ETS of the two groups before and after 8 weeks of teaching intervention.

Figure (2): Demonstrates that mean score of the studied nurse's self-efficacy improved from 14.36 to 33.48 and 33.52 before, 2 and 8 weeks of teaching intervention respectively in the simulation group while it was 19.4 before teaching that increased to 33.44 and 31.32 two and eight weeks after teaching intervention among nurses of IM group.

Table (5): Shows that there was a significant positive correlation between the total scores of nurses' knowledge and practice relevant to the ETS before, after eight weeks of teaching intervention, with P=0.035 and .038, respectively), and also among nurses in the IM group with (P=0.049 and 0.021. Only after eight weeks of educational intervention, there was positive significant correlation between the total scores of nurses' knowledge and self-efficacy related to ETS in the simulation group (P=0.023).

Table (6): illustrates that after eight weeks of education pertaining to the ETS, there was a statistically significant positive correlation between the practice scores of the nurses in the simulation group and their years of experience with P = 0.027. Also, there was a statistically significant correlation between the investigated nurses' age and their experience years in the simulation group & their self-efficacy scores after 2 weeks of teaching intervention with P = 0.018& 0.048, respectively.

Table (7): Proves that there was a statistically significant positive relationship between age and experience of nurses of IM group & their practice before teaching related to ETS with P= 0.017&0.013, respectively. there was a statistically positive relationship between educational level of nurses of IM group & their practice after 8 weeks teaching related to ETS with P= 0.009. Also, there was a statistically significant association between the nurses in the IM group & their self-efficacy scores after 2 weeks of teaching intervention with P =0.033.

Discussion

One of the frequent procedures carried out by nurses in NICUs is tracheal suctioning. Among the clinical professionals, nurses have an essential function in performing suction. To correctly perform the

suctioning operation, nurses must adhere to standardized ETS evidence-based recommendations. to reduce the incidence of common complications of tracheal suctioning **(Pinto, 2020)**. Based on the recent research, post-tests that were given two and eight weeks after the educational intervention indicated a significant improvement in the total level and mean score of the nurses' ETS knowledge in both groups. These results supported the conclusion made by (**Elbokhary, 2019),** who stated that the total knowledge of the studied subjects has increased from 30% in phase one to 68% in phase two with highly significant results.

These results were also in line with those of **(Hassan, 2018),** who found that the nurses' overall knowledge of endotracheal tube care increased after program implementation and follow-up than before the implementation, and who came to the conclusion that this might be because of the intensive care unit's in-service training and education program. The present study also demonstrated that both groups' mean and total scores on the posttests provided two and eight weeks after instruction revealed improvement in the observed nurses' ETS practices. This result was consistent with **(Aboalizm & Hamed, 2019)** who illustrated that following the intervention, the mean nurse's practice improved. The findings were consistent with those of **(Azizian et al., 2020),** who reported significant improvement in nurses' practice scores across the board following the intervention as compared to baseline.

In terms of nurses' overall feeling of self, the current study found that nursing staff in both groups had perceived self-efficacy regarding neonatal ETS after two- and eight-weeks following teaching intervention. This result can be related to the effect of teaching technique and nurses were satisfied after using discussion and simulation that lead to improve their knowledge retention, skills, communication and increased their self-confidence and satisfaction. This result was congruent with the study of **(Babenko, 2015)** revealed that after applying simulation-based learning, the studied sample had gained the requisite knowledge and skills and had a high level of self-efficacy.

In the present study, overall practice and knowledge scores for nurses regarding ETS were positively correlated before and eight weeks after the educational intervention in both groups. This may be connected to the assumption that the use of simulation in conjunction with a combination of various teaching approaches improved the nurses' knowledge and resulted in a surge in their confidence while applying or practicing the procedure. **Majeed, (2017)** supports the findings that, following the educational intervention for ICU nurses, there was a relationship between nurses' practice and knowledge. The findings confirmed those of **Alshammari et al., (2017),** who found a clear positive relation between knowledge and performance following the intervention.

According to the current finding, there was a statistically significant favorable correlation among the educational attainment of the nurses in the IM group and their practice eight weeks after receiving education. This finding did not fall in line with that of **Elbokhary, (2019)**, who reported that there is no correlation between the degree of knowledge and practice and the nursing degree. This study demonstrated a statistically significant meaningful association between nurses' years of experience and their practice in the simulation group eight weeks after the instruction of neonatal ETS. This finding contrasts with those of **(Tero et al., 2015),** who found no correlation between years of experience, expertise, and practice. This was explained from the perspective of the researcher that grounds that higher experience among the nurses in the NICU resulted in more knowledge because of the expansion of their knowledge and clinical experience as nurses' time progressed. Finally, incorporation of simulation into the teaching process together with other educational approaches can allow nurses to provide high-quality healthcare by fostering integrated learning, critical thinking, and optimal decision-making abilities. **(Sarfati et al., 2019)**

Conclusion

According to this study's findings, the researchers founded that both approaches are effective at enhancing NICU nurses' performance of ETS, but following the interventions, a significant difference was discovered in mean score of nurses' knowledge, practice, and self-efficacy among those who had received simulation-based training.

Recommendations

1. In-service educational intervention programs about recent ETS recommendations should be performed periodically for nurses to refresh their theoretical as well as practical skills
2. In the intensive care unit, a colorful booklet with updated ETS guidelines should be issued.
3. Periodic supervised and continuous updated training should be provided for (NICU) nurses regarding ETS.
4. Encouraging nurses to attend endotracheal tube suction-related courses and training.

References

- **Aarabi A., Cheraghi M., & Ghiyasvandian S. (2015):** Modification of Nursing Education for Upgrading Nurses' Participation. Global Journal of Health Science.;7(4) :1-15**.**
- **Aboalizm E. & Hamed A. (2019):** Effect of educational intervention on nurses' knowledge and

practices regarding endotracheal tube suctioning. International Journal of Nursing and Health Science.;5(3):1-8.

- **Ahmed A. (2015):** Knowledge and Practice of ICU Nurses Regarding Endotracheal Suctioning for Mechanically Ventilated Patients in Khartoum Teaching Hospital. American. Journal of Clinical Neurology and Neurosurgery; 1(2):92-98.
- **Alshammari F., Edison S., Alrashidi A., Anamarie M., & Rosaupan J. (2017):** Effect of Simulated Learning Regarding Knowledge and Clinical Performance Ability on endotracheal Suctioning. International Journal of Nursing Care.; 10(9): 19-25.
- **Azizian K., Azadi A., Veisani Y., & Bastami M. (2020):** The effect of performance feedback and educational video on endotracheal-suctioning practices of critical care nurses. Journal of Education and Health Promotion; 9(3):112.
- **Babenko Y., Ferguson K., & Riddell T. (2015):** Influence of simulated and actual community clinics on students' empowerment and self-efficacy for public health nursing competencies. Journal of Public Health Nursing; 32(3): 277-83.
- **Ebrahimi H., Abbasi A., & Sohrabi S. (2020):** Effect of simulation-based suction education on the knowledge and performance of pediatric intensive care unit nurses. Journal of Critical Reviews.;7(5):680-690.
- **Elbokhary R. (2019):** Effect of Teaching Program on ICU Nurse's knowledge and Practice of Endotracheal Suctioning procedure at Omdurman military hospital, Ph.D degree in medical surgical nursing. Shendi University.
- **Fallahinia G., Gharabaghi A., & Azizi A. (2018):** The Effect of Standard Suction Training by Group Method Education on Nurses' Performance in Critical Care Unit. Scientific Journal of Hamadan Nursing & Midwifery Faculty; 26(2): 154-145.
- **Ghorbanpoor A., Jouybari L, Vakili M., Sanagoo A., & Kavosi A. (2018):** Knowledge and practices of nurses in intensive care units endotracheal suctioning. J Nurs Edu.; 7(2):9-17.
- **Haerling K. (2018):** Cost-Utility Analysis of Virtual and Mannequin-Based Simulation. Simul Healthc.; 13(1): 33-40.
- **Hassan A. (2018):** Effect of Educational Program on Nurses' practice Regarding Care of Adult Patients with Endotracheal Tube. Port Said Scientific Journal of Nursing; 5(2): 142-169.
- **Jeet G., Prinja S., & Aggarwal A. (2017):** Cost analysis of a simulation-based training for health workforce in India. Indian J Public Health; 61(2): 92-98.
- **Khan M., Agha S., & Alhamrani A. (2015):** Satisfaction of medical students with simulation-based learning. Saudi Medical Journal; 36(6): 731-6.
- **Kim J., Gu M., & Chang H. (2019):** Effects of an evidence-based practice education program using multifaceted interventions. BMC Med Edu; 19(5):1-10.
- **Lillekroken D. (2019):** Nursing students' perceptions towards being taught the fundamentals of care by clinical nurses within a simulated learning environment. Nurse Educ Pract.; 36(5):76-81.
- **Majeed H. (2017):** Assessment of knowledge and practices of intensive care unit nurses about endotracheal suctioning for adult patients in Baghdad teaching hospitals; 5(4):1396-1404.
- **Mosser N. & Stephens K. (2013):** Simulation to improve pediatric patient outcomes: university and hospital collaborative. Journal of Clinical Simulation in Nursing; 9(7): 243-7.
- **Mwakanyanga E., Masika G., & Tarimo E. (2018):** Intensive care nurses' knowledge and practice on endotracheal suctioning of the intubated patient. PLoS ONE; 13(8):1-10.
- **Pinto H., D'silva F., & Sanil T. (2020):** Knowledge and Practices of Endotracheal Suctioning amongst Nursing Professionals. Indian J Crit Care Med.; 24(1):23–32.
- **Ran H., Young K., & Min S. (2011):** The relationship among learning satisfaction, learning attitude, self-efficacy, and the nursing students' academic achievement after simulation-based education on emergency nursing care. Journal of Korean Academic Society of Nursing Education; 17(1): 5-13.
- **Sarfati L., Ranchon F., Vantard N., Schwiertz V., Larbre V., Parat S., Faudel A., & Rioufol C. (2019)**: Human-simulation-based learning to prevent medication error. J Eval Clin Pract. Feb; 25(1): 11-20.
- **Schwarzer R. & Jerusalem M. (1995):** Generalized Self-Efficacy scale. In J. Weinman, S. Wright, & M. Johnston, Measures in health psychology: A user's portfolio. Causal and control beliefs (pp. 35-37), Windsor, UK: NFER-NELSON.
- **Simes T., Roy S., O'Neill B., Ryan C., Lapkin S., & Curtis E. (2018):** Moving nurse educators towards transcendence in simulation comfort. Nurse Education in Practice; 28(2): 18-223.
- **Tero A., Pekka Y., & Helvi K. (2015):** Evaluation of endotracheal-suctioning practices of critical-care nurses. American Journal of Clinical Neurology and Neurosurgery. 1(2):92-98.
- **White S. (2019):** Reading the medical literature: Basic & Clinical Biostatistics. Lange Medical Book/ McGraw – Hill. Medical Publication Division, New York. 5th ed., Ch. 3-10, PP 20 – 233.