Effect of Developing Nursing Practice Guidelines on Comfort Behavior in Intubated pediatric patients

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Abstract

Background: Endotracheal tubes (ETTs) and mechanical ventilation (MV) are commonly used in the pediatric intensive care units. Despite being life-saving, they can make patients feel uncomfortable. Purpose: To evaluate the effect of developing nursing practice guidelines on comfort behavior in intubated pediatric patients. Research design: A quasi experimental design. It was carried out at pediatric intensive care unit (PICU) in Menoufia University Hospital. Sample: A convenient sample of 33 nurses and 60 intubated pediatric patients. Instruments: Three data collection instruments were used; structured interview questionnaire, comfort behavior Likert scale and observational checklist for nurses' practice. Results: There were highly statistical significant differences between nurses' knowledge and practices on post intervention compared to pre intervention. As well, intubated pediatric patients who received nursing care based on nursing practice guidelines showed a highly statistical significant improvement in the different levels of comfort behavior (73.3% VS 3.3%). Conclusion: Implementation of nursing practice guidelines improved nurses' knowledge and practices regarding promoting comfort behavior in intubated pediatric patients on post and follow-up tests than on pretest. Also, it contributed to lower levels of discomfort behavior in intubated pediatric patients on posttest than on pretest. Recommendations: The study recommended that ongoing in-service education programs about promoting comfort behavior in intubated pediatric patients should be designed and implemented in all pediatric intensive care units to improve nurses' knowledge and practices on the basis of nurse's actual needs.

Keywords: Nursing Practice Guidelines, Comfort Behavior, Intubated Pediatric Patients.

Introduction

Critically ill children and infants often require a Pediatric Intensive Care Unit (PICU), where they might need to receive critical care, including endotracheal intubation and mechanical ventilation **(Medjo et al., 2018).** Mechanical ventilation (MV) is a crucial therapeutic method used frequently in PICUs 20 to 64 percent of patients admitted to PICUs around the world need endotracheal intubation and mechanical ventilation **(Wolfler et al., 2016; Medjo et al., 2018).** MV may cause some difficulties and discomfort to patients, although there is the potential to save lives.

According to previous research, 54 percent of patients who received MV during intubation experienced discomfort **(Nelson et al., 2019).**

Furthermore, Patients in the pediatric intensive care unit (PICU) are subjected to unpleasant internal and external stimuli, both of which may cause discomfort. The bedside of a ventilated child in the PICU is overwhelming and includes bright lights, numerous alarms, regularly changing caretakers, several types of mechanical equipment, medical emergencies, erratic sleep/wake cycles, separation from the family and familiar surroundings **(Minardi et al., 2017; Nelson et al., 2019).** In actuality, some researches have found that PICU noise levels are eight times greater than those suggested by the World Health Organization and the American Environmental Protection Agency **(Milette & Carnevale, 2013).**

Therefore, due to the complexity and invasiveness of the treatments needed in the pediatric intensive care unit, it is not surprising that a higher percentage of children are prescribed comfort-promoting drugs in this setting than in other pediatric units. Due to this, it is crucial that children receive the right management to minimize any discomfort they may feel while they are in the PICU **(Arroyo-Novoa et al., 2018).**

Comfort is a priority for pediatric patients in all healthcare settings **(Balik et al., 2018).** A foundational and comprehensive approach to comfort management is provided by comfort theory. Comfort theory was developed by

Katharine Kolcaba in 1991. It is geared towards promoting comfort to patients through holistic nursing care. Kolcaba hypothesized that there is a relationship between patients' requirements, nursing actions, comfort and outcomes. The theory defined comfort as a state experienced by patients receiving comfort measures; it is conceptualized as a state of having needs met. Kolcaba defined comfort measures as nursing interventions designed to address specific comfort needs of patients **(Kolcaba & Kolcaba, 1991 & Bergström et al., 2018).**

Nursing practice guidelines are evidence-based documents that that make it easier to integrate the most recent findings into routine emergency nursing practice. It includes suggestions based on a systematic review and critical evaluation of the available research on a given clinical issue. In addition, it helps pediatric emergency nurses improve patient care by bridging the gap between practice and the latest research **(Boltz et al., 2020).**

According to the comfort hypothesis, clients can experience comfort if their requirements are addressed in the four comfort contexts of physical, psych-spiritual, environmental, and sociocultural comfort. Physical comfort pertains to bodily sensations experienced by the patient such as pain and pain relief. Internal awareness, including self-esteem, identity, sexuality, and life purpose, is related to psycho-spiritual comfort. Also, external surroundings and conditions of patients are related to the environmental comfort such as lighting, sound, heat and security. Sociocultural comfort indicates to personal, family and social interactions **(Kolcaba & Fisher, 1996& Oliveira et al., 2020).**

Nursing practice guidelines can promote comfort for intubated children during ventilator treatment according to the comfort theory through assessment of discomfort behavior, maintaining appropriate positioning, performing effective suctioning, providing good oral care, using effective communication, control of environmental stressors , encouraging parental presence and participation in child 'care and reassessment of discomfort behavior **(Rustam et al., 2018).** Therefore, this study was conducted to evaluate the effect of developing nursing practice guidelines on comfort behavior in intubated pediatric patients.

Significant of study

Endotracheal intubation (EI) and mechanical ventilation (MV) are frequently utilized with children to reduce ventilator-induced lung damage and improve gas exchange and patient comfort. They are common practices in pediatric intensive care units (PICUs). Rates of use in pediatric intensive care units across the majority of Latin American countries, as well as in Spain and Portugal, have ranged from 30% to 50%. One out of every two newborns and children admitted to PICUs required mechanically ventilated **(Medjo et al., 2018).** In the pediatric intensive care unit in Menoufia university hospital, number of children who were intubated and mechanically ventilated was 8 in July, 7 in August and 12 in September 2017. All these children are liable to discomfort, pain, anxiety, environmental noises, loneliness, depression, agitation and removal of lifesaving medical equipment (e.g., endotracheal catheters and intravascular lines) **(Wang et al., 2017).** Moreover, limited researches and training programs were conducted in Egypt concerning this issue. Because of this, this study was carried out to evaluate the effect of developing nursing practice guidelines on comfort behavior in intubated pediatric patients.

Definition of Variables

Nursing practice guidelines

In this study, nursing practice guidelines are guidelines for positioning, suctioning, mouth care, effective communication, environmental control and parental presence and participation in care. They were assessed using an observational checklist developed by the researcher instrument 3).

Comfort Behavior

In this study, comfort behavior is the alertness, calmness-agitation, respiratory response, physical movement, muscle tone and facial tension. It was assessed by comfort behavior scale which was developed by Van Dijk et al., 2005 (instrument 2).

Purpose

The purpose of this study was to evaluate the effect of developing nursing practice guidelines on comfort behavior in intubated pediatric patients. This aim achieved through:

- Assessing nurses' of knowledge about nursing practice guidelines related to promoting comfort in intubated pediatric patients.
- Assessing nurses' practice related to promoting comfort in intubated pediatric patients
- Evaluating the effect of nursing care based on nursing practice guidelines on comfort Behavior in Intubated pediatric patients.

1.2. Research Hypothesis:

1. Nurses who receive health education will have higher level of knowledge about nursing practice guidelines related to promoting comfort in intubated pediatric patients on posttest than on pretest.
2. Nurses who receive health education will have higher level of practice related to promoting comfort in intubated pediatric patients on posttest than on pretest.
3. Intubated pediatric patients who receive nursing care based on nursing practice guidelines will have higher comfort behavior than intubated pediatric patients who do not receive nursing care based on nursing practice guidelines on posttest than on pretest.

2. Methods

2.1. Research Design: A quasi- experimental design (pretest, posttest, follow-up test and between groups' comparison) was used for this study.

2.2. Research Setting: This study was conducted at the pediatric intensive care unit (PICU) in Menoufia University Hospital. This unit lies in the 4th floor. It is divided into 4 parts, 3 parts in the foreground (the first section) and one part at the background) the second section). The first section is divided into three parts. The first part is on the left side and includes 2 beds. The second part is on the right side and includes one bed (isolation part). Isolation part is surrounded by two glass walls with an opening for entrance. The third part is behind the isolation part (nurses 'dressing room) and is separated with aluminum wall with aluminum door for entrance.

The second section is separated from the first section with a glass wall at both sides with an opening in between for entrance and includes 7 beds. The distance between these beds is about 4 feet. In this unit there are 10 monitors, 10 mechanical ventilation machines, 16 syringe pumps, one x-ray machine, one Refrigerator and 2 emergency cars.

2.3. Sampling:

- A convenient sample of 33 nurses who were providing direct care to children in the pediatric intensive care unit was included in the current study.
- A convenient sample of 60 intubated pediatric patients who were not sedated was included in the study. They were divided into two groups:-

Group (I) received routine nursing care (n= 30)

Group (II) received nursing care based on nursing practice guidelines (n= 30)

2.4. Instruments:-

For data gathering, three instruments were used:

Instrument one:

Structured Interviewing Questionnaire. The researcher designed it after reviewing related literature **(Latour et al., 2018؛ Lawson et al., 2018; Morrow & Argent, 2018; Thompson, 2018; Dampier et al., 2019; Konkani & Oakley, 2019; Landstrom et al., 2019؛ Society of Critical Care Medicine, 2019; Wip & Napolitano, 2019). It composed of two parts:**

Part one: social characteristics of studied nurses. It contained items related to nurses' age, education level and years of experience and attending previous training courses in the pediatric intensive care unit.

Part two: Nurses' knowledge about nursing practice guidelines for promoting comfort in intubated pediatric patients. It contained 65 questions about causes of child's discomfort during mechanical ventilation (9 questions), assessment of comfort behavior in mechanically ventilated children (4 questions), positioning (3 questions), suctioning (25 questions), oral care (5 questions), communication (11 questions), environment control (4 questions) and parent's presence and participating in care for intubated children (4 questions). Scoring items ranged from complete answer (2), incomplete answer (1) to don't know (0).Total score of Nurses' knowledge scale was130. The level of Nurses' knowledge considered satisfactory if the score was 79 – 130 (> 60%) and unsatisfactory if the score was 0 – 78 (≤ 60%). Reliability of the tool was r = 0.85.

Instrument two:

Comfort Behavior (Comfort–B) Likert Scale:

It was adopted from van Dijk et al., (2005) & Trimmel, M. & Trimmel, K. (2017). It was used for assessing comfort level for intubated pediatric patients. It included three parts:

Part one: social characteristics of studied children. It contained items related to children's age, sex.

Part two: medical data. It contained items related to children's diagnosis, length of stay on mechanical ventilation and length of stay in PICU.

Part three: **Comfort behavior in intubated pediatric patients**. It contained six domains (alertness, calmness-agitation, respiratory response, physical movement, muscle tone and facial tension). Scores of each domain ranged from 1 to 5 points. The total score ranged from 6- 30.The the level of comfort considered no discomfort if the score was ranged from 6-13, mild-moderate discomfort if the score was ranged from 14-21 and sever discomfort if the score was ≥ 22. Reliability of the tool was r = 0.85.

Instrument three:

Observational checklist for nurses' practice regarding promoting comfort for intubated pediatric patients: It was developed by the researcher based on review of related literature **(Johnstone et al., 2017؛ Morrow & Argent, 2018; Gardner& Shirland, 2019).**

It was divided into three parts:

Part one: Observational checklist to assess nurses' performance during endotracheal, oropharyngeal and nasopharyngeal suctioning.

Endotracheal suctioning procedure: It included 3 phases (getting ready, during the procedure and after the procedure). The first phase included 4 statements, the second phase included 9 statements and the third phase included 5 statements. The total score for the procedure was 36 points.

Oropharyngeal suctioning procedure: It included 3 phases (getting ready, during the procedure and after the procedure). The first phase included 4 statements, the second phase included 9 statements and the third phase included 5 statements. The total score for the procedure was 36 points.

Nasopharyngeal suctioning procedure: It included 3 phases (getting ready, during the procedure and after the procedure). The first phase included 4 statements, the second phase included 10 statements and the third phase included 5 statements. The total score for the procedure was 38 points.

- Scoring items for each observation ranged from not done (0), improperly done (1) to properly done (2).

Part two: Observational checklist to assess nurses' performance during oral hygiene for intubated children. It included 3 phases (getting ready, during the procedure and after the procedure). The first phase included 4 statements, the second phase included 4 statements and the third phase included 4 statements. Scoring items for each observation ranged from not done (0), improperly done (1) to properly done (2). The total score for the procedure was 24 points.

Part three: Observational checklist to assess nurse's communication with intubated children. It included all nonverbal communication strategies (11 items) that the nurse can use with intubated children which involved no technology strategies such as gesture, facial expression, eye contact, touch etc., low technology approaches such as drawing, writing, pointing to alphabet board and high technology strategies that use communication devices such as "ICU patient communicator "mobile application. Scoring items for each observation ranged from not used (0 to used (1).

Total scoring system for nurses' practices was properly done if the score was ≥ 60% (90-149), improperly done if the score was 30% to < 60% (46-89) and not done if the score was< 30% (0-45). The tool's reliability was determined by using Cronbach's co-efficiency alpha test. It was r = 0.78.

2.5. Validity

For ensuring their validity, the three instruments were submitted to a jury of five experts including two professors of pediatric nursing and three professors of medical surgical nursing to modify any required items of the instruments. The changes were done to determine their relevant and comprehensive.

2.6. Ethical considerations

An official approval was obtained on February 2020 (Code: 729) from the Ethical Research Committee in the Faculty of Nursing, Menoufia University. A written consent was obtained from nurses who participated in the study. An initial interview was done to notify participants (nurses, children and parents) about the aim, benefits of the study and describe that participation in the study was voluntary and the participants could discontinue from the study at any time without punishment.

2.7. Pilot study

After the instruments were developed and before data collection began, a pilot study was performed on 4 nurses (10% of the sample) to assess the practicality and applicability and to determine how long it would take to fill out the instruments. No essential modifications were done. Therefore, the pilot study was involved in the total sample.

2.8. Procedure

1. Before collecting the data, an official letter was submitted by the Dean of the Faculty of Nursing at Menoufia University explaining the purpose of the study and the methods of data collection. Therefore, written permission to conduct the study was obtained from the unit director.

2. Data for this study was collected for a 6-month period covering from 1st of March 2020 to the end of August 2020.Data collection process was guided by Kolcaba's Comfort theory.

Kolcaba Theoretical Framework for comfort

Kolcaba's Comfort theory attributed the theoretical base for the current study. Kolcaba divided comfort into three categories: transcendence, ease, and alleviation. A patient feels comfort in the sensation of alleviation when particular comfort demands are addressed. According to the theory, nursing includes the deliberate assessment of comfort needs, the creation of comfort measures to meet those needs, and the subsequent evaluation of comfort levels **(Kolcaba, 1994 & Sepahvand et al., 2021).** Comfort is the optimal state that nurses would like for their patients," claims Kolcaba. Today, nurses are the ones in close contact with their patients, providing relief from specific discomforts while continuously analyzing, monitoring, and providing care to ensure the client is at peace; therefore delivering comfort is undoubtedly within their purview **(Kolcaba, 2003 & Osundina, 2019).**

3. The researcher introduced herself to the participating nurses and went over the study's purpose and data collection techniques.

4. Assessment of the comfort level of all conscious intubated pediatric patients (group I) was done by the researcher for three months (from the first of March 2020 to the end of May 2020) by using instrument II (pretest).

5. Pre intervention assessment for nurses' practices regarding promoting comfort for intubated pediatric patients was done by the researcher for two months (from the first of March 2020 to the end of April 2020) by using instrument three (pretest).

6. Then, instrument one was distributed between nurses (pretest). Each data collection interview lasted between 20 to 30 minutes. It took about two weeks for all nurses to fulfill the pretest instrument.

7. All nurses working in the pediatric intensive care unit at Menoufia University Hospital received health education sessions from the researcher. Two health education sessions were given to each nurse. Each session included 2 - 4 nurses and lasted for 60-90 minutes. Oral presentations, group discussions, smart phone, demonstration and re-demonstration and feedbacks were used for health education and explanatory booklets were distributed between nurses. Some sessions were conducted in the nurses' dressing room and others were conducted inside the ward in the previously mentioned setting.

The first session covered general knowledge on how to measure a child's level of comfort when ventilated and determine the sources of their pain and discomfort (see appendix II).

The second session was about nursing practice guidelines for promoting comfort in ventilated children (positioning, suctioning, oral hygiene, effective communication and family presence and participation in care). The researcher gave a summary of the information presented during the first session. Following that, practice guidelines for promoting comfort in ventilated children was discussed. Direct reinforcement was used in the form of chocolates and pens were distributed between nurses who were able to fulfill data collection sheets.

8. The protocol used for oral hygiene was translated into Arabic by the researcher and distributed by the pediatric resident in all ventilated children files after approval of the director of the unit for application in all intubated pediatric patients.

9. Reassessment of nurses' knowledge regarding promoting comfort for intubated pediatric patients was done immediately following the health education sessions by the researcher by using instrument one (posttest).

10. Reassessment of nurses' practice regarding promoting comfort for intubated pediatric patients was done immediately following the health education sessions by the researcher by using instrument three (posttest).

11. Assessment of the comfort level of all conscious intubated pediatric patients (group II) was done by the researcher for three months (from the first of June 2020 to the end of August 2020) by using instrument II (posttest).

12. After 3 months, reassessment of nurses' knowledge regarding promoting comfort for intubated pediatric patients was done by the researcher by using instrument one (follow up).

13. After 3 months, reassessment of nurses' practice regarding promoting comfort for intubated pediatric patients was done by the researcher by using instrument three (follow up).

Statistical analysis:

The SPSS (Statistics Package for Social Science) statistical package, version 22, was used to enter and analyze the data. In order to create the graphics, Excel was used. Quantitative data was displayed using the mean (X) and standard deviation (SD).The student t test was used to compare two means, and the ANOVA (F) test was used to compare more than two means. ANOVA (F) test for repeated measures were used for comparison between mean scores in pre, post and follow up intervention. Tables showing frequency distribution, numbers, and percentages were used to present qualitative data. It was analyzed by chi-square (χ^2) test. However, if the expected value of any cell in the table was less than 5, Fisher Exact test was used (if the table was 4 cells) or Likelihood Ratio (LR) tests (if the table was more than 4 cells). Repeated Friedman Test (type of Chi square test for repeated procedures for qualitative data) for comparison of (knowledge, and practice levels) between the three time points of intervention in nurses participating in the study. Level of

significance was set as P value <0.05 for all significant tests.

Results

Table 1 showed social characteristics of studied nurses. It was clear that more than half of studied nurses (54.5%) were between 20 - < 25 years. In relation to nurses' qualifications, more than three quarters of studied nurses (81.8%) were graduated from technical nursing institute. Regarding years of experience, less than half of studied nurses (48.4 %) had 1 - < 5 years. Concerning training programs, all of studied nurses (100%) did not participate in any prior training courses regarding promoting comfort behavior in intubated pediatric patients.

Table 2 revealed social characteristics of studied children. It was clear that more than half of intubated children ranged from 1-5 years in both groups (60% in group I and 63.3% in group II). More than half of studied IPP in both groups were males (53.3% in group I and 63.3% in group II). Regarding clinical diagnosis, approximately one fifth of studied intubated pediatric patients (IPP) in both groups suffered from neural diseases (16.7% in group I and 13.3% in group II), half of studied IPP in group I (50%) and more than one quarter of studied IPP in group II (30%) suffered from combined diagnosis. Other diseases constituted approximately one fifth in group I (16.7%) and approximately one quarter in group II (23.3%). On the other hand, children suffering from CVS and renal diseases had the lowest percentages in both groups (3.3% in group I and 6.7% in group II). There were no statistical significant differences between group I and group II regarding all items of social Characteristics as well as their diagnosis, mean length of stay in PICU and mean length of stay on mechanical ventilation (P > 0.05 for each).

Figure 1 showed mean of total knowledge scores regarding nursing practice guidelines for promoting comfort behavior in intubated pediatric patients on pre, post and follow up intervention. As showed in the figure, mean scores of total nurses' knowledge on pre intervention were 63.09± 5.8 compared to 122.45± 7.0 and 117.12±11.6 on post and follow-up tests respectively. So, there was a highly statistical significant differences between levels of nurses knowledge on pre, post and follow up tests (P<0.0001).

Table 3 shows mean of nurses' knowledge level about nursing practice guidelines for promoting comfort in intubated pediatric patients on pre, post and follow-up intervention. Nurses had the highest level of mean scores of knowledge on posttest. Therefore, there were highly statistical significant differences between levels of nurses knowledge on pre, post and follow up tests (P<0.0001).

Table 4 displayed mean of levels of nurses' practices regarding promoting comfort for intubated pediatric patients on pre, post and follow-up intervention. This table showed that nurses had the highest mean scores of practices on post and follow-up intervention. Therefore, there were highly statistical significant differences between nurses' practices on pre, post and follow-up tests (P<0.0001).

Table 5 illustrated mean of total comfort behavior scores among group I and group II. The table illustrated that group II had lower levels of discomfort behavior compared to group I (12.8±2.1 Vs 20.4±2.6 respectively). Therefore, there were highly statistical significant differences between group I and group II (P<.0001).

Figure 2 showed correlation between grand total score of knowledge and grand total score of practices among studied nurses. It reflected that there was a strong positive highly statistical significant correlation between grand total score of knowledge and grand total score of practices (P<0.0001).

Table (1): Social characteristics of studied nurses (n=33)

Social characteristics of studied nurses	N0.	%
Age (Years)		
20 - <25	18	54.5
25 – <30	11	33.4
≥ 30 years	4	12.1
Mean ± SD	**22.6 ± 1.7 years**	
Educational Level		
Nursing Diploma	1	3
Institute of Nursing tech.	27	81.8
Bachelor	5	15.2
Experience		
< 1 year	6	18.2
1 - <5 years	16	48.4
5 - < 10 years	6	18.2
≥ 10 years	5	15.2
Training courses about promoting comfort behavior in intubated pediatric patients		
No	33	100
Total	33	100

Table (2): Characteristics of studied children (n=60)

Social Characteristics of studied children	Group I (N=30)		Group II (N=30)		P- value
	N0.	%	N0.	%	
Age (Years)					
1 – 5 years	18	60	19	63.3	χ^2=1.8,
6 - 10 years	8	26.7	5	16.7	p=0.61, NS
11 – 15 years	4	13.3	6	20	
Gender					
Female	14	46.7	11	36.7	χ^2=0.62
Male.	16	53.3	19	63.3	p=0.43, NS
Medical data					
Diagnosis:					
Neural	5	16.7	4	13.3	
Respiratory	3	10	6	20	
CVS	1	3.3	2	6.7	**χ^2=3.5,p=0.60**
Renal	1	3.3	2	6.7	NS
*Combined diagnosis	15	50	9	30	
**Others	5	16.7	7	23.3	
Length of stay in PICU (days) Mean± SD	33.5 **±13.5**		34.3 **±18.3**		**t=0.08 ,p=0.93 NS**
Length of stay on Mechanical ventilation(days) Mean± SD	21.3 **±9.7**		23.5 **±8.6**		**t=0.30 ,p=0.76 NS**

N.B: *Combined diagnosis: (chronic kidney disease and hemorragic pleural effusion, chronic kidney disease and cardiomyopathy, post arrest , status epileptics and respiratory distress grade II, nephrotic range protinuria and pericardial effusion, pneumonia and heart failure, aspirated, chronic kidney disease, cystinosis and pneumonia, febrile pneutrobenia, cardiomyopathy and electrolyte disturbance, fulminant myocarditis, massive pericardial effusion and pneumonia, chronic kidney disease, hyperkalemia, fits and shock, Preterm, sepsis, moderate dehydration and refusal of feeding, chronic kidney disease and convulsion, chronic kidney disease, severe pneumonia and respiratory distress grade IV, chronic kidney disease and respiratory distress grade III, acute respiratory distress syndrome (ARDS) , pneumonia, fever and convulsion, respiratory distress grade IV and fits)

**** Others :** (type 1 mitochondrial disorder, post arrest and shock, ingestion of toxic dose of rayasan (Tizinnatine) central muscle relaxant, post traumatic spinal cord injury, postoperative (shunt operation due to hydrocephalaus), polytrauma, vitamin D resistant rickets, respiratory distress grade III and bronchopneumonia). **NS** means no statistical significant differences

Table (3): Mean of nurses' knowledge level about nursing practice guidelines for promoting comfort in intubated pediatric patients on pre, post and follow-up tests.

Knowledge aspects	Intervention	Mean	SD	Minimum	Maximum	P value
Total score of causes of discomfort	**Pre**	10.6	1.6	8	14	F=203, P=0.000 HS
	Post	17.4	1.4	10	18	
	Follow up	16.8	1.4	13	18	
Total score of assessing comfort behavior	**Pre**	4.4	1.1	3	6	F=175.4, P=0.000 HS
	Post	7.9	0.4	6	8	
	Follow up	7.6	0.7	6	8	
Total score of positioning	**Pre**	3.8	1.1	2	6	F=65.4, P=0.000 HS
	Post	5.8	0.4	4	6	
	Follow up	5.7	0.6	4	6	
Total score of oral care	**Pre**	5.4	1.2	2	8	F=152, P=0.000 HS
	Post	9.5	.9	7	10	
	Follow up	9.2	1.0	6	10	
Total score of communication	**Pre**	7.5	1.9	4	12	F=578, P=0.000 HS
	Post	19.6	1.4	15	22	
	Follow up	18.8	1.4	15	21	
Total score of environmental control	**Pre**	5.1	1.4	1	8	F=67, P=0.000 HS
	Post	7.7	.6	5	8	
	Follow up	7.4	.8	5	8	
Total score of parental presence and participation in child's care	**Pre**	4.0	2.1	0.0	8	F=54, P=0.000 HS
	Post	7.4	1.0	5.	8	
	Follow up	7.2	1.1	5	8	

NB: HS **(P<0.000): Means highly statistical significant difference**

Figure (1): Mean of total knowledge scores regarding nursing practice guidelines for promoting comfort behavior in intubated pediatric patients on pre, post and follow up intervention (N=33).

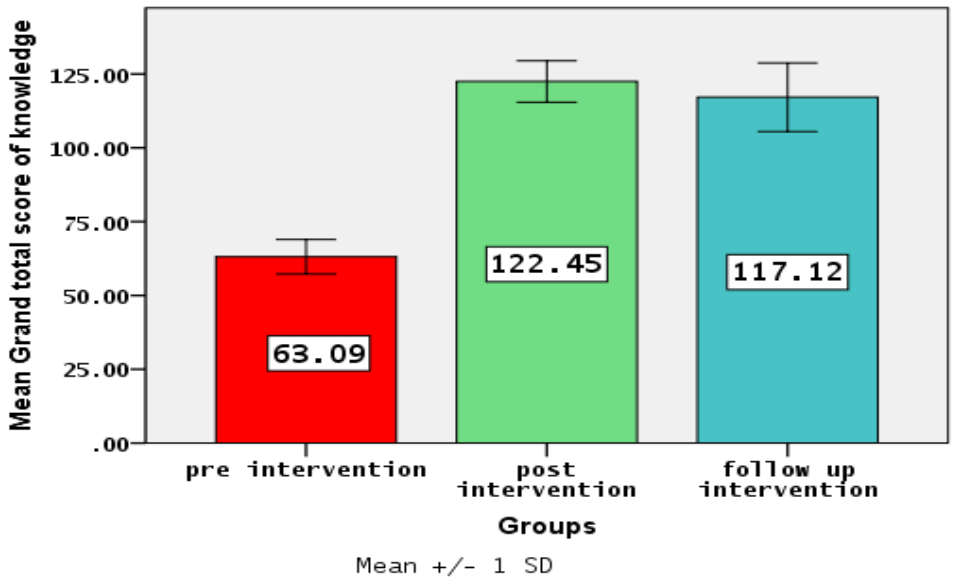


Table (4): Mean of levels of nurses' practices regarding promoting comfort for intubated pediatric patients on pre, post and follow-up tests (N=33).

Items	Pre intervention (N=33)	Post intervention (N=33)	Follow- up intervention (N=33)	Friedman test	P –value
Endotracheal suctioning					
Mean ± SD total score	12.8 ± 1.2	28.8 ± 2.4	27.4 ±1.5	F=802.0	P< 0.0001
Oropharyngeal suctioning					
Mean ± SD total score	15.9 ± 1.5	29.2 ±3.8	29.6 ± 4.5	F=157.2	P< 0.0001
Nasopharyngeal suctioning					
Mean ± SD total score	15.8 ± 1.3	30.9 ± 2.6	29.1 ± 3.8	F= 282.6	P< 0.0001
Oral care					
Mean ± SD total score	0 ± 0.0	26.2 ± 3.5	25.5 ± 2.6	F=1119.6	P< 0.0001
Communication					
Mean ± SD total score	7.0 ± 0.0	8.8 ± 1.6	7.9 ±1.3	F= 17.5	P< 0.0001
Total practices scores	51.6 ± 2.8	123.9 ± 10.2	119.5 ± 6.1	F=1075	P< 0.0001

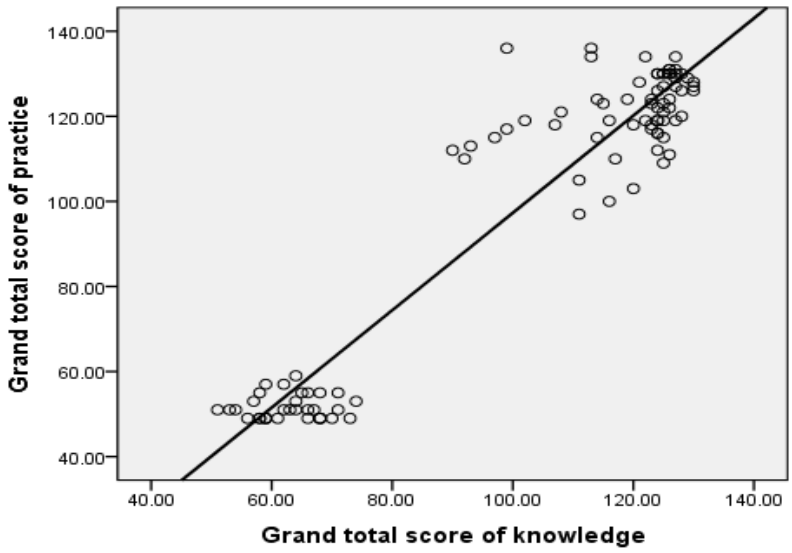
NB: P<0.0001: Means highly statistical significant difference F test = Analysis of variance for repeated measures for quantitative data

Table (5): Mean of total comfort behavior scores among group I and group II.

Comfort behavior	Group I (pre-intervention) (N=30)		Group II (post-intervention) (N=30)		Test of sig.	P value
	N0.	%	N0.	%		
No discomfort (6 -13)	1	3.3	22	73.3		
Mild to moderate discomfort (14 -21)	16	53.4	8	26.7	X^2= 42.4	0.000
Sever discomfort (≥ 22)	13	43.3	0	0.0		
Total	30	100.0	30	100.0		
Mean ± SD total score of comfort behavior	20.4±2.6		12.8±2.1		t paired = 12.3	0.000

NB: P<0.000: Means highly statistical significant difference

Figure (2): Correlation between total score of nurses' knowledge and total score of nurses' practices with regression line (N=33).



Discussion

Endotracheal tubes (ETTs) and mechanical ventilation (MV) are commonly used in the pediatric intensive care units. Although they are life-saving, they may be a great source of stress to the children. In pediatric intensive care units (PICUs), mechanical ventilation (MV) is a common type of respiratory assistance. It is one of the most frequently performed procedures in the pediatric intensive care unit, where anywhere from 20% to 64% of patients admitted need ventilator assistance **(Kurachek et al., 2018).** Although potentially life-saving, MV may cause patients to feel uncomfortable. According to earlier research, 54% of individuals who received MV reported discomfort **(Nelson et al., 2019).** Thus, nurses and other healthcare professionals must appropriately manage this situation to prevent fear, depression, agitation, delirium, and unplanned extubation **(Grap et al., 2017).**

The current study hypothesized that nurses who get health education will have higher level of knowledge about nursing practice guidelines related to promoting comfort in intubated pediatric patients on posttest than on pretest. Also, nurses who receive health education will have higher level of practice related to promoting comfort in intubated pediatric patients on posttest than on pretest. Also, intubated pediatric patients who receive nursing care based on nursing practice guidelines will have higher comfort behavior than intubated pediatric patients who do not receive nursing care based on nursing practice guidelines on posttest than on pretest.

Regarding to hypothesis one: Nurses who receive health education will have higher level of knowledge about nursing practice guidelines related to promoting comfort in intubated pediatric patients on posttest than on pretest, the findings showed that regarding nurses' knowledge about positioning of intubated children on pre, post and follow-up tests. This study revealed that the majority of nurses had higher levels of knowledge about positioning of intubated children on post and follow up tests than on pre intervention. From the researcher's perspective, this could be attributed to the educational program which in turn helped nurses to acquire and improve their knowledge about positioning of intubated children. This result was consistent with **AbuSaad & Tantawey (2021).** They found that there was a highly statistical significant difference between nurses' knowledge after program implementation and before the program regarding importance of elevating head of bed to 30-45 for prevention of VAP in PICU (96.1% after program implementation compared to 41.2% before program implementation).

Regarding nurses' knowledge about suctioning of intubated children on pre, post and follow-up tests, this study illustrated that there was a significant improvement in the knowledge of nurses about suctioning of intubated children on post and follow-up tests than on pretest. From the researcher's perspective, this could be attributed to the clarity and simplicity of the methods of teaching (oral presentations, group discussion, feedbacks and explanatory booklets) that were used in sessions which in turn helped nurses to acquire and improve their knowledge about suctioning of intubated children. Besides, the utilized communication techniques (e.g. good listening, feedback and two-way communications) could be effective.

This result was consistent with Seema et al., (2017), they revealed that there was a significant improvement in all domains of nurses' knowledge scores after the intervention. They recommended that multidimensional VAP prevention program, nurses' motivation and synchronizing education with training can improve the nurses' awareness of evidence based preventive measures.

Concerning nurses' knowledge about oral care of intubated children on pre, post and follow-up tests, this study illustrated that there was an improvement in the knowledge of nurses about oral care in intubated children on post and follow up tests than on pre intervention. This could be related to the educational program which in turn helped nurses to acquire and improve their knowledge about oral care of intubated children. This result was in line with **Abd EL-Aziz (2014),** It was found that majority of nurses had satisfactory level of knowledge about oral care immediately after program.

In relation to nurses' knowledge about communication with intubated children on pre, post and follow-up tests, the present study illustrated that the majority of nurses had higher levels of knowledge about communication with intubated children on post and follow-up tests than on pre intervention. From the researcher's

perspective, this may be related to the educational program in which the researcher used uncomplicated teaching techniques.

(Oral presentations, group discussion, using smart phone, communication board, feedbacks and explanatory booklets) that were used in sessions which in turn helped nurses to acquire and improve their knowledge about communication with intubated children. This result was in line with **Finke et al., (2018),** they reported that In order to increase communication with nonverbal patients, nurses must be educated about communication, the detrimental effects of communication breakdowns, and how to use augmentative and alternative communication (AAC) technologies. In the same context, **Trotta, et al., (2020),** it was reported that the frequency of communication and positive nurse communication with intubated patients improved when nurses received basic communication skills training.

Regarding nurses' knowledge about environmental control in PICU on pre, post and follow up tests, this study illustrated that there was an improvement in nurses ' knowledge about environmental control in PICU on post and follow up tests than on pre intervention. This could be attributed to the educational program which in turn helped nurses to acquire and improve their knowledge about importance of environmental control in PICU. This result was in line with **Hasegawa et al., (2020),** they discovered that the basal noise level identified exceeded the guidelines set forth by the International Noise Council. The basis for creating a noise reduction program is education about how noise affects human hearing and how it relates to stress. Concerning nurses' knowledge about parental presence and participation in child's care on pre, post and follow up tests, this study illustrated that the majority of nurses appreciated parental presence and participation in intubated child's care on post and follow-up tests than on pre intervention. From the researcher's perspective this could be attributed to the educational program in which the researcher used simple methods of teaching (oral presentations, group discussion, life examples, feedbacks and explanatory booklets) that were used in sessions which in turn helped nurses to acquire and improve their knowledge about the importance of parental presence and participation in care for intubated children.

However, helping parents to be involved in the care of their children could reduce children's pain. **Sajedi et al., (2017)** found that Kangaroo care was effective in reducing injection pain. **Midtsund et al., (2019)** stated that maternal care and presence improves the mother-child relationship, enhances mothers' self-esteem, and calms children. Therefore, it was important to help parents to participate in the care of their children.

In relation to hypothesis two: Nurses who receive health education will have higher level of practice related to promoting comfort in intubated pediatric patients on posttest than on pretest, the present study illustrated that concerning nurses' practices regarding suctioning of intubated children on pre, post and follow-up tests. This study illustrated that the majority of nurses showed improved performance regarding suctioning of intubated children on post and follow-up tests than on pre intervention. From the researcher point of view this could be due to the methods of teaching that were used in sessions which in turn helped nurses to acquire and improve their practices about suctioning of intubated children. In these sessions, demonstration and remonstration on suctioning procedures were done. This result was in line with **Dubbert (2019)**. She stated that education, training and feedback improved the suctioning performance of nurses. Level of adequate performance showed significant improvement after the intervention from 49% to 74% after health education).

Concerning nurses 'practices regarding oral care of intubated children on pre, post and follow-up tests, this study illustrated that the majority of nurses had more adequate performance regarding oral care for intubated children on post and follow-up tests than on pre intervention. Improvement of oral care for intubated children on post and follow-up tests could be due to the methods of teaching that were used during health education sessions such as demonstration and remonstration of oral care procedure. Bedsides, the researcher bought all supplies needed for oral care for all intubated children and translated an oral care protocol which was distributed between nurses in intensive care unit after getting

the approval of the manager of the unit. This result was consistent with **Tolentino-DelosReyes et al., (2017)** who stated that dental care was improved, and there was a decline in VAP, as a result of educational initiatives concerning VAP prevention. Additionally, they came to the conclusion that education highlights the significance of dental hygiene and offers chances to hone skills and pose questions. In addition, **Johnstone (2017)** identified that pediatric nurses need adequate supplies in combination with health education in order to ensure that children receive consistent, regular and effective oral hygiene.

In relation to nurses 'practices regarding communication with intubated children on pre, post and follow-up tests, this study illustrated that the majority of nurses had more adequate performance regarding communication with intubated children on post and follow-up tests than on pre intervention. From the researcher's perspective this could be attributed to the educational program in which the researcher used simple methods of teaching (oral presentations, group discussion, smart phone, communication board, feedbacks and explanatory booklets) that were used in sessions which in turn helped nurses to acquire and improve their practices about communication with intubated children. Besides, nurses felt empowered to assist intubated children in reducing anxiety and stress through better communication. After the program they appreciated that communication can be used to meet children' psychological needs. Moreover, **Yoo et al., (2020)** recommended that the communication skills training program might be helpful in reinforcing fundamental/intuitive communication techniques, facilitating the learning of new skills, and ensuring communication supplies are available.

In relation to hypothesis three: Intubated pediatric patients who receive nursing care based on nursing practice guidelines will have higher comfort behavior than intubated pediatric patients who do not receive nursing care based on nursing practice guidelines on posttest than on pretest, the findings showed that the more than two thirds of studied children in group II (who received nursing care based on nursing practice guidelines program) revealed a significant improvement in their level of comfort behavior. This result was consistent with **Abou Zed & Mohammed (2019),** they stated that the use of the nursing recommendations improved nurses' expertise, knowledge and performance with regard to preventing ventilator-associated pneumonia in newborns. Moreover, this finding came in line with **Khasanah et al., (2019),** They claimed stated that the oral nursing care guideline had been accurately and successfully implemented, and that this had increased patient oral integrity.

Conclusion

In light of the findings of this study, it was concluded that implementation of nursing practice guidelines improved nurses' knowledge and practices regarding promoting comfort behavior in intubated pediatric patients on post and follow-up tests than on pretest. Also, it contributed to lower levels of discomfort behavior in intubated pediatric patients on posttest than on pretest.

Recommendations

Based on the conclusion of the present study, the following recommendations can be suggested:

1. Ongoing in-service education programs about promoting comfort behavior in intubated pediatric patients should be designed and implemented in all pediatric intensive care units to improve nurses' knowledge and practices on the basis of nurse's actual needs.
2. Integrating nursing practice guidelines into the daily routine care of all intubated pediatric patients in all pediatric intensive care units to promote comfort behavior for all intubated pediatric patients.
3. Future studies should be applied on a larger sample to investigate the effect of developing nursing practice guidelines on comfort behavior in intubated pediatric patients to ensure the generalizability of results.

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