Effect of Clinical Pathway on Nurses' Performance and Neonates Outcomes regarding Noninvasive Continous Positive Airway Pressure

Nessma Mohamed Attia [1], Hanan Tharwat Elbahnasawy [2], Basma Rabie Abd El- SadeIk [3] and Seham Mohammed Abd. ElAziz [4]

(1) Assistant lecturer of Pediatric Nursing, Faculty of Nursing, Dammieta University, Egypt, (2) Professor of Pediatric Nursing, Faculty of Nursing, Menoufia University, Egypt, (3) Professor of Pediatric Nursing, Faculty of Nursing, Benha University, Egypt and (4) Assistant Professor of Pediatric Nursing, Faculty of Nursing, Benha University, Egypt.

Abstract

Background: Noninvasive continuous positive airway pressure is a means of providing respiratory support to neonates vulnerable to respiratory problem and complications. Clinical pathway provide detailed guidance for each stage in the management of neonates with a specific condition over a given time period and include progress and outcomes details**. Aim of the study** Was to evaluate the effect of clinical pathway on nurses' performance and neonates outcomes regarding noninvasive continuous positive airway pressure. **Design:** A quasi- experimental design was used in the current study. **Setting:** The study was carried out at Neonatal Intensive Care Units at Benha University Hospital and Benha Specialized pediatric Hospital at Benha city. **Subjects:** All available nurses (60) nurses who are working at previously mentioned settings and a purposive sample of (60) neonates on noninvasive continuous positive airway pressure. **Tools of data collection**: **Tool (1):** A structured interviewing questionnaire format including subjects' characteristics and nurses' knowledge regarding care of neonates undergoing noninvasive continuous positive airway pressure. **Tool (II**): Assessment sheet of medical outcome for neonates. **Tool (III):** Clinical pathway checklists. **Results:** The majority of studied nurses had a poor level of knowledge at pre-clinical pathway intervention compared with most of them had a good level of knowledge post clinical pathway intervention map for care of neonates, most of studied nurses had incompetent practice level pre clinical pathway intervention compared with more than three quarters had competent practice level regarding post clinical pathway intervention, there was a decrease in length of hospital stay after clinical pathway intervention, this may be due to improvement of health status of neonates due to effect of clinical pathway. **Conclusion:** Implementation of clinical pathway improved nurses' knowledge and practice that reflecting obvious improvement in clinical outcomes of neonates undergoing noninvasive continuous positive airway pressure. **Recommendations:** Provision of continuous education by using clinical pathway to update nurses' knowledge and enhance their practices regarding care of neonates on noninvasive continuous positive airway pressure.

Keywords: Neonates, Noninvasive Continuous Positive Airway Pressure, Clinical Pathway, Nurse performance.

Introduction

Continuous Positive Airway Pressure (CPAP) is used when the neonate is breathing spontaneously without a mechanical ventilator. To use CPAP, the neonate can be either intubated which considered a mode of invasive mechanical ventilation or given a

tightly fitting face mask **(Dries & Marini, 2018).**

Continuous positive airway pressure used to treat Respiratory Distress Syndrome (RDS), it prevents collapse of the alveoli at end-expiration, maintaining some degree of alveolar inflation. It thus decreases the work of breathing in accordance as the pressure required to overcome the collapsing forces generated by surface tension is reduced because the radius of curvature is greater when the alveolus is partially inflated **(Seigel, 2018)**.

Indications of nasal continuous positive airway pressure include: preterm before 30 wks., very low birth weight < 1500 gm., also at post extubation with oxygen requirements 30% or more to maintain oxygen saturation (SPO2) 92-96% or signs of mild to moderate RDS including (tachypnea more than 60 cycle / minute, audible respiratory grunting, sterna, intercostal, lower costal recessions , nasal flaring and cyanosis) depending on chest radiography and blood gases of partial pressure of oxygen (PaO2) <50-60 mmHg **(Zhu et al., 2022).**

Clinical Pathways are evidence – based multidisciplinary care plans which describe the essential steps needed in the care of patients with a specific clinical problem. It is used to translate clinical guidelines into local protocols and clinical practice. Whereas clinical guidelines provide generic recommendations, CPWs are specifically tailored to the local hospital structures, systems and timeframes used (**Chuter et al., 2022**).

The benefits of clinical pathway, enhancing the quality of care, improving patient outcomes, promoting patient safety, increasing patient satisfaction, and optimizing the use of resources". The facilitation of the communication among the team members and with patients and families. Reduction of unnecessary variation in care and reduction in hospital length of stay. The coordination of the care process by coordinating the roles and sequencing the activities of the multidisciplinary care team, patients and their relatives. The documentation, monitoring, and evaluation of variances and outcomes, and the identification of the appropriate resources **(Gartner et al., 2022).**

The nurse plays an important role in family support for parents who have a neonate at NICU that causes social, cultural influences and affects the parental approach for communication, coping and care decisions. The responsibility of neonatal nurse and other members of the health team are informing the family about the reason for the nasal CPAP including the benefits and possible complications **(Ferreira & Cruz, 2022).**

Nurses have a key role in all aspects of clinical pathway use. Participating in the development of the pathway is the first step. Because the nurses begin and the chain of staff involved in delivering care, nurses possess a unique perspective in how health care systems work to enhance or impede the delivery of care. Nurses are also responsible for initiating the pathway on appropriate patients and ensuring that the various events occur as planned **(Abbott et al., 2022).**

Significance of the study: CPAP therapy is widely used in neonates. NCPAP is shown to reduce need for mechanical ventilation, surfactant administration and incidence of broncho pulmonary dysplasia. Also it has been shown to reduce the risk of mortality by 48% and the need for mechanical ventilation by about 50%,so it has become the standard of care in managing sick neonates with

respiratory distress **(Thukral et al., 2016).** The application of clinical pathway provides opportunities for collaborative practice and team approaches that can maximize the expertise of multi health care team.Therefore, this study was conducted to evaluate the effect of clinical pathway on nurses performance regarding neonates outcomes on Noninvasive continuous positive airway pressure.

Aim of the study

The aim of this study was to evaluate the effect of clinical pathway on nurses` performance and neonates' outcomes regarding noninvasive continuous positive airway pressure.

Research hypothesis

1.Nurses` performance improved after implementing the clinical pathway intervention.

2.Neonates outcomes improved after implementing the clinical pathway intervention, improved respiration and reduced length of hospitalization

Research design:

A quasi-experimental design was be utilized to achieve the aim of the current study. The manipulation of independent variable to observe the effect on dependent variable.

Settings:

The study was conducted at Neonatal Intensive Care Units (NICUs) at Benha University Hospital and Benha Specialized pediatric Hospital affiliated to Ministry of Health at Benha city.

Subjects:

The subjects consisted of two types of samples:

1- **Group (1):** All available nurses (60) nurses who are working at previously mentioned settings regardless their personal characteristics and willing to participate in the study.

2- **Group (2):** A purposive sample of 60 neonates who were undergoing NICPAP throughout data collection after fulfilling the criteria

Inclusion criteria: Age from birth to 30 days and both sexes.

Exclusion criteria: Neonates with congenital anomalies.

Data collection tools:

Data were gathered by using the following tools:

Tool I: A structured interviewing questionnaire format:

It was designed by the researcher in the light of current relevant studies and research to assess personal and medical data for the studied subjects (nurses and neonates), it was written in simple Arabic language to suit study sample. It is composed of the following parts:

Part (1): **Characteristics of the studied nurses:** such as age, gender, educational qualifications, years of experience in NICUs, place of work, and attendance of training program related to care of neonates undergoing NICPAP (6 questions).

Part (2): **Characteristics medical data of studied neonates** such as gestational age, gender, birth weight, current weight, medical diagnosis, number of days for neonates undergoing NICPAP and methods of NICPAP delivery for neonate (7questions).

Part (3): Nurses' knowledge regarding NICPAP: It was developed by the researcher guided by **Seigel, (2018) and Dewez et al., (2018)** and revised by supervisors to assess nurses' knowledge regarding NICPAP. It included knowledge

related to definition, types, functions, indications, complications of CPAP, time of changing CPAP connection, signs for administration CPAP, obstacles, components and efficiency of CPAP, the time for weaning from CPAP, obstacles of weaning. This part included 12 questions in a form of multiple choice questions.

Part (4): **Nurses' knowledge regarding care of neonates undergoing NICPAP:** It was developed by the researcher guided by **Bowden &Greenberg, (2016)** to assess nurses' knowledge regarding care of neonates undergoing NICPAP**.** It consists of (34) multiple choice questions, categorized under 5 main categories, questions related to suction, oxygen therapy, blood gases technique, feeding for neonates and infection control in NICU.

Part (5): Nurses' knowledge regarding clinical pathways: It was developed by the researcher guided by **Pirog et al., (2015) and Warner et al., (2020),** to assess nurses' knowledge regarding clinical pathways. It consists of multiple choice questions which included definition, goals, elements, steps, nursing role, benefits of a clinical pathway for nurses and neonates, barriers, types of deviation, definition and cause of negative deviation, definition and cause of positive deviation. This part included 13 questions.

Part (6): Nurses' knowledge regarding multidisciplinary team management: It was developed by the researcher guided by **Weizi et al., (2014)** to assess nurses' knowledge regarding multidisciplinary team management. It consists of multiple questions. This part included (5question).

Part (7): Nurses' knowledge regarding implementing the Clinical pathway care map in the care of neonates undergoing NICPAP: This map was adapted from **National Health Services (2009).** The researcher modified the clinical pathway formats and contents and reviewed them with the research supervisors to suit the nature of the study.

Scoring system:

The studied nurses' answers were compared with a model key answer and scored as; "2" for complete correct answer, (1) for incomplete correct answer, and "zero" for the incorrect or unknown answer, total knowledge scores ranged from(0-192) point. In this respect, the level of nurses' knowledge was categorized as the following: good level knowledge ≥ 80% was ranged from (154-192), average level knowledge from 60% < 80% ranged from(116 to < 154) and poor level knowledge < 60 % ranged from (0-115).

Tool II- Assessment sheet of medical outcome for neonates': It was developed by the researcher to assess the improvement of the neonates' condition after applying the clinical pathway. It included length of hospital stay, oxygen saturation, respiratory rate, colour of the skin, improved of feeding, result of c-reactive protein and duration of neonates connected on NICPAP (7items).

Tool III- Clinical pathway checklists: it was adopted from **Bowden α Greenberg, (2016) and Abd- Allah et al., (2013).** It was used to assess nurses' practice level regarding nursing care for neonates undergoing NICPAP. It contained 129 steps under main (9) procedures as assisting in extubating (10 steps), care of neonate after extubating (13 steps), NICPAP application (7 steps), connect neonates on NICPAP (13 steps), care of neonates on NICPAP (13 steps), administration of oxygen therapy by nasal cannula, oxygen hood and mask oxygen (12 steps), suctioning (25 steps), taking

capillary blood gases (14 steps) and gavage feeding (22 steps).

Scoring system:

Nurses' responses were scored as follows: (1) done completely and (zero) not done, so the total practice scores (129) points. Accordingly, nurses' practice level is as follows: Competent level was ≥80% ranged from (103- 129) and incompetent level < 80% ranged from (0- 103) degrees.

Tools validity and reliability:

Tools of data collection were translated into arabic and investigated for their content validity by three expert's (three professors of Pediatric Nursing from the Faculty of Nursing at Benha University), who are selected to test the content validity of the instruments and to judge its clarity, comprehensiveness, relevance, simplicity and accuracy. All of their remarks were taken into consideration; some items were re-phrased to arrive at the final version of the tools. The tools were regarded as valid from the experts' point of view.

Reliability of the tools was examined by using Cronbach's Alpha Coefficient test to measure the internal consistency for all tools; Tool (I) - A structured interviewing questionnaire format which include nurses' knowledge regarding noninvasive continuous positive airway pressure was 0.916, care of neonates under NICPAP was 0.825, clinical pathway was 0.878, clinical pathway map was 0.883, Tool (II): Assessment sheet of medical outcome for neonates'.was 0.879, Tool (III): Clinical pathway checklists was 0.960 that, reflect accepted internal consistency of the tools.

Ethical consideration:

Written approval was obtained from the ethical committee of faculty of nursing benha university. The researcher clarified aim of the study to the studied nurses. Verbal approval wasprerequisite to participate in the study. Nurses were assured that all gathered data was used for research purposes only and the study was harmless. Additionally, nurses allow to withdrawal from the study at any time without giving the reason. Confidentially of the gathered data and results were secured

Pilot study:

A pilot study was conducted to test the clearness and applicability of the study tools and estimate the time needed for each tool. It was done on 10% of the total subjects, (6) neonates undergoing NICPAP and (6) nurses who excluded from the present study to avoid sample bias. In the light of pilot study analysis, modification was done and the last form was developed.

Field work:

The Clinical pathway application was implemented achieve the aim of the current study; assessment, planning, implementation and evaluation phases. These phases were conveyed from the earliest starting point from the first of September 2021 to the end of May 2022 covering 9 months.

Assessment phase:

This phase involved interviews with nurses to collect baseline data. It took about (16 weeks), the researcher was available four days/week; (Saturday, Monday) at Benha University Hospital (Tuesday and Thursday) at Benha Specialized pediatric Hospital by rotation from 11.00 AM and extended to 1.30 PM hour. Average number collected was 2-3 nurses per /day. At the beginning of interview; the researcher welcomed each nurse, explained the purpose, duration and activities of the study and took written consent from nurses. After that, pre-test was done used tools. Each nurse was asked to fill the questionnaire sheet (pre/post) for 15-20 minutes to assess their knowledge regarding the clinical pathway and care of neonates on

NICPAP; the actual nurses' practice was assessed by using the tool of an observational checklists and it took 30 minutes.

Planning phase:

Clinical Pathway intervention was designed based on the actual needs assessment of nurses then implemented and evaluated. The application of the clinical pathway was carried out in the previously mentioned study settings with the studied nurses whereas, (the theoretical contents were provided through three teaching sessions; the practical contents were provided through nine sessions, each session took 60 minutes). Training sessions including teaching and learning methods , media that were lecture, video, PowerPoint presentation, hand out, group discussion, brain storming, flip charts, pictures, real situation, demonstration and redemonstration.

Implementation phase:

Toward the start of the clinical pathway intervention, a direction to the motivation behind clinical pathway took place and the nurses were informed about the time and place of sessions. The contents of the clinical pathway were prepared in the light of actual needs assessment of the studied nurses after reviewing the related literature. It took about 16 weeks for clinical pathway intervention. The studied nurses were divided into 10 groups each group consisted of 6 nurses, the program has taken 12 hours for each group, the program consisted of 12 sessions, distributed as the following; (3) session for theoretical part each session kept going 60 minutes and (9) session for practical part, each session kept going one hour, 4 days/week in the morning shift and were implemented according to nurses readiness. These sessions were repeated to each subgroup of nurses. **Theoretical part as the following**; **first session** of clinical pathway aimed to identify the purpose of clinical pathway and overview about non invasive continuous positive airway pressure, **second session** aimed to increase knowledge of clinical pathway including, definition, aims, elements, steps, barriers**,** benefits of clinical pathway for nurses and for patients, types and causes of variances, **third session** aimed to increase knowledge about multidisciplinary team roles in caring of neonates on NICPAP.

Practical part concerned with application of care related to ; fourth session aimed to how to perform technique of NICPAP connection, **fifth session** aimed to how to apply nursing care for neonates undergoing NICPAP, **sixth session** aimed to how to apply weaning of neonates from NICPAP, **seventh session** aimed to how to perform technique of physiotherapy for neonates**, eighth session,** aimed to how to perform technique of suctioning for neonates, **ninth session,** aimed to how to apply oxygen therapy technique in neonates**, tenth session** aimed to how to perform technique of blood gases sampling for neonates on NICPAP**, eleventh session** aimed to how to perform technique of gavage feeding for neonates on NICPAP **twelfth session** aimed to how to apply infection control for neonates on NICPAP.

At the end of each session, the researcher summarizes the key topics and verifies that the nurses understand the information presented.

Evaluation phase:

Post clinical pathway intervention, the post test was carried out to assess the effect of clinical pathway on nurses performance and neonatal outcome undergoing NICPAP by using the same pretest format as a post test which took one month.

Statistical analysis:

Computerized data entry and statistical analysis were fulfilled using the Statistical Package for Social Sciences (SPSS) version 25. The obtained data were tion of qualitative data was done, chi square test was used to compare data between the different time points. Pearson's Correlation coefficient (r), was used to the relationship between the variables. The relationship between personal data and study variables was tested using chi square test. statistical significant was considered at P-value ≤ 0.05organized, analyzed and represented in tables and graphs as required. Data were presented using descriptive statistics in the form of Number, frequency distribution for descrip, highly significant at P-value ≤ 0.001, insignificant at P-value > 0.05

Results:

Table (1): Shows that, less than two thirds (63.3%) of the studied nurses were in the age group 20 to < 25 years with mean age 23.80 ± 3.07 years, nearly two thirds (65.0%) had Bachelor of Nursing Science. While, slightly more than two thirds (66.7%) had experienced < 5 years in NICU. The majority (85.0%) didn't attend training course regarding care of neonates on NICPAP

Table (2): Demonstrates that, more than two-thirds (66.7%) of the studied neonates were in gestational age group from 32 to < 36weeks with mean age 36.13 ± 1.73 weeks, half (50%) had weight admission from 2000 to < 2500 gm. while, more than half (53.3%) had current weight from 2000 to < 2500 gm. More than two thirds (71.7%) suffering from respiratory distress syndrome on admission.

Figure (1): Reveals that, most (96.7%) of studied nurses had a poor level of knowledge at pre clinical pathway intervention compared with most (90.0%) had a good level of knowledge regarding care of neonates undergoing NICPAP after clinical pathway intervention.

Figure (2): Illustrate that, most of studied nurses (98.3%) had incompetent practice level regarding pre-clinical pathway intervention compared with more than three quarters (76.7%) had competent practice level regarding clinical pathway implementation .

Table (3): Shows that the majority (83.3%) of the studied neonates had regular respiratory rate and normal oxygen saturation post clinical pathway intervention compared with more than two thirds (66.7%) had irregular respiratory rate and three quarters (75%) had abnormal oxygen saturation pre clinical pathway intervention. where as, there was highly statistical significance differences related to all items except length of stay and CRP had statistical significance differences, there was an improvement in neonatal outcome.

Table (4): Shows that, there was highly statistically significant relation between total nurses' knowledge regarding clinical pathway implementation and their year of experience of nurses at pre and post intervention phases. While there were no statistical significant relation between total nurses knowledge regarding clinical pathway implementation and their age and attending training course regarding NICPAP.

Table (5): Shows that, there was statistically significant relation between total nurses' practice regarding pre-clinical pathway intervention and their years of experience and educational level at pre and post clinical pathway implementation. While, there were no statistical significant relation between total nurses' practice regarding clinical pathway intervention and their age

and attending training courses regarding NICPAP.

Table (6): Reveals that, there was a highly statistically significant with a positive correlation between nurses' total knowledge and practice regarding clinical pathway and NICPAP in neonates at post clinical pathway intervention (P < 0.001)**.**

Table (1): Distribution of the studied nurses according to their characteristics (n=60).

Characteristics	No.	%
Age / years		
<20	2	3.3
20 - <25	38	**63.3**
25 - <30	16	26.7
≥ 30	4	6.7
Mean ± SD 23.80 ± 3.07 Years		
Educational level		
Secondary School of Nursing	2	3.3
Technical Institute of Nursing	17	28.4
Bachelor of Nursing Science	39	**65.0**
Post-graduate Studies	2	3.3
Years of experience in Neonatal Intensive Care Units		
< 5 years	40	**66.7**
5 - < 10 years	18	30.0
≥ 10 years	2	3.3
Mean ± SD 4.15 ± 6.61 Years		
Attended training course regarding care of neonates undergoing NICPAP		
Yes	9	15.0
No	51	**85.0**
Number of training course (n=9)		
One time	7	**77.8**
Two time	2	22.2

Table (2): Distribution of the studied neonates according to their characteristics and medical data (n= 60).

Characteristics	No.	%
Gestational age / weeks		
28 < 32	5	8.3
32 - < 36	40	**66.7**
36 - ≤ 40	15	25.0
Mean ± SD 36.13 ± 1.73 Weeks		
Current age / days		
<5	14	23.3
5<10	42	**70**
10≤ 15	2	3.3
.> 15	2	3.3
Mean ± SD 8.01± 2.75 days		
Weight on admission/ gms.		
1500 -<2000 gm	15	25.0
2000 -<2500 gm	30	**50.0**
2500 -<3000 gm	10	16.7
3000 ≤ 3500gm	5	8.3
Mean ± SD 2461.66 ± 749.93 gm.		
Current weight/ gms.		
<2000 gm	16	26.7
2000 -<2500 gm	32	**53.3**
2500 -<3000 gm	8	13.3
3000 -<3500gm	2	3.3
≥3500gm	2	3.3
Mean ± SD 2484.16± 708.39gm.		
Medical Diagnosis		
Respiratory Distress Syndrome	43	**71.7**
Diabetes Mellitus	7	11.7
Premature	10	16.6

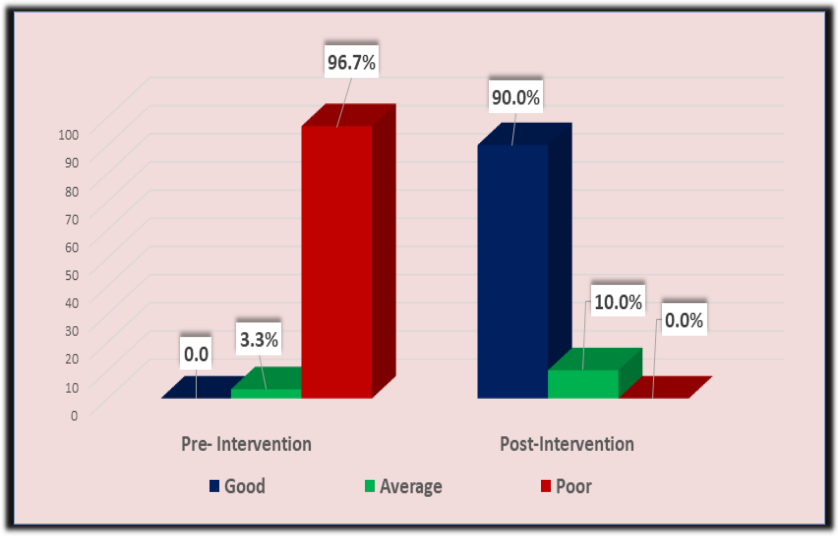

Figure (1): Distribution of total nurses' knowledge level regarding care of neonates undergoing NICPAP at pre and post clinical pathway map intervention (60) .

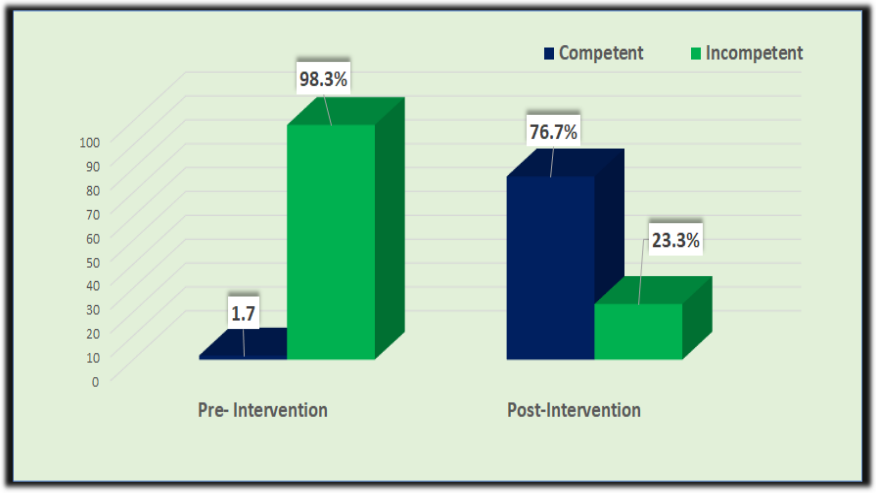

Figure (2): Distribution total level of the studied nurses' practice regarding care of neonates undergoing NICPAP at pre and post clinical pathway intervention.

Table (3): Distribution of the studied neonate's outcomes after clinical pathway intervention (n= 60)

Characteristics	Pre- clinical pathway intervention phase		Post clinical pathway intervention (n=60)		χ2 /FET	P-value
	No.	%	No.	%		
Length of stay						
< 5 days	10	16.7	8	13.3	**5.79**	**0.017***
5 - < 10 days	10	16.7	6	10.0		
10 - < 15 days	15	25.0	43	**71.7**		
≥ 15 days	25	**41.6**	3	5.0		
Mean ± SD 18.02 ± 2.08 days 11.00 ± 1.01 days						
Respiratory rate						
Regular	20	33.3	50	**83.3**	**24.5**	**0.000****
Irregular	40	**66.7**	10	16.7		
Oxygen saturation						
Normal	15	25.0	50	**83.3**	**25.36**	**0.000****
Abnormal	45	**75.0**	10	16.7		
Color of skin						
Pallor	35	**58.3**	6	10.0	**17.24**	**0.000****
Pink	25	41.7	54	**90.0**		
Feeding						
Good	-	-	50	**83.3**	**29.39**	**0.000****
Bad	60	**100.0**	10	16.7		
CRP						
Negative	25	41.7	55	**91.7**	**14.94**	**0.001****
Positive	35	**58.3**	5	8.3		
Duration of neonates connected on NICPAP						
<5 days	5	8.3	45	**75.0**	**26.73**	**0.000****
5 -<7 days	5	8.3	6	10.0		
7 -<10 days	10	16.7	4	6.7		
≥ 10 days	40	**66.7**	5	8.3		
Mean ± SD 17.83 ± 0.22 days			**4.01± 0.09 days**			

Table (4): Relation between nurses' total knowledge score and their characteristics pre and post clinical pathway intervention (n= 60).

Characteristics	Total Knowledge Pre- clinical pathway intervention (n=60)				χ2/FET	(P-Value)	Total Knowledge Post-Intervention (n=60)				χ2/FET	(P-Value)
	Poor ((n= 58)		Average (n=2)				Average(n=6)		Good (n=54)			
	No.	%	No.	%			No.	%	No.	%		
Age / years												
< 20	2	3.4	-	-	1.198	0.754	-	-	2	3.7	1.380	.710
20:< 25	36	62.1	2	100.0			4	66.7	34	63.0		
25:< 30	16	27.6	-	-			2	33.3	14	26.0		
≥ 30	4	6.9	-	-			-	-	4	7.3		
Educational level												
Secondary School of Nursing	2	3.4	-	-	7.683	0.021*	-	-	2	3.7	11.742	0.003*
Technical Institute of Nursing	17	29.4	-	-			1	16.7	16	29.6		
Bachelor of Nursing Science	38	65.5	1	50.0			4	66.6	35	64.9		
Post-graduate Studies	1	1.7	1	50.0			1	16.7	1	1.8		
Years of experience in neonatal care												
< 5 years	38	65.5	2	100.0	0.445	0.884	4	66.7	36	66.7	13.697	0.000**
5:< 10 years	18	31.0	-	-			2	33.3	16	29.6		
≥ 10 years	2	3.4	-	-			-	-	2	3.7		
Attended training course regarding NICPAP												
Yes	7	12.1	2	100.0	0.818	0.510	1	16.7	8	14.8	0.491	0.449
No	51	87.9	-	-			5	83.3	46	85.2		

Table (5): Relation between nurses' total practice score and their characteristics pre and post clinical pathway intervention (60).

Characteristics	Total practice Pre- clinical pathway intervention (n=60)				χ2/FET	(P-Value)	Total practice Post clinical pathway intervention (n=60)				χ2/FET	(P-Value)
	Incompetent(n=59)		Competent (n=1)				Incompetent (n=14)		Competent (n=46)			
	No.	%	No.	%			No.	%	No.	%		
Age / years												
< 20	2	3.4	-	-	0.923	0.899	-	-	2	4.4	3.715	.294
20:< 25	37	62.7	1	100.0			9	64.3	29	63.0		
25:< 30	16	27.1	-	-			5	35.7	11	23.9		
≥ 30	4	6.8	-	-			-	-	4	8.7		
Educational level												
Secondary School of Nursing	2	3.4	-	-	5.48	0.832	1	7.1	1	2.2	4.202	.042*
Technical Institute of Nursing	17	28.8	-	-			6	42.9	11	23.9		
Bachelor of Nursing Science	38	64.4	1	100.0			7	50.0	32	69.6		
Post-graduate Studies	2	3.4	-	-			-	-	2	4.3		
Years of experience in neonatal care												
< 5 years	39	66.1	1	100.0	0.819	0.664	11	78.6	29	63.0	7.766	.005**
5:< 10 years	18	30.5	-	-			3	21.4	15	32.6		
≥ 10 years	2	3.4	-	-			-	-	2	4.4		
Attended training course regarding clinical pathway and NICPAP												
Yes	9	15.2	-	-	0.673	0.717	5	35.7	4	8.7	0.490	.351
No	50	84.8	1	100.0			9	64.3	42	91.3		

Table (6): Correlation between nurses' total knowledge and total practice pre and post clinical pathway intervention (n=60)

	Pre- clinical pathway intervention		Post clinical pathway intervention	
	r	P value	r	P value
Knowledge	**0.246**	**0.034***	**0.650**	**0.000****
Practice	**0.331**	**0.029***	**0.815**	**0.000****

Discussion:

Nasal continuous positive airway pressure is connected through the nasal interface as single or bi-nasal prongs, nasopharyngeal tube and nasal mask as a safe and an effective ventilation method at the post extubation period with documented favorable patient outcomes **(Meng et al., 2022).** A clinical pathway is a method for the patient-care management of a well – defined group of patients during a well-defined period of time **(Debleser etal, 2017).**

This study was conducted to evaluate the effect of clinical pathway on nurses' performance and neonates outcomes regarding noninvasive continuous positive airway pressure**.**

As regards age of the studied nurses, the present study revealed that, more than half of the studied nurses within age from 20 to less than 25 yrs with mean age 23.80 ± 3.07 Years. This finding agreed with **Tawfik et al. (2015)** in a study entitled "Assessment of nursing care provided to neonates with respiratory distress" who reported that, half of the studied nurses within age from 20≤ 25 yrs. From the researcher point of view, this may be due to the appointment of a new staff from newely graduated nurses each year in the hospital.

Regarding the qualifications of the studied nurses, the present study revealed that nearly two thirds of the studied nurses had Bachelor of Nursing Science. The finding of this study disagreed with **Hegazy et al. (2014)** in a study entitled " Nurses knowledge versus their performance in caring for neonates having respiratory distress syndrome" who reported that, more than half of the studied nurses had nursing diploma. From the researcher point of view, this may be due to the reason that the critical areas such as neonatal intensive care units need the qualified nurses

As regards the years of experience of the studied nurses, the present study revealed that, more than two thirds of the studied nurses had less than five years of experiences with mean 4.15 ± 6.61 Years. The finding of this study was in agreement with **Abd-Elbaky et al. (2018)** in a study entitled " Impact of simulated education program on nurses' performance of invasive procedure at intensive care units " who reported that, the majority of the studied nurses had had less than five years of experiences. From the researcher point of view, this result probablydue to young age of the studied nurses, the decrease in the nurses experience year may affect on their performance level which may affect on their practice.

The present study showed that the majority of the studied nurses didn't attendence training courses for neonates on NICPAP. The finding of this study was consistent with **Elsobky & Mohamed (2018)** in a study entitled "Effect of educational guidelines program about nursing care of neonates receiving CPAP " who found that, two thirds of the studied nurses didn't attendance training courses for neonates on NICPAP. The researcher believes that, the hospital should provide continuous training for neonatal intensive care nurses to gain and update their knowledge and practices about CPAP.

According to the admission weight of the studied neonates on NICPAP, the present study was found that the mean weight of neonates was 2461.6±749.9 gm and the mean gestational age was 36.13±1.73 wks. The finding of this study was consisted with **Atia et al. (2019)** in a study entitled "Nurses

malpractices during performing blood samples withdrawal for neonates" who found that, the mean gestational age was 36.72±1.42. The finding of this study was agree with **Hameed & Raiees (2015)** in a study entitled " Continuous positive airway pressure and nasal trauma in neonates" who reported that, the mean weight of neonates was 2492±688.

Regarding the medical diagnosis of the studied neonates on NICPAP, the present study revealed that, more than two thirds of the studied neonates had respiratory distress syndrome. This finding in accordance with the finding of the study reported by **Elsobky &Mohamed (2018)** in a study entitled "Effect of educational guidelines program about nursing care of neonates receiving CPAP " who found that, the most causes of neonatal admission to the NICU was respiratory distress syndrome.

According to the gender of the studied neonates on NICPAP, the present study revealed that more than half the studied neonates were females. This result was disagree with **Zhu et al. (2017)** in a study entitled "Effect of using clinical pathway on nursing care of neonates with respiratory distress syndrome " who reported that, the majority of the studied neonates were female.

Concerning the total score of the nurses knowledge regarding implementation of clinical pathway care map activities pre, post implementation, the present study found that, the majority of the studied nurses had poor knowledge pre clinical pathway intervention, while improved to the majority of the the studied nurses had good knowledge post clinical pathway intervention. The finding of this study was in agreement with **Abd Elmenem et al. (2015)** who reported that all of the studied nurses had poor knowledge pre clinical pathway intervention, while the majority of them had a good knowledge post intervention. In the same line, this result was supported by **Mohamed et al. (2014),** in a study entilted "The effect of a clinical pathway on outcome of children" it showed a very highly statistical significant difference between the study group and control group in relation to clinical pathway activities.

Regarding nurses total level of practice of care provided to neonates on NICPAP pre and post clinical pathway intervention, the present study illustrated that, the implementation had a greater effect on improving studied nurses practice at post clinical pathway intervention compared with the pre clinical pathway intervention. The finding of this study was in agreement with **Milligan & Goldstein, (2017)** in astudy entitled "Implementation of an evidence-based non-invasive respiratory support (NIRS) bundle in the NICU to decrease nasal injury complications" who revealed that, the intervention had a greater effect on improving studied nurses practice at post clinical pathway intervention compared with the pre clinical pathway intervention. From the researcher point, improvement in nursing practice after implementation of the clinical pathway intervention may be due to efficient application of the clinical pathway intervention and the readiness of the studied nurses to improve their level of practice

Regarding effect of a clinical pathway on neonates 'outcomes, neonates undergoing noninvasive continuous positive airway pressure, the present study revealed that, there was an obvious improvement of neonates' condition whereas, the majority of the studied neonates had regular respiratory rate and normal oxygen saturation post clinical

pathway intervention compared with more than two thirds of them had irregular respiratory rate and three quarters of them had abnormal oxygen saturation pre intervention, more than two thirds of them had length stay 10 day to less than 15 days compared with the pre application of the clinical pathway. These findings of this study concise with **Abdel Sadik & Khalaf (2017)** in a study entitled "effect of using clinical pathway on nursing care of neonates with respiratory distress syndrome" who reported that, there was an obvious improvement of neonates condition and decrease length of stay of the studied neonates after clinical pathway intervention.

Concerning relation between total nurses' knowledge and their characteristics pre and post clinical pathway implementation, the present study showed that, there was statistically significant relation between the studied nurses' total score of knowledge and their years of experience and their educational level. The finding of this study was supported by **Abd Elmageed et al. (2020)** in a study entitled" Knowledge, Attitude and Practice of Nurses in Administering Medications "who found that, there was a statistically significant relation between nurses' level of knowledge and years of experience. The finding of this study consistent with **Mohamed et al. (2020))** who found that there was statistical significant relation between nurses' knowledge and their qualifications. From the researcher point of view, this result may indicate that the ability to acquire knowledge increased with high educational level and years of experience.

Concerning relation between total nurses knowledge and their characteristics, the present study showed that, there was no significant relation between the studied nurses' total score of knowledge and their age, attended training course regarding NICPAP. These findings of this study in an agreement with **Mohamed et al. (2019)** who reported that, there was no significant statistical difference between total nurses knowledge scores the care of neonates undergoing mechanical ventilation and their age. This result may indicate that the ability to acquire knowledge not depend on the studied nurses age.

Concerning relation between total nurses practice' and their characteristics pre and post clinical pathway intervention, the present study showed that, there was a significant relation between the studied nurses' total score of practice and their years of experience and their educational level. These findings of this study were disagreed with **Mostafa et al. (2019)** in a study entitled" who reported that, there were statistical significance between total qualifications score and total practice score. From the researcher point of view, this indicates that high level of education for nurses, affect on their level of performance and efficient of care.

Concerning correlation between nurses total knowledge and total practice regarding care of neonates on NICPAP pre and post clinical pathway intervention, the present study revealed that there was a very highly positive statistically significant correlation between nurses knowledge and total practice pre and post clinical pathway intervention. The finding of this study congruent with **Abd Elmenem et al. (2015)** who found that, there was a very high statistically significant correlation between nurses knowledge regarding clinical pathway and intervention clinical pathway care map pre, post intervention of nursing clinical pathway. From the researcher point of view, this may indicate that the nurse knowledge

affects on their practice. Lack of knowledge may influence nurses practice regarding care of neonates on NICPAP

Conclusion:

Implementation of the nursing clinical pathway can improve the nurse's performance and neonatal outcomes regarding noninvasive continuous positive airway pressure through increasing the nurses knowledge, enhancing their practice regarding NICPAP, reduce the length stay for the neonates.

Recommendations:

-Provision of Continuous education program all for nurses working in NICU about using clinical

-Pathway for updating of their knowledge and their practices regarding care of neonates undergoing NICPAP.

-Designing and distributing a manual booklet about us of clinical pathway to all nurses who are caring neonates undergoing NICPAP.

-Further studies need to be carried out to assess the effectiveness of clinical pathway applications in care of neonates on NICPAP and outcomes using larger sample size and determined the neonates' inclusion criteria.

References:

Abbott, M., Heppner, A., Hicks, N., Hermesch, A., VanHaitsma, K. (2022). Evaluating the implementation of a pragmatic person-centered communication tool for the nursing home setting: PAL Cards. Journal of Clinical Gerontologist, 45(3), 634-646

Abd Elmageed, E., Soliman, H., Abdelhamed, H. (2020). Knowledge, attitude and practice of nurses in administering medications at mansoura university hospitals. Journal of Nursing and Health Science (IOSR JNHS), 9 (4): 06-16. DOI: 10.9790/1959-0904060616

Abd Elmenem, H., Sharkawy, s., Adly, R. (2015). Effect of Clinical Pathway Regarding to Care of Neonates undergoing CPAP. Doctorate degree, faculty of nursing, Ain shams University. pp.72

Abd-Allah, S., Abd. Almoneim, I., Abou khalaf, M. (2013). Assessment of Pediatric Nurses' Performance Regarding Oxygen Administration Therapy. Master Thesis, Faculty of Nursing, Ain Shams University, PP: 142-148

Abdel Sadik, B., Khalaf, S. (2017). Effect of using clinical pathway on nursing care of neonates with respiratory distress syndrome, Tanta Scientific Nursing Journal, Vol. 12 No. 1

Abd-Elbaky, M., Mohamed, E. , Nagib, R. (2018). Impact of simulated education program on nurses' performance of invasive procedure at intensive care units: Evidence Based Practice, International journal of Nursing Didactics: 8(12), 13-20

Atia, N., Elrafy, S., Kunswa, M. (2019). Nurses Malpractices during Performing Blood Samples withdrawal for Neonates. Master degree, Faculty of Nursing , Ain shams university, pp.120

Bowden, V., Greenberg, C. (2016). Pediatric Nursing Procedures, 4th Ed, China, pp.120

Chuter, V., Quigley, F., Tosenovsky, P., Ritter, J., Charles, J., Cheney, J., Fitridge, R. (2022). Australian guideline on diagnosis and management of peripheral artery disease: part of the 2021 Australian evidence-based guidelines for diabetes-related foot disease. Journal of Foot and Ankle Research, 15(1), 1-25

Debleser, L., Depreitere, R., Dewaele, K., Vanhaecht, K., Vlayen, L., Sermeus, W. (2017). Defining pathways. Journal of Nursing Management; 14 (5): 553-563. Available at https://www.researchgate.net/ publication/6789575

Dewez, J., Chellani, H., Nangia, S., Metsis, K., Smith, H., Mathai, M., van den Broek, N. (2018). Healthcare workers' views on the use of continuous positive airway pressure (CPAP) in neonates: a qualitative study in Andhra Pradesh, India. BMC pediatrics, 18(1)

Dries, D., Marini, J. (2018). Mechanical Ventilation, Critical Care Nephrology E-book, 3rd Ed, Canada, Chapter 3, 10-21

Elsobkey, F., Mohamed, S. (2018). Effect of edtional guidelines program about nursing care of neonates receiving continues positive airway pressure, international organization of scientific research, Journal of Nursing and Health Science: 7(3), 2018, PP 16-26

Ferreira, F., Cruz, F. (2022). What is the best digital technology for the keep in ventilation with mechanical ventilation nursing intervention in ICU-Systematic Literature Review. Journal of Specialized Nursing care, 14(1)

Gartner, B., Abasse, S., Bergeron, F., Landa, P., Lemaire, C., Côté, A. (2022). Definition and conceptualization of the patient-centered care pathway, a proposed integrative framework for consensus: A concept analysis and systematic review. BMC health services research, 22(1), 1-24

Hameed, N., Raiees, R. (2015). Continuous Positive Airway Pressure and Nasal Trauma in neonates : a descriptive prospective study, volume 14, issue 11, pp 110-116

Hegazy, A. Youssef, M., Abou khalaa, M. (2014). Nurses' Knowledge versus Their Performance in Caring for Neonates Having Respiratory Distress Syndrome. Unpublished Doctorate Dissertation, Faculty of Nursing, Ain Shams University, P:42

Meng, M., Zhang, J., Chen, L., Wang, L. (2022). Prehospital noninvasive positive pressure ventilation for severe respiratory distress in adult patients: An updated meta-analysis. Journal of clinical nursing, doi: 10.1111/jocn.1624. Epub ahead of print. PMID: 352212078

Milligan, P., Goldstein, M. (2017). Implementation of an evidence-based non-invasive respiratory support (NIRS) bundle in the NICU to decrease nasal injury complications, Journal of neonatal nursing: 23(2), 89-98

Mohamed, N., Ahmed, S., Tawfic, A., (2020). Assessment of Pediatric Nurses' Performance regarding Intravenous Therapy. Minia Scientific Nursing Journal (Print - ISSN 2537-012X) (Online - ISSN 2785-9797). 8 (1), 3 14

Mohamed, E. Al Sharkawy, S., Abd-Elsadek, B. (2019). Intervention program for nurses about care of preterm undergoing continous positive airway pressure. Master Thesis, Faculty of Nursing, Benha University, PP: 142-148

Mohamed, H., Abd El-moniem, I., Morsy, M. (2014). Effect of a Clinical Pathway on Outcomes of Children with Hemolytic Anemia. Unpublished Doctorate Thesis, Faculty of Nursing, Ain-Shams University, PP:102-103

Mostafa, A., Mehany, M. & Ahmed, M., (2019). Effect of educational program on

nurses' knowledge and practice about oxygen therapy. Assiut scientific nursing journal. 7 (18): 93-102.

National Health of Services. (2009). Mapping of clinical Pathway. A resource pack, East of England , septemper, 2009

Pirog, F., Kleiner, H., Marcheva, B., Jagun, D., Sweetnam, N., Frieder, M. (2015). Clinical pathways: overview of current practices and potential implications for patients, payers, and providers; 27(7): Research Network. Pediatrics, 107 (1): 1-8. Resource Pack, East of England, September, 2009

Seigel, T. (2018). Mechanical Ventilation and Noninvasive Ventilatory Support, rosen's Emergency Medicine: Concepts and Clinical Practice, 9th Ed, China, Chapter 2, 25-33

Tawfik, N., El-Dakhahney, A., Mahmoud, B. (2015). Assessment of Nursing Care provided to Neonates with Respiratory Distress, Master degree, Faculty of nursing, Zagazig university

Thukral, A., Sankar, M., Chandrasekaran, A., agarwal, R., Paul, V. (2016). Efficacy and safety of CPAP in low- and middle-income countries, Journal of Perinatology: 36 (Suppl 1): $21-$28,May, 2016.

Warner, W., Kulick, M., Stoops, M., Mehta, S., Stephan, M., Kotagal, R. (2020). An evidenced-based clinical pathway for acute appendicitis decreases hospital duration and cost. Journal of pediatric surgery, 33(9), 1371-1375

Weizi, L., Kecheny, L., Hongqiao, Y., Changrui, y. (2014). Integrated clinical pathway management for medical quality improvement- based on a systematically inspired systems. architecture, European Journal of information; 28(10): 1057

Zhu, M., Xia, L., Yang, X., Huang, P., Sun, Y., Ma, J. (2022). Transnasal high-flow oxygen therapy versus noninvasive positive pressure ventilation in the treatment of copd with Type II respiratory failure: A meta-analysis. Computational and mathematical methods in medicine, 2022

Zhu, X., Zhao, J., Tang, S., Yan, J., Shi, Y. (2017). Noninvasive high-frequency oscillatory ventilation versus nasal continuous positive airway pressure in preterm infants with moderate-severe respiratory distress syndrome: A preliminary report, Journal of Pediatric pulmonology, 50(90), 1028 -104

تأثير المسار الاكلينيكي علي أداء الممرضين والأطفال حديثي الولادة الخاضعين لجهاز الضغط الهوائي الإيجابي المستمر اللإختراقي (السيباب)

نسمة محمد عطية السيد – حنان ثروت البهنساوي- باسمة ربيع عبدالصادق- سهام محمد عبدالعزيز

يعتبر جهاز الضغط الهوائي الإيجابي المستمر اللإختراقي طريقة لعلاج الأطفال حديثي الولادة الذين يعانون من مشاكل في التنفس والمضاعفات الخاصة به. يتم تطبيق المسار الاكلينيكي علي مجموعة خاصة من الأطفال حديثي الولادة في فترة زمنية معينة واستخدام خطوات معينة ودليل إرشادي للوصول الي افضل النتائج. لذا هدفت هذه الدراسة الي تحسين مستوي أداء الممرضين تجاه رعاية الاطفال حديثي الولادة الخاضعين لجهاز الضغط الهوائي الإيجابي المستمر اللإختراقي بعد تطبيق المسار الاكلينيكي. وقد أجريت هذه الدراسة في وحدات الرعاية المركزة للأطفال حديثي الولادة في كل من مستشفي الأطفال التخصصي ومستشفي جامعة بنها بمدينة بنها. وقد اشتملت عينة الدراسة علي جميع الممرضين القائمين علي رعاية الأطفال حديثي الولادة الخاضعين لجهاز الضغط الايجابي المستمر اللإختراقي وكذلك اشتملت علي جميع الأطفال حديثي الولادة الخاضعين لجهاز الضغط الهوائي الإيجابي المستمر اللإختراقي الذين كانوا متواجدين أثناء فترة تجميع البيانات. وكشفت الدراسة الحالية عن ان هناك تحسن ذو دلالة إحصائية عالية في معلومات وممارسات الممرضين تجاه تطبيق المسار الاكلينيكي للأطفال حديثي الولادة الخاضعين لجهاز الضغط الهوائي الإيجابي المستمر اللإختراقي قبل وبعد التدخل التعليمي ، علاوة على ذلك تطبيق المسار الاكلينيكي ادي الي تحسن الحالة الخاصة بالأطفال حديثي الولادة. وقد اوصت نتائج الدراسة بالتزويد بالبرامج التثقيفية في كل المؤسسات الصحية والتي تكون مسئولة عن تحديث معلومات وممارسات الممرضين وعمل المزيد من الدراسات عن المسار الاكلينيكي وتقييمه وتحديد نتيجته علي اكبر عدد من العينة المستخدمة .