Guidelines protocol for enhance nurses' performance for care of children with respiratory disorders on oxygen therapy and pulse oximetry

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Abstract:

Background: Pulse oximetry is a noninvasive method that enables rapid measurement of the oxygen saturation of hemoglobin in arterial blood, it important for the quality of healthcare and the infant's safety. ***The aim of the study:*** the aim of the current study was to develop and evaluate guidelines protocol to enhance nurses' performance for the care of children with respiratory disorders on oxygen therapy and pulse oximetry. ***Design:*** A quasi-experimental design was used. ***Setting:*** the study carried out in the NICU and PICU on the pediatric department at Maternity & Children Hospital in Alexandria. ***Sample****:* A convenient sample of 100 nurses worked at the NICU, and PICU in pediatric department were enrolled in this study. ***Tools:*** Three tools were used to collect the study data, **tool I;** a structured interview to assess the basic characteristics of the nurses as well their knowledge about respiratory disorders, pulse oximetry, and oxygen therapy. **Tool II;** an observational checklist to evaluate nurses' performance regarding pulse oximetry, and oxygen therapy. ***Results:*** The study results revealed that after the implementation of guidelines protocol the nurses had a satisfactory level of knowledge and performance regarding pulse oximetry and oxygen therapy. ***Conclusion:*** The guidelines protocol of pulse oximetry and oxygen therapy has a good effect on nurses' knowledge and performance among children with respiratory disorder. ***Recommendation:*** Continuous updates of nurses' knowledge and performance regarding pulse oximetry and oxygen therapy.

Keyword*:* Guidelines protocol, nurses' knowledge and performance, oxygen therapy, pulse oximetry and respiratory disorder.

Introduction:

Respiratory diseases are the causes of childhood morbidity and mortality as well as hospitalization globally especially among children less than five years old (Ralston S et al, 2014). Pneumonia is the leading cause of death in children under 5 years of age, being responsible for at least 18% of all deaths in this age category. Every year, over 5.9 million children die, and

more than 95% of those deaths occur in developing countries. (United Nations Inter-Agency Group for Child Mortality Estimation, 2015).

Children with respiratory disease can have lower levels of oxygen and they need to use efficient oxygen in order to bring their oxygen levels up to a healthier level. Efficient oxygen protects their bodies from the effects of low oxygen levels, helps them to function better, and allows them to stay more active. The brain is extremely sensitive to O2 supply; decreased O2 can lead to an altered mental status (Sockrider M et al, 2015).

Oxygen therapy is the most important aspect of supportive care in the management of children with respiratory disease which remains poorly understood and inadequately practiced by the nurse Pulse oximetry and the availability of reliable oxygen sources in hospitals is evidenced that can reduce death rates of respiratory disorders by about one- third (Hasegawa K et al, 2013). Pulse oximetry (SpO2) is a noninvasive method used to detect the oxygen saturation of functional hemoglobin. Oxygen saturation measured by pulse oximetry (SpO2) between 96 and 100 % are considered normal. A reading of 100 % means that all the hemoglobin in the red blood cells is carrying oxygen molecules. Children with low oxygen saturation don't have enough oxygen in the hemoglobin, usually because of respiratory problems (Martin S, 2015).

Nursing care has a greater impact on improving the efficiency of the infant's respiration, and increasing the chance of recovery. Early detection of changes in respiratory status, and regular assessment of the infant's tissue oxygenation status and proper evaluation of arterial blood gases results and indices of end-organ perfusion are essentials in proper management of respiratory diseases among children (Fournier M, 2014).

Providing adequate training to staff nursing regarding administration of O2 therapy and use the pulse oximetry to monitor the oxygen saturation level for the infants and ensure the competency of clinical outcomes are mandatory. Many of studies reported that the most of staff had insufficient knowledge regarding pulse oximetry (Norwood A et al 2010). So further study should emphasize on improving and enhancing knowledge of nursing regarding to pulse oximetry, procedure, and equipment's of its and all skills practice for the preferred quality of nursing care.

Significant of the study:

Respiratory disorders in infants and children are challenging problems, it is considered the most frequent reason for children hospitalization. Hypoxemia (insufficient oxygen in the blood) is the major fatal complication of common respiratory disorder, increasing the risk for death many

times, thereby making oxygen administration a life-saving adjunctive when indicated. Pulse oximetry can rapidly detect changes in oxygen saturation, thus providing an early warning of dangerous hypoxemia. However, many health care settings that manage most of the cases of respiratory disorders often lack the adequate manpower and facilities to decide which infant should be on oxygen therapy. Therefore, the study aimed to develop and evaluate guidelines protocol to enhance nurses' performance for the care of children with respiratory disorders on oxygen therapy and pulse oximetry.

Research Hypothesis:

Implementation of guidelines protocol will improve the nurses' knowledge and performance for the care of children with respiratory disorders on oxygen therapy and pulse oximetry.

Subjects and Method:

Design: A quasi- experimental design was used.

Setting: The study carried out in the NICU and PICU on the pediatric department at Maternity & Children Hospital in Alexandria.

Sample: All available nurses working in NICU and PICU on the pediatric department at Maternity & Children Hospital in Alexandria at the study time. They accounted 100 nurses.

Tools: In order to collect the necessary data for the study three tools were used:

Tool (I): Nurses' knowledge about respiratory disorders, oxygen therapy and pulse oximetry structured interview schedule: It was developed by the researchers to collect the necessary data. It included three parts;

Part 1: Personal characteristics of the studied nurses. It included data such as age, level of educations and years of experiences.

Part 2: Nurses' knowledge regarding respiratory disorders, pulse oximetry, and oxygen therapy. It contained 76 statements divided into three domains, respiratory disorders (24 items), pulse oximetry (31 items) and oxygen therapy (21 items). Responses to each statement were incorrect, somewhat correct/complete or correct/complete. A correct complete answer was scored as (2), somewhat correct/complete was scored as (1), but the scoring of incorrect was (0). The total score was generated by summing up the scores from all statements. The resultant total score was converted into percentage score and distributed as follow, those having a score less than 65% were considered unsatisfactory knowledge, and those with a score of 65% and more were considered satisfactory knowledge.

Tool (II): Nurses' practice regarding pulse oximetry, and oxygen therapy they included items about guideline, pre procedure, procedure and documentation. The check list consisted of 47 items, distributed into two domains pulse oximetry (23 items) and oxygen therapy (24 items). Responses to each statement were incorrect, somewhat correct/complete or correct/complete. A correct complete answer was scored as (2), somewhat correct/complete was scored as (1), but the scoring of incorrect was (0). The total score was generated by summing up the scores from all statements. The resultant total score was converted into percentage score where as those having a score of less than 85% were considered incompetent, and those with a score of 85% and more were considered competent.

Method:

- Approval of responsible authorities was obtained through official letters from the Faculty of Nursing.
- Meetings were held with the directors of the selected settings to clarify the purpose of the study and to gain their cooperation and support during data collection.
- Tool (I) was developed by the researchers after reviewing the recent relevant literature. It was validated by juries of (5) experts in the field. Their suggestions and recommendations were taken into consideration.
- Cronbach Alpha Coefficient was used to ascertain the reliability of tool (I) and (II), (r = 0.82 for tool I and r =0.88 for tool II).
- Pilot study was carried out on 10 nurses who were randomly chosen from El Ramal hospital which were not included in the sample in order to ascertain the relevance, clarity and applicability of the tools, test wording of the questions and estimate the time required for the interview. Based on the obtained results, the necessary modifications were done.
- Data was collected by the researchers during the period from January 2019 to May 2019.

Field work:

- The study was constructed in four phases; assessment phase, developing planning phase, implementing phase, and evaluation phase. The guidelines protocol was conducted in 4 sessions each 10 nurses, the guidelines protocol included illustrated Arabic booklet involve instructions to improve nurses' knowledge and performance regarding pulse oximetry and oxygen therapy among respiratory disorder children, and the posttest done immediately after the guidelines protocol implementation and follow up care was done after two months of the

guidelines protocol implementation. ***Assessment phase:*** This phase encompassed interviewing the participant to collect baseline data as well their knowledge and practice. ***Planning phase:*** Based on the needs identified in the assessment phase and relevant review of literature, the researchers prepared the procedure of pulse oximetry and oxygen therapy procedure in the NICU, and PICU at the mentioned hospital. ***Implementation phase:*** The guidelines protocol was implemented over two weeks. The procedure classified into assessment, preparation, implementation, and documentation, through exposing nurse's intervention that developed by the researchers such as: knowledge about respiratory disorder, pulse oximetry and oxygen therapy, methods of performance every procedure. Each session took approximately 15 to 30 minutes. ***Evaluation Phase:*** The nurses' knowledge and performance were evaluated after immediately implementation of guidelines followed after 2 months.

- **Ethical considerations:**
  - Informed oral consents were obtained from the nurses after brief explanation of the purpose and nature of the research.
  - The anonymity and confidentiality of responses, voluntary participation and right to refuse to participate in the study were emphasized to the nurses. The researcher explained the objectives of the study to the participants.
  - The approval from the research committee to conduct the study were obtained.
- **Statistical analysis:**

  After data were collected, they were coded and transferred into specially designed formats so as to be suitable for computer feeding. Following data entry, checking and verification processes were carried out to avoid any errors during data entry, frequency analysis, cross tabulation and manual revision were all used to detect any errors. The statistical package for social sciences (SPSS version 20) was utilized for both data presentation and statistical analysis of the results. The level of significance selected for this study was P equal to or less than 0.05.

Results:

Table (1) illustrates that the mean age of the studied nurses was 24.92 ± 5.20 where, more than one third (38%) of them aged from 20 to less than 25 years. The majority (80%) of them were females. More than half (52%) of them have a diploma of secondary school of nursing. Moreover, less than three quarters (72%) of the nurses didn't have training about pulse oximetry and oxygen therapy.

Table (2): reveals that more than half (52.0%) of the nurses have unsatisfactory knowledge level about respiratory disorders before implementation of the guideline compared to 11.0% and 17.0% of them immediately after the guideline and after 2 months respectively. There was statistically significant difference between knowledge levels of the nurses through guidelines phases (X^2 = 50.148, P= 0.000). Moreover, more than two thirds (67%) of the nurses have unsatisfactory knowledge about pulse oximetry pre guideline compared to 10.0% and 35.0% of them immediately after the guideline and after 2 months respectively. There was statistically significant difference between knowledge levels of the nurses through guideline phases (X^2 = 69.785, P= 0.000). Furthermore, 68% of the nurses have unsatisfactory knowledge about oxygen therapy before implementation of the guideline compared to 13.0% and 16.0% of them immediately after and 2 months later respectively. There was a statistically significant difference between the nurses' knowledge levels through guidelines phases (X^2 = 12.882, P= 0.002).

Table (3): shows that the knowledge about respiratory disorders mean score was (32.04±9.46) before implementation of the guideline and raised to (42.92±5.93 and 39.13±6.95) immediately after the guideline and after 2 months respectively. There was statistically significant difference between knowledge mean scores of the nurses through guidelines phases (F= 52.90, P= <0.000). Moreover, the knowledge about pulse oximetry mean score pre guideline was (37.42±8.72) compared to (57.78±6.30 and 50.16±12.2) immediately after the guideline and after 2 months respectively. There was statistically significant difference between knowledge mean scores of the nurses through guideline phases (F = 119.99, P= 0.000). Furthermore, the mean score of the nurses' knowledge about oxygen therapy before implementation of the guideline was (25.37±5.32) compared to (37.92±4.96 and 32.96±5.62) immediately after and 2 months later respectively. There was a statistically significant difference between the nurses' knowledge mean scores through guidelines phases (F = 141.86, P= 0.000).

Table (4): reveals that more than three quarters (78.0%) of the nurses have competent practice level regarding pulse oximetry before implementation of the guideline which raised to 93.0% and 81.0% of them immediately after the guideline and after 2 months respectively. There was statistically significant difference between practice levels of the nurses through guidelines phases (X^2 = 9.375, P= 0.009). Additionally, 15.0% of the nurses have competent practice level regarding oxygen therapy pre guideline compared to 84.0% and 70.0% of them immediately after the

guideline and after 2 months respectively. There was statistically significant difference between practice levels of the nurses through guideline phases (X^2 = 108.16, P= 0.000).

Table (5): shows that the nurses' mean practice score regarding oxygen therapy before the guideline was (39.28±4.94) compared to (64.69±3.76 and 57.64±2.67) immediately after the guideline and after 2 months respectively. There was statistically significant difference between practice mean scores of the nurses through guideline phases (F = 130.34, P= 0.000). Moreover, the mean score of the nurses' practice about pulse oximetry before implementation of the guideline was (32.91±8.81) compared to (59.06±3.92 and 50.12±4.21) immediately after and 2 months later respectively. There was a statistically significant difference between the nurses' practice mean scores through guidelines phases (F = 478.71, P= 0.000).

Table (6) illustrates that nurses' age, level of education and years of experience were significantly correlated with their knowledge and practice level before and after the implementation of the guideline.

Discussion:

Nurses working at pediatric NICU & PICU exposure to and dealing with different equipment and devices need more knowledge and practice experience to provide quality of nursing care. Pulse oximetry, and oxygen therapy were considered procedures need wide explanation. The knowledge about pulse oximetry among clinicians and nurses continues to be limited. Pulse oximetry measure oxygen level is a critical component of the standard of care of critically ill infants that improve outcomes. The current study shed the lights about the importance of providing nurses with adequate knowledge and performance of pulse oximetry, and oxygen therapy.

The result of the present study revealed that the majority of study subject were females. This result was in contrast with Bhattacharya U, et al, (2015) showed that the majority of study subject was male. Regarding, level of education more than half of them had a secondary school of nursing, while one fifth of them had a university education. This result was disagreed with (Hemati Z, et al.,2016) that found the majority of their study subjects had university education.

The results of the current study showed that more than half of the studied nurses had an unsatisfactory level of knowledge about respiratory disorder before application of guidelines. This might be due to the lack of continuous education for these nurses, in addition to lack of their motivation to updating their knowledge. But this figure was changed as the majority of them had

a satisfactory level of knowledge after the implementation of guidelines, which highlight the importance of continuous education and training of staff nurses as they have an important role in managing children with respiratory disorder; the nurse should identify the child with pre-terminal severe breathing difficulty and arrange immediate or urgent medical attention. These results were supported by Hussein H (2014), Fabrellas N, et al (2011), who found that there were highly statistically significant differences regarding nurse's knowledge and practice about pneumonia between pretest and posttest scores.

As regard to knowledge about pulse oximetry the result of the present study showed that about two thirds of the studied nurse had unsatisfactory knowledge before application of guidelines protocol which decreased to one tenth immediately after the implementation of the guideline and to around one third in the follow up phase. This may be due to poor education of the nurses about uses and limitation of pulse oximetry. Similar results were reported by Orimadegun A et al (2011), who reported that the majority of the studied pediatric nurses had low level of knowledge about pulse oximetry. Moreover, Vandenbranden S (2010), reported that nurses' understanding of pulse oximetry was poor and pointed that their knowledge level was improved through educational program.

The result of the current study revealed that about one third of the studied nurses had unsatisfactory knowledge about oxygen therapy before application of guidelines which decreased to less than one fifth after the implementation of the guideline and in the follow up phase. These results were supported by Mahmoud A et al, (2016) who found poor knowledge level regarding oxygen therapy among nurses. Moreover, Kavitha K & Patil N, (2015) reported a rise in the nurses' knowledge level after the application of training program regarding oxygen therapy.

Many nurses or other health-care providers have lack of the appropriate clinical fundamentals and limitations of the use of oxygen therapy and pulse oximetry. This deficiency in knowledge has been linked to changes in the management of different respiratory disorder (Fouzas S, et al, 2011). This was reflected in the results of the current study where more than three quarters of the nurses were competent in use of pulse oximetry and less than one fifth of them were competent in oxygen therapy. The same was noticed by Ralston S et al (2017) who found that good assessment and management skills among the health care providers can lead to reduce unnecessary care for bronchiolitis patients.

The current study found that the implementation of guideline protocol for use of oxygen therapy and pulse oximetry was effective as it raised the nurses' practice level. These results may be explained in the light of the rise of their knowledge level occurred after the implementation of the guideline. The same results were noticed by Cunningham S et al (2015), Hermeto F et al (2009) and Martin S et al 2015 who found statistically significant increase in their subjects' practices after the implementation od management protocol of the respiratory disorders. They concluded that regular training of the health care personal can lead to significant change in the quality of care provided which will be reflected on the patients' health.

Additionally, the current study revealed that age, level of education and years of experience were significantly correlated with the nurses' knowledge and practice levels. The same results were noticed by Kord Z 7et al, (2012) & Hemati Z et al, (2016). These results suggest that nurses should be provided by continuous update knowledge and practice regarding pulse oximetry and oxygen in caring for children with respiratory disorder for quality of nursing care, and effective outcomes.

Conclusion:

The present study concluded that guidelines protocol about pulse oximetry and oxygen therapy was effective and improved nurses' knowledge and performance among children with respiratory disorder.

Recommendations:

- Further research to provide more evidence-based practice regarding pulse oximetry and oxygen therapy to nurses dealing with children with respiratory disorder.
- Continuous update for nurses' knowledge and performance regarding pulse oximetry and oxygen therapy.
- Establishing a guidelines protocol for pulse oximetry and oxygen therapy to improve the quality of nursing care provided to children with respiratory disorder or any health problems in different pediatric departments.

Table (1): Distribution of the studied Nurses according to their personal characteristics of

Items	Subjects (n=100)	
	No.	%
Age (years)		
- < 20	20	20.0
- 20-	38	38.0
- 25-	22	22.0
- 30-	35	35.0
- ≥ 35	35	35.0
Mean ±SD	**24.92 ± 5.20**	
Gender		
- Male	20	20
- Female	80	80
Level of education		
- Secondary School of Nursing Diploma	52	52.0
- Technical Institute of Nursing Diploma	28	28.0
- Bachelor Degree of Nursing	20	20.0
Years of experience		
- < 5	52	52.0
- 5-	11	11.0
- 10+	37	37.0
Training about pulse oximetry and oxygen therapy		
- Yes	28	28.0
- No	72	72.0

Table (2): Comparison of the knowledge level of the studied nurses regarding respiratory disorders, oxygen therapy and pulse oximetry before, and after the application of the guideline.

Item	Total (N= 100)						Test of Significance	
	Pre		Post 1		Post 2			
	No.	%	No.	%	No.	%		
Respiratory disorders								
- Satisfactory	48	48.0	89	89.0	83	83.0	X^{2a}= 38.95	P= 0.000*
- Unsatisfactory	52	52.0	11	11.0	17	17.0	X^{2b}= 27.11	P= 0.000*
							X^{2c}= 1.495	P= 0.221
Test of Significance	X^2= 50.148 P= 0.000*							
Oxygen therapy								
- Satisfactory	68	68.0	87	87.0	84	84.0	X^{2a}= 10.35	P= 0.001*
- Unsatisfactory	32	32.0	13	13.0	16	16.0	X^{2b}= 7.017	P= 0.008*
							X^{2c}= 0.363	P= 0.546
Test of Significance	X^2= 12.882 P= 0.002*							
Pulse Oximetry								
- Satisfactory	33	33.0	90	90.0	65	65.0	X^{2a}= 68.61	P= 0.000*
- Unsatisfactory	67	67.0	10	10.0	35	35.0	X^{2b}= 20.49	P= 0.000*
							X^{2c}= 17.92	P= 0.000*
Test of Significance	X^2= 69.785 P= 0.000*							
Total knowledge level								
- Satisfactory	49	49.0	80	80.0	69	69.0	X^{2a}= 20.98	P= 0.000*
- Unsatisfactory	51	51.0	20	20.0	31	31.0	X^{2b}= 8.268	P= 0.004*
							X^{2c}= 3.185	P= 0.074
Test of Significance	X^2= 22.01 P= 0.000*							

χ^2	The association b/w knowledge level pre, post 1 and post 2 guideline
χ^{2a}	The association b/w knowledge level pre and post 1 guideline
χ^{2b}	The association b/w knowledge level pre and post 2 guideline
χ^{2c}	The association b/w knowledge level post 1 and post 2 guideline
χ^2 = Chi square test	*** Statistically significant at P ≤0.05**

Table (3): Comparison of the knowledge mean scores of the studied nurses regarding respiratory disorders, oxygen therapy and pulse oximetry before, and after the application of the guideline.

Item	Total (N= 100)			Test of Significance	
	Pre	Post 1	Post 2		
	Mean ±SD	Mean ±SD	Mean ±SD		
Respiratory disorders					
	32.04±9.46	42.92±5.93	39.13±6.95	F=52.90	P= 0.000*
				t^a= 9.744	P= 0.000*
				t^b= 6.039	P= 0.000*
				t^c= 4.148	P= 0.000*
Oxygen therapy					
	25.37±5.32	37.92±4.96	32.96±5.62	F= 141.86	P= 0.000*
				t^a= 17.35	P= 0.000*
				t^b= 9.826	P= 0.000*
				t^c= 6.665	P= 0.000*
Pulse Oximetry					
	37.42±8.72	57.78±6.30	50.16±12.2	F= 119.99	P= 0.000*
				t^a= 18.92	P= 0.000*
				t^b= 8.486	P= 0.000*
				t^c= 5.543	P= 0.000*
Total Knowledge Mean Score					
	94.83±7.83	138.62±5.73	122.25±8.26	F= 100.33	P= 0.000*
				t^a= 45.13	P= 0.000*
				t^b= 24.09	P= 0.000*
				t^c= 16.28	P= 0.000*

F	The association b/w knowledge mean scores pre, post 1 and post 2 guideline
t^a	The association b/w knowledge mean scores pre and post 1 guideline
t^b	The association b/w knowledge mean scores pre and post 2 guideline
t^c	The association b/w knowledge scores post 1 and post 2 guideline

F = ANOVA test **t = Paired t test** *** Statistically significant at P ≤0.05**

Table (4): Comparison of the practice level of the studied nurses regarding respiratory disorders, oxygen therapy and pulse oximetry before, and after the application of the guideline.

Item	Total (N= 100)						Test of Significance	
	Pre		Post 1		Post 2			
	No.	%	No.	%	No.	%		
Pulse Oximetry								
- Competent	78	78.0	93	93.0	81	81.0	X^{2a}= 9.074	P= 0.003*
- Incompetent	22	22.0	7	7.0	19	19.0	X^{2b}= 0.276	P= 0.599
							X^{2c}= 6.366	P= 0.012*
Test of Significance	X^2= 9.375 P= 0.009*							
Oxygen therapy								
- Competent	15	15.0	84	84.0	70	70.0	X^{2a}= 95.23	P= 0.001*
- Incompetent	85	85.0	16	16.0	30	30.0	X^{2b}= 61.89	P= 0.000*
							X^{2c}= 5.534	P= 0.019*
Test of Significance	X^2= 108.16 P= 0.000*							
Total practice level								
- Competent	56	56.0	85	85.0	72	72.0	X^{2a}= 20.22	P= 0.000*
- Incompetent	44	44.0	15	15.0	28	28.0	X^{2b}= 5.556	P= 0.018*
							X^{2c}= 5.007	P= 0.025*
Test of Significance	X^2= 20.49 P= 0.000*							

χ^2	The association b/w practice level pre, post 1 and post 2 guideline
χ^{2a}	The association b/w practice level pre and post 1 guideline
χ^{2b}	The association b/w practice level pre and post 2 guideline
χ^{2c}	The association b/w practice level post 1 and post 2 guideline
χ^2 = Chi square test	*** Statistically significant at P ≤0.05**

Table (5): Comparison of the practice mean scores of the studied nurses regarding respiratory disorders, oxygen therapy and pulse oximetry before, and after the application of the guideline.

Item	Total (N= 100)			Test of Significance
	Pre	Post 1	Post 2	
	Mean ±SD	Mean ±SD	Mean ±SD	
Oxygen therapy				
	39.28±4.94	64.69±3.76	57.64±2.67	F= 130.34 P= 0.000* t^a= 40.93 P= 0.000* t^b= 32.69 P= 0.000* t^c= 15.29 P= 0.000*
Pulse Oximetry				
	32.91±8.81	59.06±3.92	50.12±4.21	F= 478.71 P= 0.000* t^a= 27.12 P= 0.000* t^b= 17.63 P= 0.000* t^c= 15.54 P= 0.000*
Total Practice Mean Score				
	72.19±6.87	123.75±3.84	107.76±4.34	F= 586.93 P= 0.000* t^a= 65.51 P= 0.000* t^b= 43.77 P= 0.000* t^c= 27.59 P= 0.000*

F	The association b/w practice mean scores pre, post 1 and post 2 guideline
t^a	The association b/w practice mean scores pre and post 1 guideline
t^b	The association b/w practice mean scores pre and post 2 guideline
t^c	The association b/w practice mean scores post 1 and post 2 guideline

F = ANOVA test **t = Paired t test** *** Statistically significant at P ≤0.05**

Table (6) Correlation between the studied nurses 'age, level of education and years of experience and their total knowledge and practice before and after the guideline implementation:

Items	Age		Level of Education		Years of Experience	
	R	P	R	P	R	P
Total knowledge pre guidelines	0.259	0.005	0.153	0.006	0.140	0.025
Total performance pre guidelines	0.253	0.000	0.245	0.005	0.161	0.042
Total performance pre guidelines	0.478	0.001	0.302	0.001	0.140	0.005
Total performance post guidelines	0.462	0.002	0.330	0.001	0.249	0.005

r = Pearson correlation * Significant p at ≤0.05

r ≥0.7 high correlation r 0.5-<0.7 moderate correlation r < 0.5 low correlation

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