

Effect of Evidence Based Program on Critical Care Nurses' Performance Related to Care for Intubated Patients

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Abstract

Background: Tracheal intubation constitutes the most commonly performed procedure in the intensive care units and is often lifesaving. In contrast to the high incidence of life-threatening complications that can be avoided by nursing care. Evidence based practice help critical care nurses to apply procedures safely for critically ill patients. **Aim:** To evaluate the effect of evidence based program on critical care nurses' performance related to care for intubated patients. **Method:** A quasi-experimental, pre-test and post-test intervention research design was implemented to conduct the current study. The study was conducted in the general intensive care unit at Benha University Hospital, Qalyubia Governorate, Egypt. A convenient sample of 60 critical care nurses of both gender who assigned care for intubated patients within nine months were enrolled in this study. **Tools:** Three tools were used to collect data: (I) a structured questionnaire for nurses which consisted of nurse's personal data and nurse's knowledge regarding care for intubated patients, (II) observational checklist for nurses' practice, (III) nurses' activities scale. **Results:** Overall knowledge level; procedural practice level and activities mean scores showed significant increase after the program implementation. A statistically significant positive relation was found between total nurses' knowledge scores and total practice scores with their education qualification in immediate post and after three months of program implementation. Also, presence a positive correlation between knowledge, procedural practice and activities pre and post the implementation of the evidence-based practice program. **Conclusion:** Performance mean scores of critical care nurses exposed to evidence- based practice program about intubated patients care was statistically significantly higher than preprogram implementation. **Recommendations:** There is a need for an ongoing planned education and training program offered on a regular basis to critical care nurses to improve their knowledge, practice, and activities towards following evidence based practice recommendations to execute the procedure correctly in the intensive care unit to achieve high quality nursing care for intubated patients.

Keywords: Critical care, Evidence based program, Intubated patients, Nurses' performance.

Introduction

Intubation is a common medical procedure that is widely performed in all specialties of surgery and critical care especially in the intensive care unit (ICU); it is usually performed in case of respiratory failure and

shock (Abubaker, et al., 2019). Tracheal intubation (TI) is considered one of airway management, it is an essential life-saving intervention; however, complications during airway management in such patients may precipitate a crisis. Hence, professional competence in airway management is required

while caring for critically ill patients (Behzadi, et al., 2018) & (Guillon, et al., 2019). Intubation is the process of inserting a tube, called an endotracheal tube (ET), through the mouth and then into the airway. This is done so that a patient can be placed on a ventilator to assist with breathing during anesthesia, sedation, or severe illness. The tube is then connected to a ventilator, which pushes air into the lungs to deliver a breath to the patient (Kim, et al., 2019). There are two main types of intubation procedures: **Nasotracheal intubation**, which inserts the intubation tube through the nose and down in the trachea. Doctors typically use this approach in people who are awake and there is a need to avoid using the mouth. **Orotracheal (endotracheal) intubation**, which inserts the tube through the mouth, vocal cords and into trachea with aids of laryngoscope or bronchoscope by trained respiratory therapist, nursing and medical staff. This is the most common type of intubation. It is the preferred method, especially in emergency situations, because airway can be secured faster (Lewis, et al., 2018).

Despite advances in the management of critically ill patients, TI is potentially considered life-saving intervention; TI in these patients remains a high-risk procedure associated with increased morbidity and mortality (De Jong, et al., 2014), (Lois Krug, et al., 2016) & (Turkelson & Keiser, 2017). The presence of an endotracheal tube (ETT) is a major stressful event and may cause significant inconvenience to intensive care patients (Coskun, et al., 2018). The most common complications that accompany the insertion of a TI which need special care around the clock such as: hypoxemia, hypercapnia, bronchospasm, laryngospasm, laryngeal damage, aspiration of oral or gastric contents, displacement of tube, fractured teeth, necrosis, tracheal stenosis, herniation of cuff through vocal cords, otitis media and inflamed lips (Lewis, et al., 2018) & (Frat, et al., 2019). The unstable physiological state of critically ill patients together with the subject assessment of suboptimal airways response to pre-oxygenation are the major factors for the high incidence of life-threatening complications like severe hypoxaemia and

cardiovascular collapse in the ICU . Complications in the critically ill patients are attributable to the compromised physiologic status of the patient, time constraints for evaluation of airway and inefficiency of conventional pre-oxygenation (De Jon, et al., 2018), (Holm & Dreyer, 2018) & Frat, et al., 2019).

Intubated patients often have an increased production of mucous and weakened ability to clear airway secretion which may pose some risks to the patient including infection (pneumonia) and atelectasis (Janz, et al., 2017). Caring for patients with ETT is an essential element of nursing practice, such as monitoring respiratory status, providing oral care every 2 hours, placement of the TI, repositioning the patient to avoid threats of immobility. In addition performing ETT suctioning of secretions from the lungs which patients are unable to expel (Janz, et al., 2017), (Mackey & Bassendowski, 2017) & (De Jon, et al., 2018). Critical care nurses (CCNs) play a crucial role in improving health care that provide comprehensive care and support for patient at ICU from the time of admission till discharge. The performance of health care staff, including professional nurses in ICU, link directly and closely to the productivity and quality of care provision within health care organizations. ICU can be pointed as one of the most stressful and necessary location in hospitals for nurses especially for the newly graduated group whom never worked at it previously (Janz, et al., 2017) & (De Jon, et al., 2018). Nurses are at a patient's bedside around the clock, and it is expected from them to be knowledgeable of the ETT complications that can arise (Chamberlain, et al., 2107). Performance means the current manner of activities to achieve responsibilities according to standards. It is a signal of what is done and how well it is done. In addition, it refers as accomplishment in a productivity of system in the form of services. A growing body of evidence signalize that inadequate nurse's preparation of knowledge and unsatisfactory skills mix are attached with negative outcome especially for critical ill patients (Chamberlain, et al., 2107), (Janz, et al., 2017) & (Kassew, et al., 2020).

Evidence-based practice (EBP) is defined as a problem-solving approach to the delivery of healthcare that incorporates the best available evidence, clinicians' expertise in making decisions about a patient's care, patient values and preferences. It also can be defined as systematically developed statements based on the best evidence of recommended practice in a specific clinical or health work environment (Lois Krug, et al., 2016) & (Kim, et al., 2019). The EBP is a vital part of enhancing critical care nursing practice, which is essential for providing high quality of care to patients. Studies suggest that establishing EBP leads to higher quality of care reduces costs and complications (Mwakanyanga, et al., 2018) & (Casey, et al., 2019). The EBP is required due to rapidly changing environment, also professional knowledge and skills is becoming increasingly complex and specialization (Elgazzar, et al., 2019). To enhance the uptake and implementation of EBP, multiple strategies can be used in the form of educational programs. These strategies include passive methods, such as printed material and formal lectures, as well as active methods, such as educational sessions, audits, feedback, educational outreach visits, academic detailing and videoconferencing (Gulanick & Myers, 2017), (Bayoumi & Mahmoud, 2017) & (Villarosa, et al., 2019). Existing evidence-based programs, using both passive and active implementation strategies, could improve the knowledge of nurses regarding managing intubated patients in ICUs (Villarosa, et al., 2019).

Evidence-based practice programs will help CCNs to apply many procedures safely at ICU to mitigate risks, reduce complications and coast. The CCNs can follow EBP during ETT insertion, care and suctioning, these strategies will include following ideal steps in performing routine hand hygiene, and during open suction, oral hygiene using chlorhexidine, etc. (Gulanick & Myers, 2017). To prevent central venous catheter (CVC) infection, there are a number of EBP recommendations that help CCNs in reducing its occurrence, these recommendations included EBP for CVC insertion, optimal measurement technique, and skin dressing for the insertion site. It is

important therefore that ICU nurses have the necessary knowledge and skills based on valid scientific evidence in performing procedures for intubated patients and aspects related to it (Ghorbanpoor, et al., 2018), (Villarosa, et al., 2019) & (Kim, et al., 2019). Health care agencies cannot improve and success without productive nursing staff. The quality of nursing care is influenced by the level of knowledge, skills, values, and judgment of those participating in providing care for patients, and the nurses' cognitive to decide on a plan of action that depends on other factors as their educational level, experience, and training course in caring for those patients (Chen, et al., 2019). Therefore, the quality of care that is given to the patients' outcomes and performance of health staff depends not only on the nurse competence (knowledge and practice) but also the availability of infrastructure, equipment and support systems, such as, information systems, resources and accountability systems that are in place as well as on their motivation and job satisfaction (Abubaker, et al., 2019) & (Ziarat, et al., 2019). So that that improving the productivity and performance of health care workers is a must to ensure that health interventions are efficiently delivered which continues to be a main challenge today (Dellaca, et al., 2017). Evidence based nursing programs are outcomes of dynamic relationship with social, educational, economical, legislative and professional forces present in contemporary society (Haniffa, et al., 2017) & (Crowe, et al., 2018). It is important that nurses and health care members use the most excellent accessible evidence in making decisions concerning the intubated patients care. Educational programs need to be planned to enhance professional growth of nurses to improve skills and knowledge, this provides high quality and effective health care for patients (Mohammed, et al., 2016), (Polit & Beck2017), (Higgs, et al., 2018) & (National Institute for Health and Care Excellence, 2020).

Significance of the study

Unsafe practice of nurses in ICUs is a worldwide problem. It has been shown that

nurses do not have adequate knowledge and perform procedures in ICUs based on traditional/routine methods which mainly are not safe, according to some studies (Mohammed, et al., 2016), (Gorman & McDowell, 2018) & (National Institute for Health and Care Excellence, 2020). During clinical observation, it was found that complications associated with TI may occur in up to 40% of critically ill patients (Higgs, et al., 2018). Incorrect management that may lead to a number of complications, which can result in increased morbidity, prolonged hospitalization, and in some cases mortality. Thus nurses should have practice to give care of patients and provide timely intervention to minimize the associated problems and complications during caring of intubated patients (Mohammed, et al., 2016) & (Higgs, et al., 2018). In Egypt there is a serious lack of nurses' practice regarding care provided for patients with endotracheal tube; also researchers observed that CCNs whom assigned to work in ICUs had low level of knowledge and skills about EBP, almost of them needs training about the ideal techniques of applying ICU procedures (Mohammed, et al., 2016), (AbdElbaky, et al., 2018) & (Abubaker, et al., 2019). On the other hand low level of knowledge and practice of the CCNs in ICUs leads to increased rates of nosocomial infection to be more than 70% with increased mortality rates. So, it is necessary for nurses to follow established endotracheal tube care evidence-based recommendation to perform the procedures correctly in the ICU (Ghorbanpoor, et al., 2018), (Gorman & McDowell, 2018) & (Huang, et al., 2021). Therefore, the current study was designed to provide evidence for conducting educational program that aims to improve CCNs' performance about following EBP during invasive procedure related to care of adult patients with endotracheal tube.

Aim of the study

This study was done to evaluate the effect of evidence based program on critical care nurses' performance related to care for intubated patients through: 1. Assess the nurses' performance (knowledge and practice) regarding

care for intubated patients. 2. Develop and implement evidence based program regarding nursing care of intubated patients. 3. Evaluate the effect of evidence based program on nurses' performance regarding care of intubated patients.

Study hypothesis:

The mean score of nurses' performance regarding the care for intubated patients after implementing evidence-based program will be higher than their score before implementation.

Operational definition:

Nurses' performance: Mean nurses' level of knowledge, practice and activities in which nurses engaged with varying degrees of frequency and skills.

Intubated patients: Defined as patients who underwent tracheal intubation and insertion of a tube called an endotracheal tube.

Subjects and methods

Research design: A quasi-experimental research design was used to conduct this study using a pre-/post-test approach.

Research setting: The current study was conducted in the general intensive care unit affiliated to Benha University Hospital, Qalyubia Governorate, Egypt, in the second floor of medical building; it consisted of 22 beds, 20 mechanical ventilator devices and 25 monitors. This unit provides care for critically ill patients. The nurse-patient ratio is nearly 1:2.

Subjects: A convenient sample of all available nurses (60) who were working in the above mentioned settings and whom actually provide direct care for critically ill patients, from both sexes with different qualifications, their age ranged from 20 to 50 years old and were willing to participate in the study.

Data collection tools:

Three tools were used to collect data of the current study:

Tool I- A structured questionnaire for nurses, designed by the researcher and written in simple clear Arabic language after reviewing recent relevant literatures and scientific references **Abubaker, et al., (2019), Guitton, et al., (2019), Kim, et al., (2019), & Chen, et al., (2019)**, and included two parts:

Part (1): Nurse's personal data as age, sex, qualification, years of experiences, and attendance of any previous training courses about care for intubated patients.

Part (2): Nurse's knowledge regarding care for intubated patients: It was concerned with assessment the critical care nurses' knowledge before and after implementation of evidence – based program regarding care for intubated patients , multiple choice questions were developed to test the following items: 1. General knowledge about the concept of EBP and definition of (procedures as endotracheal tube suctioning, oral hygiene of intubated patients, knowledge about frequency, different methods of oral hygiene, endotracheal tube securing, ETT cuff pressure measuring and nosocomial infection), (15 questions). 2. The most common items of EBP should be followed during the application of procedures (11 questions). 3. CCNs role during the application of EBP as (ETT care, suctioning, endotracheal tube securing, ETT cuff pressure measuring), it was consisted of (12 questions). 4. Clinical manifestations of various nosocomial infection conditions that would occur as a result of procedures (10 questions).

Nurses' knowledge scoring system: Each correct answer was scored (1) and the wrong answer scored (zero). The total score for knowledge was (48 grade). Theses scores were summed-up and converted into a percent then categorized as follows: if the score 75% or more it considered satisfactory level of knowledge, while if its less than 75% it considered unsatisfactory level of knowledge.

Tool II: Nurse's practice observational checklist: It aimed to assess the critical care nurses' practice before and after implementation of evidence – based program regarding care for intubated patients, and designed by the researchers after reviewing recent relevant literatures and scientific references **Morton & Fontaine, (2013), Perry, et al., (2014), Lyn, (2015) & Jakimowicz, (2017)**. This tool consisted of standardized EBP steps that should be followed during the application of the following procedures: The first was ETT suctioning observational checklist composed of 27 steps, the second was oral care observational checklist composed of 23 steps, the third was endotracheal tube securing (trachy method & tape method) observational checklist composed of 23 steps, the fourth was ETT cuff pressure measuring observational checklist composed of 21 steps.

Nurses' practice scoring system: One grade was given for each step that done correctly, zero for the step that done incorrectly or not done. The total nurses' practice score of the checklist were (94 grade). The scoring level was classified as follows: if the score equal 85% or more it considered competent level of practice, while if its less than 85% it considered incompetent level of practice. The checklist was carried out three times by the researchers preprogram, immediate post and three months follow up post program implementation.

Tool III: Nurses' activities scale: This tool was adopted from **Schwirian, (1978)** to assess levels of activities in which nurses engaged with varying degrees of frequency and skills among them. It consisted of six dimensions include" assessment, planning, nursing care, teaching/ collaborating, teaching & communication and evaluation".

Nurses' activities scale scoring system: Two grades were given for each dimension that done correctly, zero for the dimension that done incorrectly or not done. The total level of nurses' activities score was (12); total activities scores were converted into a percent and categorized as follows: $\geq 70\%$ was considered an adequate level of activities, while $< 70\%$ was considered as an

inadequate level of activities. The activities scale was carried out three times by the researchers preprogram, immediate post and three months follow up post program implementation.

Evidence- based program: Researchers designed the evidence based program based on the previous assessment of CCNs knowledge, practices, available resources through a review of recent relevant literature and scientific references **Lois Krug, et al., (2016), Rojjanasrirat & Rice, (2017), Kim, et al., (2019) & Elgazzar, et al., (2019)**, and it was planned to cover knowledge and practice related to applying EBP for nurses caring of intubated patients during procedure at ICU. It covered the following information, definition, purposes, and aim of EBP, the recommended EBP steps used during applying the most used procedure at ICU (ETT care & suctioning, oral care, endotracheal tube securing and ETT cuff pressure measuring) the EBP preventive measures that should be followed during their application to prevent its complications and infection. The program was designed in a simple Arabic language booklet with colored pictures that included all theoretical and practical content to improve learning ability of the nurses.

Ethical considerations:

An official approval to conduct the study was obtained from the director responsible for the general ICU and the head nurses at Benha University Hospital after submission of a formal letter from the Faculty of Nursing, Benha University after explanation of its purpose. Then, explaining the study's aim and benefits, as well as the procedure of data collection to all participants clearly. The participants' were informed that their participation was optionally, and that they had the right to withdraw at any time without any consequences. Then, verbal consent was obtained from each nurse enrolled into the study. The researcher assured that all collected data would be absolutely confidential and only used for the study' aim.

Method:

Tools validity: The face and content validity of the tools was checked by five experts;

two professors from medical surgical nursing department, faculty of nursing, Benha University and three assistant professors from critical care nursing specialty, faculty of nursing, Mansoura University, to check the relevancy, clarity, comprehensiveness, and applicability of the questions. The consensus among experts regarding the structured questionnaire was 97% and the observational checklist was 98% for most items. Also, a designed program which covered all items related to nurses caring of intubated patients based on newest current literature was revised by the same experts then all required modifications were done consequently, and the final form the tools was used for data collection.

Reliability of tools: The designed tools of the study were tested statistically for reliability and evaluated using test-retest method. The Cronbach's alpha test which were used to measure the internal consistency. The reliability scores of the tools were r coefficient ($r= 0.83$) for tool I, and ($r= 0.87$) for tool II, which denotes the high internal consistency of the used tools.

Pilot study: A pilot study was carried out on 10% of the studied subject (6 critical care nurses) recruited to test the clarity and applicability of the study tools and the program, also to estimate the time required for each tool to be filled in as well as to identify any possible obstacles that may hinder data collection. Based on the results of the pilot study the necessary modifications were done to have more applicable tools for data collection and participants in the pilot were excluded from the study subject. The pilot study was done one month before starting the study from the end of December 2020 to the end of January 2021).

Data collection: the study was conducted over a period of nine months beginning at February 2021 till the end of October 2021 (six months for enrollment of eligible subjects and three months for evaluating the effect of evidence – based program after implementation). The precautionary practices measures due to the spread of the Corona virus, infection control were taken as maintaining physical distance, wearing facemask, gloves,

and using alcohol aseptic solution for both the researcher and the nurses included in the study.

The program was conducted in three phases:

A. Assessment phase: It was done for all studied subjects by the researcher before applying the proposed program to have base line data about nurses' knowledge and practice regarding caring of intubated patients. The researcher visited the general ICU three days per week during morning shift to collect the data by using questionnaire and observational checklist as following: **Firstly**, the questionnaire (**Tool I**) were administered by the researchers to all nurses individually to assess their knowledge. It took about 15-30 minutes for each nurse. **Secondly**, the researcher observed nurses' practice during caring of intubated patients using the observational checklist (**Tool II & Tool III**) before explaining the program. The nurse's practice was assessed using the continuous observation method throughout procedure. Based on evidence - based program. Each skill was evaluated 3 times and the mean was calculated. The time required to fill each checklist was between 30 – 45 minutes. The average time needed for the completion of each interview (by nurses) was between 35 – 45 minutes and. This period of pre-test (knowledge , practice and activities).

B. Implementation phase: The program implementation: The program content was implemented in six educational and training sessions, three sessions per week. It divided as follows: two sessions for knowledge to acquire the related information, and four sessions for the practice in the form of demonstration and re-demonstration of the EBP steps of procedures under the researchers' supervision at their ICUs to provide trainers with trust and ensure competent at applying of the procedures for their critically ill patients. The time of knowledge sessions and duration of skills sessions ranged between 45 minutes to 60 minutes, including periods of discussion according to the nurses' progress and feedback. Each session started by a summary of the previous session, and objectives of the new one. Taking into consideration, the use of Arabic

language that suits the nurses' educational level. Motivation and reinforcement during session were used in order to enhance motivation for the sharing in this study. The researcher divided the studied nurses into six groups, and each group consisted of ten nurses. Teaching methods were lectures, group discussion, demonstration and re-demonstration. Media utilized were handouts, videos and data show. The instructional colored evidence based program booklet was given to each nurse under the study in order to help for reviewing and support teaching and practicing at home; it was written in a simple Arabic language and supplemented by photos and illustrations to help the nurses understanding of the content. Each group attended the following sessions: **Theoretical sessions:** Were carried out in two sessions as follows:

- Session (1): Orientation about the program, general knowledge, definition, purposes, aim of EBP and the recommended EBP steps used during applying the most used procedure at ICU. Endotracheal tube nursing management which included (purpose of intubation, indications, contraindications and complications).

- Session (2): This session covered knowledge about CCNs role during the application of EBP, clinical manifestations of respiratory tract infection and various nosocomial infection conditions that would occur as a result of procedures.

Practical sessions: Were conducted in four sessions to cover training part of nursing care of standardized EBP steps that should be followed during the application of the following procedure:

- Session (1): ETT care & suctioning procedure.
- Session (2): Oral care procedure.
- Session (3): ETT securing or re-taping procedure.
- Session (4): ETT cuff pressure measuring procedure.

Evaluation phase: It was done immediately after implementation of evidence-based program (post-test evaluation), each nurse in the study was interviewed to evaluate their knowledge using tool I part 2, and nurse's practice evaluation was done by using tool II and tool III. After three months from implementation evidence-based program (follow up evaluation), study subjects were reevaluated by the researcher by using the same data collection tools. Evaluating the effect of implementing the program on knowledge and practice level of the CCNs done by compared the results pre, immediate and follow up (after three months) program implementation.

Statistical analysis of the data:

After collecting the data, variables in each data assessment tool were coded, scored manually, and transformed into specially designed form prior the entry of data. The collected data were tabulated and statistically analyzed using an IBM computer and the statistical package for social science (SPSS) program version 20 (SPSS Inc., Chicago, IL). Qualitative data were expressed as number and percent. Chi-square test was used to study the relation between qualitative variables, while quantitative data were presented as mean and standard deviation. For quantitative data, One-way ANOVA test for repeated measures at different time intervals was done. Paired t-test was utilized for pre-post comparison. Spearman's correlation coefficient was used for evaluation between variables of the study. For interpretation of results of significance, significance was adopted at p-value ≤ 0.05 , and high significant was adopted at p-value $p \leq 0.001$.

Results:

Table (1) shows that 75% of the studied nurses aged from 20 to less than 30 years old with mean age of 28.89 ± 5.02 years and 70% of them were females. As well, 50% of them were graduated from technical nursing institute. While, 58.3% of them had 1 to less than 5 years of experience in ICU with Mean \pm SD = 4.80 ± 3.22 . Moreover, 91.7% had not attended any previous training programs regarding EET care.

Table (2) shows that all the studied nurses 100% had unsatisfactory knowledge about EBP before receiving the program. While, immediate post program their level of knowledge improved to satisfactory level in all knowledge items to (90%, 100%, 93.3% and 76.7%) respectively. But after three months follow up slight decline in level of knowledge was observed to (85%, 96.7%, 88.3% and 73.3%) respectively. Furthermore, there were high statistically significance regarding the overall knowledge items between pre and immediate post and between pre and post three months follow up of the program implementation at ($p \leq 0.001^{**}$). While, there was no statistically significant difference in total score of nurses' knowledge between immediate post and after three months follow up of EBP program implementation at ($p > 0.05$).

Table (3) shows that percentage of competent practice of the studied CCNs that followed EBP steps in all practice items at pre implementation of the program (13.3%, 23.3%, 25% and 13.3% respectively), which improved immediate post program to become (100%, 98.3%, 93.3% and 85% respectively), While, after three months follow up slight decline in competent level of practice was observed to (98.3%, 96.7%, 91.7% and 83.3% respectively). In addition, there were high statistically significance regarding the overall practice of CCNs performed in the previously mentioned procedures items between pre and immediate post and between pre and post three months follow up of the program implementation at ($p \leq 0.001^{**}$). While, there was no statistically significant difference in total score of nurses' practice between immediate post and after three months follow up of EBP program implementation at ($p > 0.05$).

Table (4) shows activities level among the studied nurses which included the following dimensions "assessment, planning, nursing care, teaching /collaborating, interpersonal relation/communication and evaluation", the table revealed that, there items were "not done" by about two-thirds of the percentage and the remainder of percentage go to "done incompletely" at the pre-program phase. On the other hand, majority of them were "done completely" the activities related to general nurses performance at immediate post program While, after three months follow up slight decline in activities level was observed. In addition, there were high statistically significance improvement of CCNs mean score in all dimensions related to general performance immediate post and after three months follow up of EBP program implementation at ($p \leq 0.0001^{**}$).

Table (5) shows relation between overall nurses' knowledge mean scores and their personal data throughout the program phases. The table demonstrates statistically significant relation between total nurses' knowledge mean scores and their sex during preprogram implementation ($p=0.025^*$), as well as, there was statistical significant relation between total nurses' knowledge mean scores and their education qualification in immediate post program and after three months of program implementation ($p= 0.040^*$, $p=0.046^*$ respectively). While, there was no statistically significant relation between total nurses' knowledge mean scores and their age, experience years and training programs throughout the program phases at ($P= > 0.05$).

Table (6) shows relation between overall nurses' practice mean scores and their personal data throughout the program phases. The table

Table (1): Frequency and percentage distribution of the studied nurses according to their personal data (n=60).

demonstrates statistically significant relation between total nurses' practice mean scores and their education qualification in immediate post program ($p<0.05^*$). While, there was no statistically significant relation between total nurses' practice mean scores and their age, sex, experience years and training programs throughout the program phases at ($P= > 0.05$).

Table (7) shows correlation between the total mean scores of knowledge, procedural practice and performance (activities) scale among the studied CCNs throughout the program phases. This table reveals that, there was high significant statistical positive correlation between nurses' knowledge, procedural practice and CCNs performance scale at pre, immediate post and three months follow up after implementation of the program about following EBP during procedure at ($p\leq 0.001^{**}$).

Nurses' personal data	Total (n=60)	
	Number N	Percent %
Age (in year)		
20 < 30	45	75
30 < 40	11	18.3
40- ≤ 50	4	6.7
Mean ± SD = 28.89± 5.02 years	Min = 23years,	Max = 50 years
Gender		
Male	18	30.0
Female	42	70.0
Education qualification		
Nursing Diploma	15	25.0
Technical Nursing Institute	30	50.0
Bachelor of Nursing	10	16.7
Postgraduate	5	8.3
Experience Years		
<1	3	5.0
1-<5	35	58.3
5-<10	18	30.0
≥ 10	4	6.7
Mean ± SD = 4.80 ± 3.22	Min = 1years,	Max = 13 years
Previous training programs regarding EET care		
Yes	5	8.3
No	55	91.7

(SD) Standard Deviation

Table (2): Frequency and percentage distribution of total nurses' knowledge level about following EBP during procedure throughout the program phases (N=60).

Nurses' knowledge	Pre program				Total (n=60) Immediate post program				3 months follow up				Chi square (p-value) (1)	Chi Square (p-value) (2)	Chi Square (p-value) (3)
	Satisfactory		Unsatisfactory		Satisfactory		Unsatisfactory		Satisfactory		Unsatisfactory				
	N	%	N	%	N	%	N	%	N	%	N	%			
General knowledge about EBP concept	0	0.0	60	100	54	90	6	10	51	85	9	15	X ² =95.28 P =.000**	X ² =85.84 P =.000**	X ² =.696 P =.409 n.s
Knowledge about EBP should be followed during the application of ETT procedures	0	0.0	60	100	60	100	0	0.0	58	96.7	2	3.3	X ² =75.32 P =.000**	X ² =68.43 P =.000**	X ² =.702 P =.402 n.s
Knowledge about CCNs role during the application of EBP	0	0.0	60	100	56	93.3	4	6.7	53	88.3	7	11.7	X ² =96.28 P =.000**	X ² =87.34 P =.000**	X ² =.670 P =.413 n.s
Knowledge about various nosocomial infection that will occur as a result of procedures	0	0.0	60	100	46	76.7	14	23.3	44	73.3	16	26.7	X ² =64.60 P =.000**	X ² =56.04 P =.000**	X ² =.617 P =.432 n.s
Total	13	21.7	47	78.3	53	88.3	7	11.7	52	86.7	8	13.3	X ² =53.86 P =.000**	X ² =48.33 P =.000**	X ² =.287 P =.591 n.s

F= 0.002

p-value = ≤ 0.001 **

(n.s) not significant

(**) Highly statistically significant at ≤0.001

(1) X²1 Difference in total knowledge score between pre and immediate post EB program implementation

(2) X²2 Difference in total knowledge score between pre and after 3 months follow up of the program

(3) X²3 Difference in total knowledge score between immediate post and after 3 months follow up of the program

F (one way ANOVA test) used to differentiate between level of knowledge about following EBP during procedure throughout the program phases

Table (3): Frequency and percentage distribution of total nurses' practice level about application of EBP during procedures throughout the program phases (N=60).

Nurses' practice	Pre program		Total (n=60) Immediate post program				3 months follow up				Chi square (p-value)	Chi Square (p-value)	Chi Square (p-value)		
	Competent		Incompetent		Competent		Incompetent		Competent		Incompetent		(1)	(2)	(3)
	N	%	N	%	N	%	N	%	N	%	N	%			
1- ETT care & suctioning	8	13.3	52	86.7	60	100	0	0.0	59	98.3	1	1.7	X ² =91.76 P =.000*	X ² =87.98 P =.000*	X ² =1.00 P =.13 n.s
2- Oral care for intubated patient	14	23.3	46	76.7	59	98.3	1	1.7	58	96.7	2	3.3	X ² =70.82 P =.000*	X ² =67.22 P =.000*	X ² =0.34 P =.55 n.s
3- ETT securing or re-taping	15	25	45	75	56	93.3	4	6.7	55	91.7	5	8.3	X ² =57.89 P =.000*	X ² =54.85 P =.000*	X ² =0.12 P =.72 n.s
4- ETT cuff pressure measuring	8	13.3	52	86.7	51	85	9	15	50	83.3	10	16.7	X ² =61.65 P =.000*	X ² =58.86 P =.000*	X ² =0.06 P =.80 n.s
Total	12	20	48	80	56	93.3	4	6.7	55	91.7	5	8.3	X ² =65.70 P =.000*	X ² =62.48 P =.000*	X ² =0 P =.72 n.s
F= 0.005		p-value = ≤ 0.001 **													

(n.s) Not significant
≤0.001

(*) Statistically significant at ≤0.05

(**) Highly statistically significant at

(1) X²1 Difference in total practice score between pre and immediate post EB program implementation(2) X²2 Difference in total practice score between pre and after 3 months follow up of the program(3) X²3 Difference in total practice score between immediate post and after 3 months follow up of the program

F (one way ANOVA test) used to differentiate between level of practice about following EBP during procedures throughout the program phases

Table (4): Distribution regarding total activities level among the studied nurses throughout the program phases (N=60).

Scale dimensions	Pre program			Immediate post program			3 months follow up			Chi square (p-value)	Chi Square (p-value)	Chi Square (p-value)
	ND No (%)	DI No (%)	DC No (%)	ND No (%)	DI No (%)	DC No (%)	ND No (%)	DI No (%)	DC No (%)	(1)	(2)	(3)
1- Assessment	56(93.3%)	4(6.7%)	0(0.0%)	0(0.0%)	3(5%)	57(95%)	0(0.0%)	5(8.3%)	55(91.7%)	X ² =57.89 P =,000**	X ² =54.85 P =,000**	X ² =0.12 P =0.72 n.s
Mean ± SD		1.52±2.32			18.42±2.11			18.23±2.68				
2-Planning	49(81.7%)	11(18.3%)	0(0.0%)	0(0.0%)	4(6.7%)	56(93.3%)	0(0.0%)	6(10%)	54(90%)	X ² =45.68 P =,000**	X ² =42.84 P =,000**	X ² =0.10 P =0.75 n.s
Mean ± SD		2.38±3.05			16.25±2.15			16.17±2.62				
3-Nursing care	47(78.3%)	13(21.7%)	0(0.0%)	0(0.0%)	3(5%)	57(95%)	0(0.0%)	4(6.7%)	56(93.3%)	X ² =70.82 P =,000**	X ² =67.22 P =,000**	X ² =0.34 P =0.55 n.s
Mean ± SD		6.20±10.62			48.60±5.39			48.40±6.19				
4-Teaching/ Collaborating	38(63.3%)	22(36.7%)	0(0.0%)	0(0.0%)	2(3.3%)	58(96.7%)	0(0.0%)	5(8.3%)	55(91.7%)	X ² =81.76 P =,000**	X ² =77.89 P =,000**	X ² =1.00 P =0.31 n.s
Mean ± SD		2.85±3.69			15.43±1.49			15.28±2.11				
5- Interpersonal relation/ Communication	47(78.3%)	13(21.7%)	0(0.0%)	0(0.0%)	1(1.7%)	59(98.3%)	0(0.0%)	5(8.3%)	55(91.7%)	X ² =55.66 P =,000**	X ² =52.46 P =,000**	X ² =0.12 P =0.71 n.s
Mean ± SD		2.22±3.50			15.77±0.88			15.38±2.14				
6- Evaluation	34(56.7%)	26(43.3%)	0(0.0%)	0(0.0%)	4(6.7%)	56(93.3%)	0(0.0%)	7(11.7%)	53(88.3%)	X ² =67.66 P =,000**	X ² =64.82 P =,000**	X ² =0.06 P =0.80 n.s
Mean ± SD		1.62±1.79			7.65±0.96			7.47±1.22				
Overall score		25.96±4.53			118.23±3.36			115.401±8.97		t 1= 147.36 P =,000**	t 2= 83.85 P =,000**	T 3= 1.903 P= .081
					F=0.002			p-value = ≤ 0.0001**				

*ND: Not done, *DI: Done incorrectly, *DC: Done correctly F (one way ANOVA test) (**) Highly statistically significant at ≤ 0.001

T1 paired t test between pre and immediate post program

T2 paired t test between pre and after 3 months follow up of the program

T3 paired t test between immediate post and post 3 months follow up of the program

Table (5): Relation between total nurses' knowledge mean scores and their demographic characteristics throughout the program phases (N=60).

Nurses' personal data	Pre Program	Test of Sign.	P-Value	Immediate post program	Test of Sign	P-Value	3 months follow up	Test of Sign	P-Value
	Mean \pm SD			Mean \pm SD			Mean \pm SD		
Age									
20 < 30	6.23 \pm 4.46	F=0.758	.452	19.09 \pm 3.05	F=0.834	.408	18.109 \pm 4.19	F=0.026	.979
30 < 40	8.25 \pm 2.05			18.36 \pm 2.13			18.134 \pm 4.70		
40- \leq 50	7.30 \pm 4.71			19.19 \pm 2.11			18.595 \pm 3.96		
Gender									
Male	8.44 \pm 4.7	t=2.307	.025*	18.94 \pm 2.78	t=0.049	.961	19.056 \pm 2.51	t=1.116	.269
Female	5.61 \pm 4.18			18.905 \pm 2.93			17.714 \pm 4.81		
Education qualification									
Nursing Diploma	7.200 \pm 5.35	F=2.64	0.058	17.4000 \pm 5.19	F=2.95	0.040*	11.5000 \pm 8.16	F=2.85	0.046*
Technical Nursing Institute	9.200 \pm 6.76			17.6000 \pm 2.61			10.733 \pm 6.017		
Bachelor of Nursing	11.900 \pm 8.69			18.83 \pm 3.09			14.8000 \pm 7.01		
Postgraduate	15.133 \pm 6.65			19.400 \pm 2.92			16.1333 \pm 6.06		
Experience Years									
<1	6.25 \pm 4.62	F=0.109	.897	18.81 \pm 3.32	F=0.827	.442	17.917 \pm 4.10	F=.529	.529
1 - <5	6.72 \pm 3.34			19.500 \pm 1.72			18.889 \pm 3.63		
5 < 10	7.00 \pm 7.16			17.83 \pm 2.56			17.000 \pm 7.01		
\geq 10	8.25 \pm 2.05			18.19 \pm 2.109			15.625 \pm 4.96		
Training programs									
Yes	1.000 \pm 0.000	t=1.777	.081	20.5000 \pm 7.71	t=0.794	.431	14.5000 \pm 6.36	t=1.222	.227
No	6.66 \pm 4.46			18.86 \pm 2.89			18.2414 \pm 4.22		

F (one way ANOVA test)

t (independent test)

Table (6): Relation between total nurses' practice mean scores and their demographic characteristics throughout the program phases (N=60).

Nurses' personal data	Pre Program Mean ± SD	Test of Sign.	P- Value	Immediate post program Mean ± SD	Test of Sign	P- Value	3 months follow up Mean ± SD	Test of Sign	P- Value
Age									
20 < 30	25.77± 4.87	F=1.649	.619	118.41± 3.38	F=0.748	.458	115.9 ± 8.58	F=0.244	.808
30 < 40	26.69± 3.57			117.64 ± 3.37			115.29± 7.85		
40- ≤ 50	26.80 ± 4.39			117.95± 3.03			114.59 ± 9.49		
Gender									
Male	26.94± 6.25	t=.0888	.384	118.00± 4.14	t=0.349	.728	114.78 ± 9.59	t=.597	.553
Female	25.55± 3.57			118.33± 3.02			116.19 ± 7.85		
Education qualification									
Nursing Diploma	43.40 ± 40.66	F=2.30	0.087	117.40± 2.70	F=2.50	0.05*	56.53± 4.47	F=2.08	0.06
Technical Nursing Institute	50.33± 41.88			117.20 ± 3.29			74.60 ± 48.74		
Bachelor of Nursing	71.50±49.34			118.300± 3.75			90.17± 40.51		
Postgraduate	86.27± 44.65			119.60 ± 2.67			94.60 ± 39.20		
Experience Years									
<1	26.78± 3.92	F=1.887	.161	118.33 ± 3.66	F=0.060	.942	116.08 ± 8.53	F=.196	.823
1 - <5	24.2 ± 5.69			118.00± 3.24			114.78 ± 9.43		
5 < 10	26.80 ± 4.39			117.95± 3.03			11479 ± 9.49		
≥ 10	26.17 ± 3.06			118.33±1.97			116.83 ± 2.40		
Training programs									
Yes	29.50 ± 2.12	t=1.124	.266	120.50± 2.12	t=0.969	.336	119.50 ± 0.71	t=0.640	.525
No	25.84 ± 4.55			118.16 ± 3.38			115.64 ± 8.47		

F (one way ANOVA test) t (independent test) (*) Statistically significant at ≤0.05 (**) Highly statistically significant at ≤0.001

Table (7): Correlation between knowledge, procedural practice and performance total scores among the studied CCNs throughout the program phases (N= 60).

Variables	Total knowledge			Total procedural practice		
	Pre Program	Immediate post program	3 months follow up	Pre Program	Immediate post program	3 months follow up
Total EBP Knowledge	r					
	p					
Total EBP procedural practice	r	.509	.415	.422		
	p	.000**	.000**	.000**		
Performance scale of EBP (activities level)	r	.244	.257	.255	.276	.357
	p	.012*	0.01*	.012*	.009**	.000**

(n.s) Not significant (*) Statistically significant at ≤ 0.05 (**) Highly statistically significant at ≤ 0.001
r: Pearson coefficient

Discussion:

Critical care nurses play a major role during providing nursing care for critically ill patients in the period of post- intubation because it is a vital and urgent phase for airway management, inspite of successful ETT placement, and require specific training and using evidence based practice provides nurses with the scientific research to make well-founded decisions and reduce expected complications for intubated patients (32, 33). The current study aimed to evaluate the effect of evidence based program on critical care nurses' performance related to care for intubated patients. The study hypothesized that the post mean score of nurses' performance regarding care for intubated patients after implementing evidence- based program would be higher than their score before implementation.

The results of the present study showed that three- quarters of studied nurses aged from twenty to less than thirty years old with mean age of 28.89 ± 5.02 years, From the researchers point of view, this may be due to most of nurses were newly graduated and the majority of young aged nurses able to provide direct care in the ICU for patients effectively, while the higher age groups of nurses have managerial role. This result was agreed with **AbdElbaky, et al., (2018)**

& **Abubaker et al (2019)** who emphasized that the majority of the studied nurses aged between 20 and 30 years old. Also, this finding is supported by many studies (24, 26, 27). This result was incongruent with **Haniffa, et al., (2017)** who stated the majority of their studied nurses' age was more than 35 years old.

The results of the current study revealed that more than two- thirds of the studied nurses were females. It may be due to the old belief that nursing is a special profession for female so, over all ratio of male to female nurses were less in Egypt and might be due to nursing education started recently. This result is congruent with the literature and the same result was reported by other studies that most CCNs were females **Haniffa, et al., (2017), National Institute for Health and Care Excellence, (2020) & Kassew, (2020)**. Also, similar finding was founded by **Polit & Beck, (2017)** who reported that the majority of their participants were females. On the other hand, this finding disagreed with **Kassew et al., (2020)** who mentioned that the majority of studied nurses were males.

As for educational qualification; the present study showed that one-half of the studied nurses were graduated from technical nursing institute this could be explained in light

of the known fact that nursing job in Egypt was exclusive on females only till few years ago and number of nurses graduated from the technical institute of nursing was higher than Bachelor. This finding was in consistent with **Abubaker et al (2019)** who reported that half of the studied nurses were graduated from technical institute of nursing. But this result was contradicted by **Kassew et al., (2020)** who revealed that majority of nurses had a bachelor's degree or higher.

Regarding to years of experience; the findings of the current study clarified that more than one-half of studied nurses reported that they had one to less than five years of experience in the ICU; this might be related to that most of the studied nurses were newly graduated. The decrease in the experience years will have a negative effect on their performance level which intern affect their patient care delivery system if not supported with continuing educational program to enhance them **AbdElbaky, et al., (2018)** . This result was on the same line with **Mohammed et al., (2016)** who founded that more than half of the studied nurses had years of experience from one to less than five years. But **Kim et al., (2019)** disagree with the results of the present study and reported in their study that less than two-third of nurses had an experience of more than 10 years. Critical care nurses were facing many challenges during providing nursing care for critically ill patients. The number of challenges increased if the level of experience was low and also if the CCN was novice graduated and did not have the needed experience at ICU; especially new graduated nurses whom assigned to work at ICU needed enough preparation and educational support about the EBP in order to limit the occurrence of ICU infection rates and to overcome the number of challenges **Rojjanasrirat & Rice, (2017)**. **AbdElbaky, et al., (2018)**, **Guitton, et al., (2019)**.

As for the training programs that had been obtained; the findings of the present study revealed that majority of the studied nurses had not attended training programs regarding EET care. This result may be explained by mostly the nurses have workload in ICU that prevent them

from attendance any training programs, shortage of staff and lack of interest from nurses. This result was in agreement with **AbdElbaky et al., (2018)**, who reported that most of the studied nurses had not attended a training program regarding EET care. Also, this finding was correspondent to **Gulanick & Myers, (2017)** stated that the majority of the studied subjects' didn't have any previous information.

As to total nurses' knowledge level about following EBP during procedure the present study illustrated that all nurses had unsatisfactory knowledge about EBP before implementation of the evidence based program. While, immediate post program their level of knowledge was significantly improved to satisfactory level in all knowledge items. But after three months follow up slight decline in level of knowledge was observed Furthermore, there were high statistically significance regarding the overall knowledge items between pre and immediate post and between pre and after three months follow up of the program implementation . While, there was no statistically significant difference in total score of nurses' knowledge between immediate post and after three months follow up of the program implementation. According to researchers' opinions CCNs did not have enough education and training about the EBP. Also new graduated CCNs provide patient care according to their previous education studies and the personal experience of the older nurses at ICU and head nurses whom did not have chance of knowledge about the updated EBP and ideal procedure steps that related to the care of critically ill patients. Moreover, this result indicates that the implementation of evidence based program had proven its effectiveness in enhancing nurses' knowledge. This is congruent with a previous study done by **AbdElbaky, et al., (2018)** showed that all their studied nurses had lower level of knowledge at the pre-program phase. But after the application of the simulated educational program their knowledge mean score was significantly improved at the post and follow up of the program phases.

In similarity, **Abubaker, et al., (2019)** reported that all CCNs, irrespective of their

different educational levels, years of experience or area of work had unexpectedly unsatisfactory knowledge level about EBP for intubated patients pre test and the mean post-test knowledge score was higher than the mean pre-test score. On the opposite side a study was done by **Rojjanasrirat & Rice (2017)** found that CCNs had fairly good knowledge level about application of EBP in ICU post- program implementation .This difference may be attributed to that majority of nurses in this part acquire their knowledge of taking care of critically ill patients from their basic educational programs, or from hospital policies and procedures.

Concerning total practice level related to ETT care & suctioning, oral care for intubated patient, ETT securing or re-taping, ETT cuff pressure measuring, the present study results found that only a quarter of the studied nurses had competent level of practice was observed of ICU CCNs that follow EBP steps in all practice items pre implementation of the program which significantly improved to competent level of all practice in the same items immediate post program While, after three months follow up slight decline in competent level of practice was observed. Additionally, there were high statistically significance regarding the overall practice of CCNs in the previously mentioned procedures items between pre and immediate post and between pre and after three months follow up of the program implementation . While, there was no statistically significant difference in total level of nurses' practice between immediate post and after three months follow up of the program implementation. This might be due to lack of training program regarding following EBP during care for intubated patients and the effectiveness of evidence based program implementation in enhancing nurses' practices throughout the program phases. These results are the same line with **Crowe, et al., (2018)** emphasized the same results in their study that mean post-test scores for practice of EBP were significantly higher than the mean pre test scores. Also, another study conducted by **Turkelson & Keiser, (2017)** showed that all nurses had unsatisfactory practice regarding care of intubated patients

before teaching program intervention, while all of them had satisfactory practice after teaching program intervention. In addition to **Higgs, et al., (2018)** mentioned that there was significant improvement in nurses' practice level post program implementation. Contrarily with this finding a study done by **Janz, et al., (2018)** reported that EBP program have no effect on nurses' practice scores after implementation of EBP. This contradiction may be explained by this study application of EBP for a short period of time and this period not enough for improvement of nurses' practice.

In relation to activities level among the studied nurses which included "assessment, planning, nursing care, teaching /collaborating, interpersonal relation/communication and evaluation", the current study found that there were high statistically significance improvement of CCNs mean score in all dimensions immediate post and after three months follow up of the program implementation than preprogram. This finding assured the valuable effect of our EBP program about procedures regarding caring of intubated patients improves knowledge which affected on their skills for all activities dimensions of studied nurses. The same finding was reported by **Behzadi, et al., (2018)** who found that the training program significantly improved their participant general performance of EBP. This result also comes in agree with a study by **AbdElbaky, et al., (2018)** ⁽³³⁾ showed that nurses had unsatisfactory knowledge and skills before training program, which reflected on their level of performance in the hospital which was unacceptable. While knowledge levels and skills had improved after education program and had become satisfactory this in turn resulted in higher performance of staff nurses. Similar finding was reported by **Mohammed et al (2016), Turkelson & Keiser, (2017) & Crowe, et al., (2018)** they found that competent, motivated and skilled health care providers are cornerstone for improving the performance of health care organization.

With regards to relation between overall nurses' knowledge mean score and their personal data throughout the program phases, the present study results revealed that

statistically significant positive relation between total nurses' knowledge mean score and their gender preprogram implementation, as well as, there was statistical significant positive relation between total nurses' knowledge mean score and their education qualification in immediate post program and after three months of program implementation. While, there was no statistically significant relation between total nurses' knowledge scores and their age, experience years and training programs throughout the program phases. This is in agreement with **Behzadi, et al., (2018)** who reported that professional education level of CCNs showed great impact on their knowledge. Also, these findings of study supported by **Mackey & Bassendowski, (2017)** reported that nurses' age had no effect on their knowledge and practice improvements. Also, **Higgs, et al., (2018)** stated that there was statistically relation between total nurses' knowledge with only their qualification post the nursing intervention guidelines implementation training course. This was inconsistent with **Mwakanyanga, et al., (2018)** who revealed that only nurses' experience had an effect on nurses' knowledge and practice improvements.

Concerning relation between overall nurses' practice mean score and their personal data throughout the program phases. The present study revealed that there was statistically significant positive relation between total nurses' practice scores and their education qualification in immediate post program and after three months of program implementation. While, there was no statistically significant relation between total nurses' practice scores and their age, gender, experience years and training programs throughout the program phases. This could be explained in light of the known fact that empowering EBP education is a model designed for in-service training for nurses that advisable to match the training programs according to educational needs related to practical skills for nursing staff. The empowering EBP education assisted nurses for completing the professional tasks competently and correctly **Gulanick & Myers, (2017)**, **Bayoumi & Mahmoud , (2017)** & **AbdElbaky, et al., (2018)**. Similarly, to **Rojjanasrirat &**

Rice, (2017) who mentioned in their study that there was highly statistically significant relation between nurses' qualification and their practices. Also, these results agreed with **Mohammed, et al., (2016)** who reported that years of experience had no effect on the nursing performance. On contrary, **Janz, et al., (2018)** who founded that there was no statistically relation between nurses' practices with their educational level. Also, **Elgazzar et al (2019)** emphasized in their study that there was negative statistically relation between nurses' educational level and nurses' practices.

With regards to correlation between the total mean scores of knowledge, procedural practice and activities level among CCNs, the result of current study illustrated that there was high significant statistical positive correlation between nurses' knowledge, procedural practice and activities practice at pre, immediate post and three months follow up after implementation of the program about following EBP during procedure. These findings were in the same line with **AbdElbaky, et al., (2018)** who clarified that nurses perceived knowledge, skills and feedback on performance appraisal had positive relation with EBP performance. Moreover, **Mohammed, et al., (2016)** emphasized the same results in their study that significant improvements were reported in total scores of nurses' knowledge, practice and total scores of EBP performance. Conversely, **Elgazzar, et al., (2019)** showed that there was a negative statistical correlation between total scores of nurses' knowledge, practice and total scores of EBP performance.

Finally, the present study confirmed the hypothesis that evidence-based program implementation supports nurses' performance regarding care for intubated patients.

Conclusion:

The current study concluded that, implementation of evidence-based practice program had been proven to be significantly effective in improvement of nurses' performance regarding care for intubated

patients as illustrated from total knowledge level; total procedural practice level and total activities mean scores immediate post and after three months follow up of the program implementation were higher statistically significant than preprogram. Also, there was statistically significant positive relation was found between total nurses' knowledge and practice mean scores with their education qualification in immediate post and after three months of program implementation. As well as, presence of a positive correlation between total knowledge, procedural practice and activities mean scores pre and post the implementation of the evidence-based practice program.

Recommendation:

Based on the findings of the present study the following recommendations are suggested:

1. There is a need for an ongoing planned education and training program offered on a regular basis to critical care nurses to improve their knowledge, practice, and activities towards following evidence based practice recommendations to execute the procedure correctly in the intensive care unit to achieve high quality nursing care for intubated patients.

2. Head nurse or nurse supervisor should receive evidence based practice education and training about the recent knowledge and skills to transfer it to their newly graduated nurses at the intensive care unit through teaching courses or training programs to be reflected on their patients' care.

3. Continuous evaluation from the head nurse or nurse supervisor to the staff nurses' performance to determine the effect of evidence-based practice programs on upgrading their knowledge and enhancing their practice.

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