Assessment of Nurses' Performance Regarding Subglottic Suction

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Abstract

Background: Subglottic suction in the intensive care unit (ICU) potentially improve the outcomes of patients need mechanical ventilator (MV) more than 48 hours**. Aim:** This study aimed to assess nurse's performance regarding subglottic suction**. Design:** A descriptive explorative design was utilized for the conduction of this study. **Setting** the study was carried out in intensive care unit (ICU) of Beni–Suef University Hospital.**The sample of the study.** A convenient sample of 35 nurse. **Tools for Data collection**. **Tool (I)** Nurses' Self-administered Questionnaire: **Tool** (II) Nurses' practice observational Checklist (Appendix II). **Results:** The main results revealed that: mean age of nurses under study was 28.3±7.33, while 65.7% of the studied nurses were male and 71.4% of them were Technical institute nursing graduates and revealed that,0 % of the studied nurse's had satisfactory level of knowledge about subglottic suction and 2.9of the studied nurses had satisfactory level of practice about subglottic suction. Positive correlation between nurses knowledge, practice and demographic data of nurses under study. **Conclusion**, based on the findings of the current study, it can be concluded that majority of the nurses were having an unsatisfactory (knowledge, and practice) regarding subglottic suction, and positive correlation between nurses knowledge, practice and demographic data of nurses under study which supported the research question. **Recommendations:** Develop and implement an educational program based on nurses' learning needs. Assess patients' for ventilator associated pneumonia (VAP) after implementation of the educational program.

Keywords: Nurses performance, subglottic suction (SS), critical care unit.

Introduction

Intensive care unit (ICU) are special wards in the hospital as it provides both treatment and continuous monitoring for critical ill patients or patients who are in unstable condition this patient need constant observation and specialized care such as patient after major surgery, lung infection (pneumonia). In spite of its importance for patients, numerous complications may arise as those patients are exposed to equipment and procedures that put them at risk for infection such as endotracheal tube (ETT) and mechanical ventilator (MV) ***(Elpasiony et al, 2018).***

Endotracheal intubation involves passing an ETT through the mouth or nose into the trachea; intubation provides a patent airway when the patient is having respiratory distress that cannot be treated with simpler methods. Endotracheal intubation is providing an airway for patients who cannot maintain an adequate airway on their own (e.g., comatose patients, patients with upper airway obstruction), for patients needing MV, increase risk for aspiration and for suctioning secretions from the pulmonary tree ***(Freeman et al., 2020).***

Subglottic secretion drainage (SSD) as a preventive measure for VAP supports

the utilization of this specialized endotracheal tube (ETT). Micro aspirations of secretions from the maxillary sinuses, mouth, larynx and stomach accumulate on top of the cuff introduces bacterial pathogens into the lower respiratory tract and is the main cause of VAP, part of ETT lumen for inflating and deflating the cuff, lumen for SSD, consider epiglottis, ETT cuff and space where subglottic secretion accumulation ***(Fujimoto et al., 2018).***

Technique of subglottic secretions are aspirated through two main methods, continuous aspiration subglottic secretion (CASS) or intermittent subglottic drainage (ISD), CASS is performed at a constant pressure connected to the wall suction, while ISD is conducted through either intermittent pressure or manual aspiration, using syringes, at a certain frequency. Subglottic- suction ETTs more expensive than standard ETTs and are more likely to benefit patients who need prolonged MV more than 48 hours ***(Folos et al., 2017).***

Insertion of subglottic suction ETT is usually the responsibility of the physician, but it is primarily the function of the registered nurse to care for the ETT. These tasks will include the management of secretions, maintaining the position of the ETT, ensuring correct cuff pressures, prevention of complications, identifying and managing complications when they do occur ***(Hassan et al., 2018).***

The role of nurse maintenance cuff pressure of ETT between 20 and 30 cm H_2O and keep patient in semi-recumbent position during subglottic suction, do intermittent subglottic suction manually with a 10 ml syringe at an intended frequency of once every 2 hour from the time of intubation. This specialized tube is designed with a port above the cuff for aspirating the oropharyngeal secretions collected above the cuff, thereby preventing potential per tubal leakage, and reduces the incidence of VAP ***(Khalifa and Seif Eldin, 2020).***

Significance of the study

Nurses have vital role in prevention of ventilator associated pneumonia VAP by assessing patient and evaluate their physiological status, so nurses who provide direct care for critical ill patient should be knowledgeable and skillful about subglottic suction as prevention methods for VAP.

A surveillance project examining HAI and AMR in 11 hospitals in Egypt, including 43 is ICU representing both the Ministry of Health and University Hospitals. The result was 50% of the HAIs were pneumonia, 20% blood stream infections and15% urinary tract infections. A high proportion of the overall infections (64%) were a device-associated infection (DAI), where VAP constituted 92% of the overall hospital-acquired pneumonia***(Salman et al., 2019)***.

Aim of the study

This study was aiming to assess nurse's performance regarding subglottic suction in critical care unit. It will be achieved though:

1- Assess nurse's level of knowledge regarding subglottic suction.

2- Assess nurse's level of practice regarding subglottic suction.

Research question:

The current study answered the following question:

1-What is nurse's level of knowledge regarding subglottic suction in critical care unit?

2-What is nurse's level of practice regarding subglottic suction in critical care unit?

Subjects and Methods

The study was portrayed under the four main designs as follows:

I. Technical design.
II. Operational design.
III. Administrative design.
IV. Statistical design.

I. Technical design:

The technical design includes research design, setting, subjects and tools for data collection.

Research Design:

A descriptive explorative design was utilized for the conduction of this study.

Setting of the Study:

This study was conducted at the General Intensive Care Unit (ICU) at Beni - Suef University Hospitals, ICU located at 3rd floor in hospital, capacity of beds 19

beds, 12 ventilators, 19 monitors and 3 emergency carts.

Subject:

A convenient sample included all available nurses (No=35), who working in ICU and care for patients inserted of subglottic suction ETT and accepted to participate in the study from both gender with different qualification, different age, training courses and years of experiences were recruited to this study.

Data Collection tools

Data were collected using the following tools:

1-Nurses'Self-administered Questionnaire: (Appendix I).

It was developed by the researcher after reviewing related literature. It was used to assess nurses' level of knowledge regarding subglottic suction. It was include two parts**:**

First part: it was concerned with the demographic characteristics of nurses under study such as age, gender, education level, experience, courses … etc.

Second part: It was adapted from (**Hassan et al, 2018 and Qurany et al, 2018).** It was concerned with the assessment of nurses' level of knowledge regarding subglottic suction. It was written in Arabic language and included 40 questions in the form of multiple choice and true/false questions. It was categorized into 5 sections as follows:

1.Section (I): It concerned with anatomy and physiology of respiratory system. It included (7 questions) and the total score was 7grades

2.Section (II): It concerned with the nurses' level of knowledge regarding subglottic suction endotracheal tube procedure and complication (preparation, indication, post care and complication), (7 questions).

3.Section (III): It concerned with the nurses knowledge regarding endotracheal tube suctioning (nursing care before and after suction), (10questions).

4.Section (IV): It concerned with the nurses knowledge regarding mechanical ventilator (definition, indication and nursing care),(6 questions).

5.Section (V): It concerned with the nurses knowledge regarding ventilator associated pneumonia (VAP) (definition, duration, causes, risk factor, signs and symptoms and management). (10 questions).

❖ **Scoring system:**

The scoring system for this part was as follows: one grade was given for the correct answer and zero for the incorrect answer, with total grade = 40 grades, for total 40 questions.

The total level of nurses' knowledge score was categorized as follows:

- >90% was considered satisfactory (≥ 36 grades).
- <90% was considered unsatisfactory (< 36 grades).

II. Nurses' practice observational Checklist (Appendix II):

It was developed by researcher to assess the nurses' level of practice regarding subglottic suction. This tool adapted from (**Mohamed, 2017;,and Tomaszek et al, 2021)**.It was written in English language. The checklist consisted of five procedures each procedure included preparation, procedure and post procedure.

▪ **First procedure** :is concerned with subglottic suction endotracheal tube

(ETT) care that included 30 steps as follows:

1. Preparation (6 steps).
2. Procedure (18 steps).
3. Post procedure (6steps).

- **Second procedure** is concerned with deflation and inflation of endotracheal tube cuff which included 20 steps as follows.

1. Preparation (5 steps).
2. Procedure (10 steps).
3. Post procedure (5 steps).

- **Third procedure is** concerned with endotracheal tube cuff measurement which included 26steps as follows:

1. Preparation (12 steps).
2. Procedure (5 steps).
3. Post procedure (9 steps).

Fourth procedure is concerned with continuous subglottic suction drainage which included 42steps as follows:

1. Preparation(16 steps).
2. Procedure (13 steps).
3. Post procedure (13 steps).

Fifth procedure is concerned with intermittent subglottic suction which included 30steps as follows:

1. Preparation(16 steps).
2. Procedure (3 steps).
3. Post procedure (11 steps).

❖ **Scoring system for nurses practice observational checklist (Appendix II).**

The scoring system for each procedure as follows: One grade for each step that done correctly, zero for step that not done or done incorrectly.

The total grade for first procedure 30 grade in which ≥27 grades considered satisfactory(≥ 90%).

The total grade for second procedure 20 grade in which ≥ 18 grades considered satisfactory(≥ 90%).

The total grade for third procedure 26 grade in which ≥23.4 grades considered satisfactory (≥ 90%).

The total grade for fourth procedure 42 grade in which ≥ 37.8gradesconsidered satisfactory(≥ 90%).

The total grade for fifth procedure 30 grade in which ≥27 grades considered satisfactory(≥ 90%).

II. Operational design:

The operational design includes preparatory phase, validity and reliability, pilot study, pilot study, ethical consideration and field of work.

Preparatory phase:

It included reviewing of the current and more recent relevant national and international literature reviews and theoretical knowledge of the various related aspects using books, articles, periodicals, magazines and internet in order to develop the data collection tools.

Validity and reliability

Validity of the developed tools was tested using face and content validity. Validity was tested through a jury of 7 experts from critical care nursing department, Ain shams university and from critical care medical department, Beni Suef university (5professors of critical care nursing, 2 ICU specialties). The experts reviewed the tools for clarity, relevance, comprehensiveness, and simplicity, minor modification were done.

Reliability of tools were done by using Cronbach's Alpha coefficient test which revealed that tools of the study were reliable as indicated by the value for knowledge and practice were reliable at (0.526, 0.688,) respectively.

Pilot study

Pilot study was carried out on 4 nurses (10%) to test applicability of the study and to test clarity of the designed questionnaires, as well as to estimate the time needed to conduct the study. Some modification on tools were done based on

pilot study, some statements were omitted, rephrased and then the final forms were developed. Subjects included in the pilot study were excluded from the main study groups.

The ethical research considerations in the study included the following:

- The research approval was obtained from scientific research ethical committee in faculty of nursing in Ain Shams University before initiating the study work.
- The researcher clarified the objective and aim of the study to the nurse's included in the study.
- The researcher assured maintaining anonymity and confidentiality of the subjects' data.
- Nurses were informed that they allowed choosing to participate or not in the study and that they had the right to withdraw from the study at any time without giving any reasons.
- Ethics, values, culture, and beliefs were respected.

Field work:

To carry out the study, an approval was obtained from the hospital and nursing directors of intensive care units at Beni-Suef University Hospital.

Data were collected in six months from beginning of April 2021 to the end of September 2021. The study setting for three days weekly. The researcher filled the observational checklist in the morning and afternoon shifts during actual nurse's work and documented steps of care for the patients in intensive care unit. The observational checklist was used prior to administration of the questionnaire to ensure the maximal realistic observations of the nurse's performance and minimize the possibility of bias. The nurse's practice was assessed by the researcher while they were caring of patients.

Each nurse was observed by the researcher during practice using the observational checklist it took about 30-45 minutes. Then, the self-administered questionnaire sheet was filled by the nurses who providing care for patients it took about 30-35 minutes. The answers were recorded by the nurse's themselves.

Result:

Table (1): shows that the mean age of nurses under study was 25.14±3.28and 65.7% of them were male. Concerning educational level, the result revealed that 68.6% of the nurses under study were graduated from technical institute. Furthermore, 60% of nurses were had experience from 1-<5.In relation to training courses, it was found that the majority studied nurses didn't attend any course about subglottic suction (88.6%).

Table (2): shows that, 0% of the studied nurse's had satisfactory level of knowledge regarding the anatomy and physiology of respiratory system, insertion of subglottic suction ETT and complication, subglottic suction procedure, mechanical ventilator (MV) and ventilator associated pneumonia (VAP).

Table (3): shows that, 0% of the studied nurse's had satisfactory level of practice regarding subglottic suction ETT care,2.9%regarding deflation and inflation, ETT cuff pressure measurement, while 11.4% regarding continuous subglottic suction, also 5.7% regarding intermittent subglottic suction, concerning 2.9% satisfactory of total level of practice.

Table (3) :shows that there is an improvement of nurses attitude regarding subglottic suction pre, immediately post and follow-up with a slightly marked decline at follow-up phase 8.60%, 88.60%, 68.60% respectively. In addition, it was observed that there is a statistically significant difference of nurses attitude during the three phases of the study at $P < 0.05$.

Table (4): shows that there is a statistically positive correlation between the

nurses total level of knowledge; and age, education and years of experience.

Table (5): shows that there is a statistically positive correlation between the nurses practice; and age, education and years of experience.

Part I: Demographic characteristics of the Nurses under the study.

Table (1): Number and percentage distribution of demographic characteristics among nurses under the study (n=35).

Items	N	%
Age (years).		
• 20 <25	18	51
• 25 <30	15	43
• ≥30	2	6
	Mean±SD	**25.14±3.28**
Gender		
• Male	23	65.7
• Female	12	34.3
Educational level.		
• Diploma	1	2.9
• Technical institute	24	68.6
• Bachelor	9	2.9
• Higher degrees	1	2.9
Years of experience in ICU.		
• < 1	4	11.4
• 1 <5	21	60.0
• ≥5	10	28.6
	Mean±SD	**4.41±2.61**
Attendance subglottic suction courses.		
• Yes	4	11.4
• No	31	88.6

Part II: Nurse's level of knowledge regarding subglottic suction

Table (2): Percentage distribution of studied nurse's according to their level of knowledge regarding **subglottic suction** (n=35).

Item	Satisfactory level of knowledge			
	Satisfactory		Unsatisfactory	
	N	%	N	%
Anatomy and physiology of respiratory system.	0	0.0	35	100.0
Insertion of subglottic suction ETT and complication.	0	0.0	35	100.0
Subglottic suction procedure.	0	0.0	35	100.0
Mechanical ventilator (MV).	0	0.0	35	100.0
Ventilator associated pneumonia (VAP).	0	0.0	35	100.0
Total	0	0.0	35	100.0

Part III:. Nurses level of practice regarding subglottic suction .

Table (3): Percentage distribution of the studied nurse's level of practice regarding subglottic suction (n=35).

Item	Satisfactory level of practice			
	Satisfactory		Unsatisfactory	
	N	%	N	%
subglottic suction endotracheal tube (ETT) care	35	100.0	0	0.0
Deflation and inflation of endotracheal tube cuff	34	97.1	1	2.9
endotracheal tube cuff pressure measurement	34	97.1	1	2.9
continuous subglottic suction	31	88.6	4	11.4
Intermittent subglottic suction	33	94.3	2	5.7
Total	34	97.1	1	2.9

Table (4): Correlation between nurses' total level of knowledge regarding subglottic suction and demographic data (n=35).

Items	Total level of knowledge	
	r	P value
Age	0.343	0.044*
Education	0.379	0.025*
Experience	0.210	0.226

t parried test

Table (5): Correlation between nurses' of practice regarding subglottic suction and demographic data (n=35).

Items	ETTA		ETT deflation and inflation		ETT cuff pressure measurement		CSSD		ISD	
	R	P value	R	P value	R	P value	R	P value	R	P value
Age	0.247	0.153	0.440	0.008**	0.179	0.304	0.221	0.202	0.036	0.835
Education	0.334	0.050*	0.115	0.512	0.199	0.253	0.209	0.227	0.114	0.513
Experience	0.177	0.308	0.533	0.001**	0.243	0.159	0.123	0.483	0.066	0.707

Discussion

The discussion of the findings covered main parts:

Part 1: Demographic characteristics of the studied nurses' age, sex, qualifications, years of experience, and training courses.

Regarding studied nurses' demographic characteristics, the results of the current study revealed that, mean age of nurses were 25.14±3.28.This is consistent with ***(Hassan et al., 2018),***who studied effect of educational program on nurses practice regarding care of adult patients with endotracheal tube, who reported that the age of more than half of the studied nurses were between 20-25 years.In researcher point of view this result may be due to most of nurses under study were newly graduated, young to tolerate the nature of intensive care unit (ICU) work as an area of specialty necessitates a young qualified nurse for better quality of nursing care offered and ability to tolerate the working in the critical care unit.

As regard to gender of nurses under study, the current study showed that less than three quarters of nurses were males. This finding is contraindicate with ***Sharma et al., (2014)*** who's reported that the majority of

studied nurses were female), who studied Effectiveness of "endotracheal suctioning protocol" in terms of knowledge and practices of nursing personnel. In researcher point of view the nature of ICU (workload, stress, needs of critically ill patients) necessitates male nurses tolerate this nature of work.

Concerning level of education, results revealed that about two thirds of nurses under study were having technical institute qualification. These results were agree with ***Hassan et al., (2017),*** who studied effect of educational program on nurses practice regarding care of adult patients with endotracheal tube, who reported that more than one third of nurses were graduated from technical nursing institute. This result is inconsistent with ***Mishra and Rani (2020),*** who studied Effectiveness of structured teaching program on knowledge and practice regarding care bundle on prevention of ventilator-associated pneumonia among nurses who reported that two thirds of the studied nurses were having bachelor degree. In researcher point of view, this may be due to compulsory appointment for graduates of the nursing institute of Beni Suef university in Beni Suef university hospital, and they are prohibited from joining any other hospitals, whether affiliated to the ministry of health or other hospitals.

As regard to years of experience in ICU, results revealed less than two thirds of the nurses under study had experience 1 - <5 years in ICU. This finding was in agreement with ***AskandarTadros et al. (2019)****,* who studied Effect of self-learning package on nurses' performance caring for patients on ventilator who reported that more than half of the nurses had experience less than 5 years. This contraindicated with *Ahmed et al. (2019)* who studied Effect of teaching program on ICU nurse's knowledge and practice of endotracheal suctioning procedure who reported 66 % of studied nurses had less than one year of experience. In researcher point of view this finding may be due to increase turnover of nurses due to work load of ICU.

As regarding subglottic suction training courses, results revealed that more than two thirds of studied nurses didn't attended these courses, this result agree with ***Mishra and Rani,(2020)****.* Who studied Effectiveness of structured teaching program on knowledge and practice regarding care bundle on prevention of ventilator-associated pneumonia among nurses. In researcher point of view might be due to that the conducted courses include topic like cardiopulmonary resuscitation (CPR), high alert medication and infection control policy but not include subglottic suction.

Part II: Nurse's level of knowledge regarding subglottic suction **.**

As regard to nurses' level of knowledge regarding subglottic suction and VAP, the results revealed that all study samples under study had unsatisfactory level regarding subglottic suction. This finding is in agreement with ***Khalifa and Seif Eldin, (2020)*** who study the impact of an educational training program on nurses in reduction of Ventilator associated pneumonia, found majority of study sample had un satisfactory level pre-program implementations and improvement in their knowledge as regard subglottic suction post program implementations.

Part III: Nurse's level of knowledge regarding subglottic suction.

As regard to nurses' level of practice regarding subglottic suction, the results revealed that majority of study samples under study had unsatisfactory level regarding subglottic suction. This finding is in agreement with ***Mishra, and Rani, (2020)*** who studied Effectiveness of structured teaching program on knowledge and practice regarding care bundle on prevention of ventilator-associated pneumonia among nurses, found majority of study sample had un satisfactory level pre-program implementations and improvement in their practice as regard subglottic suction procedure

post program implementations. In researcher point of view this result related to study subjects newly graduated, young age.

Part V: Correlations between nurses' knowledge and practice regarding subglottic suction and demographic data.

As regarding correlation between nurses' knowledge and demographic data. The current study revealed that was a positive correlation between total nurses' knowledge and age, educational level and years of experience. This result agreed with (**Ahmed et al, 2019**) who study effect of teaching program on ICU nurse's knowledge, practice and attitude of endotracheal suctioning procedure at omdurman military hospital 2019.

As regarding correlation between nurses' practice and demographic data. The current study revealed that was a positive correlation between total nurses' knowledge and age, educational level and years of experience. This result agreed with (**Ahmed et al, 2019**) who study effect of teaching program on ICU nurse's knowledge, practice and attitude of endotracheal suctioning procedure at omdurman military hospital 2019.

Conclusion

Based on the result of the current study; it can be concluded that:

The results revealed that all study sample had unsatisfactory level of knowledge regarding subglottic suction, and minority of sample had unsatisfactory level of practice and positive correlation between nurses knowledge, practice and demographic data.

Recommendation

- Develop and implement an educational program based on nurses' learning needs.
- Assess patients' for VAP after implementation of the educational program.

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