

Knowledge and Practice of Nurses Regarding Endotracheal Suctioning Procedure

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Abstract— Endotracheal suctioning is one of the most important critical care in the intensive care unit in maintaining the airway in placed. Nurses working in the intensive care unit must have knowledge and practice to implement the procedure in order to minimize the potential hazards. This study assessed the knowledge and practice of nurses regarding endotracheal suctioning procedure while using a teaching program to improve the knowledge and performance of ICU nurses. This quasi experimental research highlights the effect of the structured program to the knowledge and practice of nurses working in the intensive care unit using questionnaire and observational checklist. This study utilized a purposive sampling technique in selecting nurses working in Omdurman Hospital. This research reveals that the structured educational program improved the knowledge and performance of the ICU nurses as evidenced by the result of the pretest and posttest. Undergoing training on endotracheal suctioning can contribute to improved ICU nurses' knowledge, performance and patient outcomes.

Keywords— Endotracheal suctioning: ETS: knowledge: practice: Omdurman Military Hospital: teaching program

I. INTRODUCTION

The endotracheal suctioning is a widely used procedure in maintaining a clear patent airway for patients with endotracheal tube. It prevents effective coughing and accumulation of airway secretion due to loss of mucociliary function making this procedure a vital component of nursing management. Since it is a potentially harmful procedure, it requires effective and safe practice. The nurses working in Intensive Care Unit are the primary workers who conducted this procedure. Endotracheal suctioning is often performed invasive procedures for patients under mechanical ventilator^[1]. Consequently, failing to do endotracheal suctioning by critical care nurses may experience patient with some respiratory problems such as obstruction of airway, hypoxemia, hypercapnia, infection and collapse of the lungs^[2]. ETS is a crucial nursing skill because if the nurses' incorrectly perform the procedure, the patient may have numerous problems. It will result to several problems including tracheobronchial edema, ulceration, and denudation of the epithelium (sole). This increase the risk of patient for bleeding due to damage to the mucosa^[3].

The ICU nurses must adhere to the guidelines as a basis of evidence about endotracheal suctioning procedure. The foremost principles of endotracheal suctioning are the prevention of complication, infection control measures and the ventilator-associated pneumonia. Educating the staff nurses is

significant in reducing numerous adverse effects. Despite the presence of guidelines and evidenced-based practice, the nurses failed to perform the accurate nursing procedure. Studies have shown that nurses were not following the current endotracheal suctioning guidelines. There is a gap between the nurses' knowledge and practices. Areas needing concern were the infection control measures during endotracheal suctioning^[4]. There is also a nurses lacking knowledge as reflected on their practice of ETS^[5]. While there is a noticeable gap between nurses knowledge and practice of endotracheal suctioning^[6], educational intervention and clinical guidelines holds the highest value in reducing complications.

Stressing the importance of proper endotracheal suctioning, the ICU nurses will follow the evidence-based guidelines in order to shorten the duration of patient hospital stay, thus reducing the cost of hospitalization^[7]. In spite of the importance of this issue, few documented studies in Sudan were available to researchers. The knowledge should be reflected in the nurses' performance on endotracheal suctioning. Further, the nurses acted differently in performing the procedure which triggered the researcher to focus on this study. The assessment of clinical performance and knowledge paid attention to help to clarify the status of knowledge and practices of ICU nurses in the researcher's country. This can be improved by experimental study to enhance the nurses' performance in endotracheal suctioning in adult patients through teaching program to offer solutions to the level of quality of their services.

This study aimed to determine the knowledge and practice of nurses working in intensive care unit regarding endotracheal suctioning procedure before and after teaching program. It sought to answer the following questions:

1. What is the knowledge and practice level of ICU nurses regarding endotracheal suctioning procedure?
2. What is the effect of structured teaching program to the ICU nurses' knowledge regarding endotracheal suctioning procedure?
3. What is the effect of structured teaching program to the ICU nurses' practice level regarding endotracheal suctioning procedure?

This study was confined to the responses of 50 staff nurses currently working in the intensive care unit of Omdurman Hospital in Sudan.

This study was anchored on the Care, Core, Cure Theory of Lydia Hall which served as a theoretical approach to the

case of endotracheal suctioning procedure to the patient under mechanical ventilator. [8]

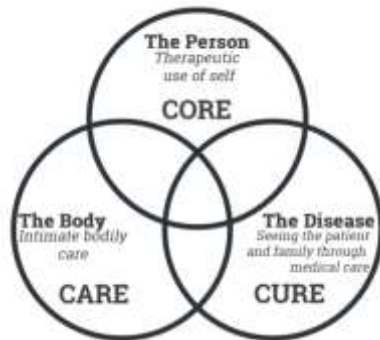


Fig. 1. Hall's Care, Core, Cure Theory

The diagram above demonstrate a theoretical approach that served as the basis of the researcher's study. It intended nurses to effectively performed the endotracheal suctioning as reflected on their knowledge. The theory helps in the process of interlocking Cs in effect to the knowledge and practice level of nurses working in the intensive care unit.

From the researcher, the IPO input-process-output into conceptual framework was created and illustrated below:

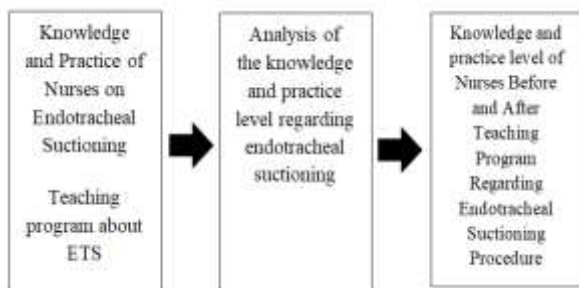


Fig. 2 The Conceptual Framework of the Study

In the figure 2 above, the input of the study are the intensive care unit nurses' level of knowledge and practice on endotracheal suctioning and the structured teaching program about ETS. By focusing on the input and its analysis, processes were applied. By the application of the teaching program designed for nurses, the effectiveness of the program represent its outcome as its effect on the knowledge and practice level of the nurses on endotracheal suctioning.

II. MATERIAL AND METHODS

A. Research Design

This study is a quantitative type of research using a quasi-experimental research design. This research design aims to establish a cause-effect relationship between variables (independent and dependent) and a non-random method was used to assign the subjects to the group [9]. Thus, it is used to approximate the causal effect of the intervention on the study population without chance.

B. Participants

The participants of this study were 50 ICU nurses working as a regular status working in Omdurman Hospital's

Intensive Care Unit. Samples were selected using purposive sampling design. The Omdurman Military Hospital is the research locale of the study. Eligibility criteria were applied on this study. For inclusion criteria: of any gender; age; marital status; and nationality who are willing to participate in the study. Exclusion criteria includes: those healthcare professional other than ICU nurses such as technician nurses, diploma holder nurses and nurse trainees and nurses who were on holidays, nurses who refuse to participate in the study.

C. Interventions and Outcome

The research collecting tool of this study consists of two main instruments. The first is a self-administered questionnaire formulated by the researcher based on the review of literature and studies focusing on the study variables; knowledge, practice regarding endotracheal suctioning procedure. The second is the observation checklist to evaluate the practice level of nurses during the endotracheal suctioning procedure's phases (preparatory phase, performance phase, evaluation phase). This checklist composed of thirty five statements under three sections.

There are two phases implemented by the researcher in data gathering. On Phase I, the application of clinical guidelines for nurses in which the gathering tool was administered to nurses to assess the pre-test knowledge, practice of the ICU nurses in endotracheal suctioning. After the assessment, they received the educational training program. Consent was secured from the study participants. The structured teaching program was explained and applied to the nurses. On Phase II, the post test was performed to evaluate the level of knowledge and practice about endotracheal suctioning. The program contains the definition of airway, types of artificial airways, indications for artificial airways insertion, definition of endotracheal suction, indications for endotracheal suction, contraindications for endotracheal suction, assessment before suctioning, assessment of need for endotracheal suction, pre-oxygenation, infection and infection control, endotracheal suction technique, size of suction catheter, suction catheter insertion depth, endotracheal suction pressure, normal saline instillation, endotracheal suction duration, endotracheal suction complication, endotracheal suction adverse effects, hyperinflation and documentation.

D. Ethical consideration

The researcher take into consideration the used of ethical principles in conducting this research. Providing informed consent and maintain confidentiality and privacy were maintained. Before the conduct of the study, participants were briefed about the purposes of the study. With the allotted time of the study, and giving informed consent, the participants' rights were followed in conducting experimental research.

This study stressed the importance of confidentiality and anonymity throughout the study. Their response would solely be used to evaluate the effectiveness of structure teaching program. The study participants were informed that at any point of data collection process, they have the right to withdraw from the study as they wish to do so.

III. RESULTS AND DISCUSSIONS

This section presents the main results of the study after data analysis. It presents organized information in tabular form. This section helps the reader to understand the research material and explain its meaning. Reading it highlights the important findings of the study.

TABLE I. Knowledge of ICU Nurses on Endotracheal Suctioning

Statement/s	Pre-test Scores	Post test Scores	Differences	Paired t test p-value
Types of artificial airways	20	35	15	0.000*
Indications for insertion of an artificial airway	21	37	16	0.000*
Definition of endotracheal suctioning	16	30	14	0.000*
Clinical indications for endotracheal suctioning	20	32	12	0.000*
Assessment before suctioning	8	40	32	0.000*
Contraindications for endotracheal suction	15	25	10	0.000*
Prevention of nosocomial infections in ventilated patients	6	21	15	0.000*
Decreasing environmental contamination	22	44	22	0.000*
Suction systems that prevents ventilator associated pneumonia (VAP)	6	22	16	0.000*
Adverse effects of hyperinflation	15	35	20	0.000*

The table 1 contains the knowledge of ICU nurses on endotracheal suctioning. The table shows the pre-test scores and post-test scores using the indicators stated on the table. Based on the data, the participants were knowledgeable in the *assessment of patient before doing the endotracheal suctioning*. It indicates that it is highly significant on the differences between pretest and posttest scores. In the assessment before suctioning, the ICU nurses implement subjective and objective assessment. In subjective, the nurse can perform a focused interview to gather history about respiratory issues. In objective, prior to endotracheal suctioning the indication of the need for suctioning should be obtained and documented [10].

Meanwhile, *decreasing the environmental contamination* garnered the second highest level of knowledge gained. This suggests that nurses have the ability to perform infection control measures to prevent infection. Studies have shown that open suctioning severely contaminates the air environment of the intensive care unit. It reveals that air within 100-200 cm of the endotracheal tube placement contaminates after open suctioning [11]. In contrast, the closed suctioning decreased the risk for aerosolization of tracheal secretions when coughing. It should be considered for patient with cardiopulmonary instability or those who have high levels of positive end-expiratory pressure (PEEP) [19].

But the nurses have low knowledge on the contraindication for endotracheal suctioning having the lowest knowledge

gained after the pretest and posttest scores.

TABLE II. Knowledge of ICU Nurses on Endotracheal Suctioning Procedure Performance

Statement/s	Pre-test Scores	Post test Scores	Differences	Paired t test p-value
the importance of preoxygenation	16	32	16	0.000*
normal saline instillation	11	28	17	0.000*
effect of instilling saline	16	35	19	0.000*
recommended size of the suction catheter	15	18	3	0.000*
appropriate suction catheter depth	18	32	14	0.000*
recommended suction source pressure	15	32	17	0.000*
recommended time duration	21	44	23	0.000*
frequency of endotracheal suctioning	28	38	10	0.000*
adverse effect of endotracheal suctioning	15	35	20	0.000*
situations require stopping the procedure	19	37	18	0.000*
complication of endotracheal suction	15	30	15	0.000*
documentation	24	44	20	0.000*
the importance of preoxygenation	16	32	16	0.000*

The table above presents the knowledge of ICU nurses on endotracheal suctioning performance. The data shows the statements where the nurses have high knowledge gained. It means that the ICU nurses engaged in recommended time duration with the highest scores among all areas. It is recommended that endotracheal suctioning should not be routinely performed as to prevent obstruction. The time should not exceed 15 seconds while the negative pressure must not exceed 100mmHg [12].

Other areas where nurses were knowledgeable were the adverse effects of endotracheal suctioning and documentation. There are potential for adverse effects of ET suctioning on respiratory functions and risk for respiratory trauma. It is evident in closed ET suctioning with the application of negative pressure without any contact with the mucus potential for more deleterious effects on lung volume loss [13]. Studies had reported that ET suctioning produce complications such as trauma, mucosal injury, bleeding, and atelectasis and the most serious complications are increased blood pressure, hypoxemia, increased ICP and pneumothorax [14].

While the nurses have more knowledge gained after the posttest, it reveals that they were less knowledgeable in the recommended size of the suction catheter.

The table III contains the ICU nurses performance during preparation phase on endotracheal suctioning. The results show that the participants maintain to perform preparations before suctioning. Apparently, they were able to assess for the need for suctioning. This was an effective measure to understand that they know the indication of suctioning.

Majority of the nurses position the patient in fowler’s position and explain the procedure to the patient. An observation study shows that ten percent of participants failed to auscultate the chest before suctioning and an estimated thirty two percent of nurses developed the patients’ position to semi-fowlers position which is comfortable for both the patient and the critical care nurses.^[15] Explaining the procedure to the patient is a crucial skill for ICU nurses as a healthcare professional because the patient understanding encourages compliance ^[16].

TABLE III. ICU Nurses Performance during Preparation on Endotracheal Suctioning Procedure

Statement/s	Pre-test Done	Pre test Not done	Post-test Done	Post test Not done
<i>Preparatory phase</i>				
Assess for the need for suction	50	0	50	0
Monitor heart rate.	8	42	30	20
Record blood pressure.	10	40	35	15
Monitor oxygen saturation.	5	45	27	23
Auscultate breath sounds.	9	41	32	18
Hand washing with soap and water.	7	43	29	21
Explain the procedure to the patient.	16	34	37	13
Position the patient in fowler’s position.	31	19	46	4

TABLE IV. ICU Nurses Performance during Performance on Endotracheal Suctioning Procedure

Statement/s	Pre-test Done	Pre test Not done	Post-test Done	Post test Not done
<i>Performance phase</i>				
Hyper-oxygenate the patient before suctioning by increasing ventilatorFIO2 to 100%.	21	29	42	8
Don’t apply suction while inserting catheter.	43	7	49	1
Pull back the catheter 1-2 cm if resistance is met.	44	6	48	2
Withdraw the catheter while rotating it back	6	44	26	24
Limits suction time to 10-15 seconds.	5	45	25	25
Don’t perform more than 4suction per suctioning.	8	42	28	22
Don’t reinsert the suction catheter into endotracheal tube.	6	44	32	18

The above table presents the ICU nurses performance during performance phase of endotracheal suctioning. It can be seen in the results that a good knowledge have been retained as to the performance phase is concerned. Looking on the numbers, the ICU nurses do not apply suction while inserting catheter and pull back the catheter 1-2 cm if resistance is met. Moreover, the area of hyperoxygenate the patient before suctioning by increasing ventilator F102 to 100% garnered also the highest knowledge among the indicators. Hyperoxygenation prior to suctioning lessen the incidence of suction related low heart rate and decrease oxygen in the tissue associated with oxygen free-radical damage and retinopathy of prematurity. There should be

increased in FiO2 of 10-20% above 2 minutes prior to suction and continues after suction as the patient reach the pre-suction oxygen saturation level ^[17].

TABLE V. ICU Nurses Performance during Evaluation on Endotracheal Suctioning Procedure

Statement/s	Pre-test Done	Pre test Not done	Post-test Done	Post test Not done
<i>Evaluation Phase</i>				
Rinse the catheter and connecting tube with normal saline until clear.	49	1	50	0
Assess for secretion clearance.	7	43	21	29
Perform hand hygiene.	42	8	50	0
Document the procedure and any changes.	47	3	50	0

The table V represents the ICU nurses performance during the evaluation phase on endotracheal suctioning. Based on the table, the participants were able to perform well the final part of the suctioning procedure. The areas where participants achieved the highest in post-test were in rinsing the catheter and connecting tube with normal saline until clear, performing hand hygiene and document the procedure and any changes. All of these parts are essential nursing actions in the clinical guidelines after performing the endotracheal suctioning. Documentation as part of the clinical nursing is essential in providing nurses continuously reflect on their choice of interventions for their patients as well as the impact of this interventions making it as a vital part of quality and continuous nursing care ^[18].

IV. CONCLUSIONS

The Intensive Care Unit nurses have low knowledge on some areas of evidenced-based endotracheal suctioning procedure. There were gaps found between their current clinical practice and the clinical based guidelines regarding endotracheal suctioning. The structured teaching program as a form of context-suitable intervention found to be effective in improving the knowledge and practice level of the nurses working in the intensive care unit of Omdurman Military Hospital.

V. RECOMMENDATIONS

Based on the foregoing findings, the following recommendations were drawn:

Manual information booklets and self-instruction modules should be developed by specialists in pertaining endotracheal suction. Similar study should be conducted using analytical approach to determine the nurses’ compliance to ET suctioning clinical based guidelines. Implement a clear clinical ET suctioning guidelines, training and education to improve ET suctioning practices. Nursing curriculum should emphasis on strengthening students’ clinical knowledge regarding various hospital-acquired infections (HAI). Conduct a similar study using large number of population to generalize the findings.

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