Effect of Educational Intervention On Nurses' Knowledge And Practices Regarding Endotracheal Tube Suctioning

Samira E Aboalizm¹ & Asmaa Hamed Abd Elhy²
Assist. Prof Medical Surgical Nursing Department, Faculty of Nursing, Menoufia University- Egypt¹²

Abstract
Endotracheal suctioning is an essential part of nurses' duties to manage airway for mechanically ill patients in intensive care units. The efficiency and problems with the endotracheal suctioning procedure are associated with the technique of accomplishment, therefore the nurses should achieve this technique carefully and efficiently.

The aim of this study was to determine the effect of education intervention on nurse's Knowledge and Practices about Endotracheal Tube Suctioning.

Research Design: A quasi experimental research design with pre-posttest was utilized to fulfill the aim of this study. Subjects: A convenience sample (nurses who working in intensive care units); 100 nurses at Menoufia University.

Tools; two tools were utilized for data collection:
- Tool I - Structure interview questionnaire schedule: which consist of two parts; part one Characteristics of Nursing Staff & part two Knowledge questionnaire sheet about endotracheal tube suction and its complication.
- Tool II- Observation checklist for endotracheal suction practice. Result: Most of the studied sample had bad knowledge regarding to endotracheal suctioning pre intervention (94%). While most of studied sample had a good knowledge post one & two post intervention (83% and 94%) respectively. The mean nurse' practice pre intervention was 29.25, while there was improvement of mean nurse’ practice post intervention (60.08 &61. 59) respectively.

Conclusion: Education intervention about endotracheal tube suctioning has a positive effect on a nurse’s knowledge and Practices about endotracheal tube suctioning.

Recommendation: Educational intervention about endotracheal suction should be performed periodically.

Keywords: Education intervention, Nurse's knowledge, Practices, Endotracheal Tube, Suctioning

1. Introduction
One of the vital responsibilities of the nurse in ICU unit is endotracheal suction to maintain airway clearance from secretion which improve oxygenation and ventilation for mechanically ventilated Patient who unable to eliminate secretion from airway (1)

The indications of suctioning when respiratory rate above normal range, ineffective airway clearance, decrease level of oxygen saturation, to reduce risk of infection, atelectasis and alveolar collapse due to accumulation of mucous, secretion in critically ill patients, to diminish the hazard of aspiration,(2,3)

Accessible technique to perform endotracheal suction is closed and opens system suctioning. Open suctioning requires disconnecting the patient from mechanical ventilation , while Closed method performs doesn't need disconnected, but performs through a special catheter during suctioning(4&5).

In new years, the closed suction system has been approval in advanced states as United States, it is used close system completely in 58% of Intensive Care Units (ICU), however 4% of other centers are used the open system. In Egypt, OSS (open suction system) is the greatest technique used as its suction catheter is inexpensive and more accessible. Improper technique of suction lead to complication such as dysrhythmia, collapse or closure of a lung, decrease level of oxygen in blood, nosocomial infections, and increases intracranial pressure, which effect on the patient's prognosis, length of hospitalization and costs (6,7&8).

To overcome these complication, staff should be aware of these dangers followed guidelines rendering to American association of respiratory care (AARC) recommendations which improve patient' outcome (9).

These guidelines include ;administration 100% oxygen before ,during ,after endotracheal suction ,avoiding instillation of normal saline before ES ,using a close system with high positive end expiratory pressure ,and increase FIO₂. The diameter of catheter half about the lament of endotracheal tube in adult personals. Maximum period of suction is ranging from 10 to 15 second (1&10).

Studied by researcher( Dougherty, and Lister 2015) (11) who Clarified that nurses not aware guidelines about suctioning which reflected on nursing practice, in addition there was a difference between ideal performance and actual practice about suction. Because the nurses spend more time beside patients, so it is essential to maintain patient safety and prevent complication of suctioning, this is done when providing adequate knowledge about
recommend guidelines to perform suction efficiently without harming patients.

Therefore, the purpose of this research was to determine the effect of education intervention on nurse's Knowledge and Practices about Endotracheal Tube Suctioning.

**Significance of the study:**

Effective suctioning is a crucial part of airway managing in the intubated censiorously ill patients. So it is important to reduce complication from it by careful attention through all steps of suction. Patients must be assessed and preparations carefully, maintain sterilization to prevent infection that leads to improve patients’ outcomes [11, 7]. Improved outcomes will shorten patient’s ICU length of stay, hospitalization as well as decrease financial burden on patients and decrease hospital costs.

**Purpose of the study**

to determine the effect of education intervention on nurse's Knowledge and Practices about Endotracheal Tube Suctioning.

**Research hypothesis:**

- There will be a change in nurse's Knowledge about Endotracheal Tube Suctioning after applying educational intervention.
- There will be a change in nurse's practice regarding to Endotracheal Tube Suctioning after applying educational intervention.

**Research Design:**

A quasi experimental research design with pre-post-test was consumed to achieve the object of this study.

**Location:**

This research was accompanied in intensive care unit of Menoufia University hospital, Egypt.

**Subjects:**

Convenience sample of 100 nurses who employed in intensive care units at Menoufia University. The study was conducted over 4 months started from the first May 2018 to end of August, 2018. The researchers visited the hospital 3 days weekly until the sample was completed.

**Tools of data collection:**

Two tools were utilized for data collection:

**The tool 1 - Structure interview questionnaire schedule:** This instrument was advanced by the researchers based on the review of the significant literature (Dougherty & Lister 2015 and Nishamol, 2011) [11&13]. It was used to determine level of knowledge about endotracheal suction care and its complication. The instrument contained of the overdue two portions:

**Part 1:-**

**Characteristics of Nursing Staff:** it compromised information about age, gender, level of education, years of experience in ICU.

**Part 2:-**

**A- Knowledge questionnaires sheet:** that established by the researchers after studying of the associated literature that contains fifteen items to assess nurses’ knowledge regarding to assessment of knowledge about endotracheal tube suction such as purpose of endotracheal suction, frequency of performing endotracheal suctioning, best method of suction, length of insertion, time limit, most appropriate position, rotation of catheter, successful suctioning test, nerve stimulated during suction, possible complication of carina irritation, importance of oxygenation before giving suctioning, suction pressure, size of suction catheter, frequency of changed suction catheter and question about instillation of sodium bicarbonate through the ET tube.

**Recording system:-**

Each question has three response categories and for data analysis the respondents answer as following:-

1. Correct and complete answer was given a score of three.
2. Correct and incomplete answer (partially correct answer) was given a score of two.
3. Incorrect answer and do not know was given a score of 1.

The nurse's responses were calculated and recorded, the total score of the nurse's knowledge ranged from 15 as a minimum score of, 45 as a maximum score and was categorized into:

- A score of 15 < 23 (< 50%) denoted poor or unsatisfactory results
- A score of 23< 34 ( 50% < 75 %) to indicated fair results
- A score between 34 and 45 (>75%) showed good or satisfactory results.

**B- Knowledge questionnaires sheet about complication:** to assess knowledge about potential complication of endotracheal tube suction that contains nine questions such as lively lung agreement and decrease functional residual capacity, atelectasis, decrease oxygen saturation, tissue trauma to the tracheal, microbial colonization, Variations in brainy blood flow and enlarged intracranial pressure, Bronchoconstricion or bronchospasm, Hypotension and cardiac dysfunction.

**Scoring system:-**

Each question was given a score 2 for responses yes and score 1 for responses no. All marks were summed and the range of mark was from 9 to 18.
• A score of 9-10 (<50%) denoted poor knowledge score.
• A score of 11 to 13 (50% < 75%) indicated moderate results.
• A score more than 14 to 18 (>75%) illustrated good knowledge score.

Observation checklist for practice: - that advanced by the investigators after studying of the associated literature (11&13) that contains 33 items to assess practice about endotracheal suction performed by nurses. The researchers used this checklist three times (pre educational intervention, after intervention (post two weeks) and after four months from educational intervention to evaluate the effectiveness on practice.

It was comprised of three parts

Part I:-
Observation checklist for practice prior to endotracheal tube suction: it includes Patient assessment, Patient preparation, Pre suctioning hyper oxygenation, Cuff pressure confirmed, Protection of eyes from secretions, Security of central venous catheter from secretions, Analgesic managed and Infection control practices(hand decontamination, gloves worn, Apron worn, face mask worn & Sterility of suction catheter

The items were categorized into three levels; correctly done, incorrectly done and not done.

Part II:-
Observation checklist for practice during endotracheal tube suction: it includes sodium chloride instillation, size of suction catheter, amount of suction passes, period of suction practical to airway, level of suction pressure, no suction until insertion the catheter, continuous suction, restarts the oxygen delivery system and flush catheter and suction.

The items were categorized into three levels; correctly done, incorrectly done and not done.

Part III:-
Observation checklist for practice post endotracheal tube suction: - it includes patient relinked to oxygen, post suctioning hyper oxygenation, chest auscultation post ETS, Patients reassure, hand disinfection after suctioning, prevents contamination from secretions, cuff pressure checked, the document need for suctioning and results in nurses’ notes, turn off the suction device, notice any changes in the vital signs and assess the secretion clearance.

Scoring system:-
A score of zero was given if the practice not done while the score of one was given if the practice was incorrectly done and the score of two was given if the practice was correct done. In every part total score was applied and converted into percent score the practice was reflected poor if the percent score was less than 60% and if the percent score was more than 60% considered good practice.

Validity and reliability of the instrument:
The two tools were advanced by the investigators after studying of the associated literature and tested for its content validity. Validity showed the degree to which the instrument measures what it is expected to measure. The questionnaire validity was resolute by a board of three experts. Alterations were carried out according to the board's judgment on the clarity of the judgments and the appropriateness of the substances. Reliability of the tool was established through test re-test method at a 15-day interval with a group. Chronbach’s alpha was practical for the reliability of the questionnaire and was established to be 0.84 for instrument one and 0.90 for second tool.

Pilot study:
A pilot study passed with 10% of a total number of nurses in ICU, to evaluate clarity in addition to the applicability of the instrument and appraisal the time needed to fill each part. The essential alteration was done as exposed from the pilot study. The sample of the pilot study was omitted from the total sample to assure the constancy of the result.

Ethical considerations:
An official consent was obtained from the hospital manager and the supervisor of intensive care units. It was obtained after explaining the objective of the study. Nurses’ official agreement was obtained to participate in the study after clarification the objective of the study. Each nurse was reassured that confidentiality and privacy will be preserved and nurses have a right to withdraw at any time.

Estimated sample size:
Based on preceding studies about the effectiveness of knowledge and practice toward the endotracheal tube suction among staff nurses, a conformist effect size of 0.40 was assessed. 29, 20 using the statistical software, the statistical power of 0.81 and statistical import 0.05, the assessed sample size essential to implement one sample t tests were 100 subjects.

Field work: Data gathering for this study was passed out from the first May 2018 to end of August 2018. Once permission was granted to conduct the study, the investigators were started gathering.

Data collection:-
Prior data collection the researchers distributed the questionnaire to the sample that agreed to share in the study, and then clarify the objective of the study to the participants. The usual period taken to finish questionnaires were around 20-30 minutes. Next achievement of the questionnaires, the investigators gather it and make sure that questionnaires sheet was being completed. Participants were cross-examined pre interference using the tool I and tool II.
Implementation Phase:-

First session: The researchers divided the sample into small group (ten nurses), then the researchers gave/provided knowledge about endotracheal suction and its complication through interactive lecture and group discussion by audio-visual aids as power point, lectures illustrated pictures and videos. This session lasted (45) minutes

Second session included practical part: this part explained the steps of the suction procedure (pre, during and post endotracheal suction). It’s done through demonstration and re-demonstrations it lasted (60) minutes. The researchers were available for 3 days/week in hospital.

Third session: the researchers assessed knowledge and practice for the studying a sample after two weeks through post-test & observation checklist. Also the researchers gave feedback.

Evaluation Phase:=
Knowledge and practice were assessed for studying sample at three different intervals before applying educational intervention, after two weeks from educational intervention and finally, after four months (using tool I and tool II).

Statistical analysis

The data together were tabulated & investigated by SPSS (statistical package for the communal science software) statistical package version 20 on IBM well-matched computer. Two categories of data were done:

1) Descriptive statistics: were stated as mean and standard deviation (X+SD) for quantitative data or number and percentage (No & %) for qualitative data.

2) Analytic statistics:

1- Student t- test: is a test of significance used for comparison between two independent clusters of normally distributed quantitative variables.

2- Repeated-Measures ANOVA: is a test of significance used when we had a long line of data for each contestant, with the repeated measures entered as separate variables on that same line (used for comparison between more than two related clusters of normally disseminated quantitative variables).

3- ANOVA test (parametric test): is a test of import used for judgment between three independent clusters of not normally distributed quantitative variables.

4- Spearman correlation: is a test of import used for quantitative variables that were not usually distributed or when one of the variables is qualitative. P-value of 0.05 was used to decide import concerning:

P-value > 0.05 to be statistically insignificant.
P-value ≤ 0.05 to be statistically significant.
P-value ≤ 0.001 to be highly statistically significant.

Results

Table 1. Exposed that the more than half of the study sample were female (59.0%). the mean age were (26.29±4.11). In relation to educational level, more than two thirds of study sample were Institute degree of nursing (77.0%). Almost half (42%) had experience of sex for ten years in intensive care unit.

Figure 1 Revealed that greatest of the studied sample had bad knowledge regarding to endotracheal suctioning pre intervention (94%). While most of studied sample had a good knowledge post one & two post intervention (83% and 94%) respectively.

Figure II showed that more than of the study sample had bad level of knowledge (60%) about hazards /complication of endotracheal suction. However, there was improvement of knowledge level post intervention one and two (60% & 90%) respectively.

Figure III Showed that the mean nurse practice pre intervention was 29.25, while there were improvement of mean nurse practice post intervention (60.08 &61.59) respectively. Information about endotracheal suctioning among nurses in ICU & their total score of Practice. Moreover, there was a statistically important relationship between information and practice (P= 0.03).

Table III Discovered that there was a positive correlation between total scores of Knowledge assessment related to complications of suction among nurses in ICU (baseline) & their total score of Practice (baseline). Furthermore, there was highly statistically significant relationship between knowledge related to complications and practice (P<0.001)

Table IV –Illustrated that there was highly statistically significant relation between level of education among nurses in ICU & their knowledge about endotracheal suctioning P (0.001). Also, there was statistically important relative between years of experience among nurses in ICU & their knowledge about endotracheal suctioning P (0.004) at baseline.

Table V: Illustrated that there was statistically important relation between level of education among nurses in ICU & their baseline practice prior to, during and post endotracheal suction (ETS) events, P (0.002). Moreover, there was statistically significant relation between years of experience among nurses in ICU & their practice before, throughout and post Endotracheal Suction (ETS) actions, P (0.01).
Table 1: Distribution of the nurses regarding their demographic data (n=100)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Frequency</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean ± SD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Range</td>
<td>26.29±4.11</td>
<td></td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>41</td>
<td>41.0 %</td>
</tr>
<tr>
<td>Female</td>
<td>59</td>
<td>59.0 %</td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Secondary</td>
<td>12</td>
<td>12.0 %</td>
</tr>
<tr>
<td>Institute</td>
<td>77</td>
<td>77.0 %</td>
</tr>
<tr>
<td>University</td>
<td>11</td>
<td>11.0 %</td>
</tr>
<tr>
<td>Years of experience in ICU:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;1 year</td>
<td>1</td>
<td>1.0 %</td>
</tr>
<tr>
<td>1 ≤ 5 year</td>
<td>36</td>
<td>36.0 %</td>
</tr>
<tr>
<td>6 ≤ 10 year</td>
<td>42</td>
<td>42.0 %</td>
</tr>
<tr>
<td>11 ≤ 15 year</td>
<td>21</td>
<td>21.0 %</td>
</tr>
</tbody>
</table>

Figure 1: Levels of Knowledge among nurses in ICU about endotracheal suctioning at three intervals (pre intervention, post 1, post II)
Figure II: Levels of Knowledge among nurses in ICU about complications of endotracheal suctioning at three intervals (pre intervention, post 1, post II)

Figure III: Nurses’ practice related to endotracheal suctioning at three intervals (pre intervention, post 1, post II)

Table II: Correlation between total score of Knowledge about endotracheal suctioning among nurses in ICU & their total score of Practice (At baseline)

Table III: Correlation between total scores of Knowledge related to complications of suction among nurses in ICU & their total score of Practice (At baseline)

Table IV: Relation between nurses’ knowledge at baseline and their characteristic regarding to endotracheal suctioning

P-value > 0.05 to be statistically insignificant. P-value ≤ 0.05 to be statistically significant.
Table V: Relation between demographic characters of nurses in ICU & their base line Practice.

<table>
<thead>
<tr>
<th>Demographic characters</th>
<th>Mean ± SD</th>
<th>Test of sig.</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years):</td>
<td>t=0.12</td>
<td>Spearman's rho</td>
<td>0.22 NS</td>
</tr>
<tr>
<td>Sex:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>32.19±2.56</td>
<td>t=0.44</td>
<td>0.65 NS</td>
</tr>
<tr>
<td>Female</td>
<td>31.94±2.78</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education:</td>
<td></td>
<td>F=7.93</td>
<td>0.001 HS</td>
</tr>
<tr>
<td>Secondary</td>
<td>30.0±1.90</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Institute</td>
<td>32.06±2.58</td>
<td></td>
<td></td>
</tr>
<tr>
<td>University</td>
<td>34.18±2.56</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Years of experience in ICU:</td>
<td></td>
<td>F=4.80</td>
<td>0.004 S</td>
</tr>
<tr>
<td>&lt;1 year</td>
<td>27.0±0.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1≤5 year</td>
<td>31.50±2.75</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 ≤10 year</td>
<td>31.83±2.25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11≤15 year</td>
<td>33.66±2.72</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

P-value > 0.05 to be statistically insignificant.
P-value ≤ 0.05 to be statistically significant.
P-value ≤ 0.001 to be highly statistically significant.

Discussion

Endotracheal suctioning is perhaps one of the most communal insidious actions achieved in patients with an artificial airway. So the nurses must have acquired enough information and practices to prevent complications.

Regarding to Socio demographic structures the current study exposed that the mean age of the deliberate subjects was reached from twenty one to forty years. Moreover, most they have nursing institute education. These events may affect knowledge and practice among nurses. Regarding to years of experience among nurses the present study showed that most nurses have thirty eight years. Furthermore years of experiences in ICU among nurses are forty two years within six to ten years. These outcomes were in contract with (Miia et al., 2015) (14) who evaluate of endotracheal suctioning practices of critical-care nurses. These results clarified that the mainstream of contributors had experienced less than ten years in ICU. These experiences, reflect on knowledge & practice.

Concerning to nurse's information beforehand and after intervention, the current study indicated that the majority of study sample had poor knowledge before intervention, however there was a noteworthy improvement of knowledge score among the studied sample immediate after intervention. These results were in the same line with studies carried by (Elbokhary et al, 2015) (19) that provide information and practice of ICU nurses concerning endotracheal suctioning for mechanically ventilated patients, who indicated that the greatest number of nurses had poor knowledge during assessment of knowledge. At the same line Ozden D, et al., 2012 (16) who study the advance of typical practice strategies for open and closed system suctioning who revealed that nurses had low levels of information and clinical skill of suction pre intervention but enhancing of knowledge and practice after training (Seema, et al, 2017) (16).

Regarding to knowledge score categories among nurses related to complications of endotracheal suctioning. The current study found that two thirds of subjects had bad knowledge in pre intervention than post intervention; on the other hand the majority of subjects had good knowledge and significant difference than pre intervention. These grades reinforced by Elsman, 2017 (17) who found that enhancement of nurses knowledge after application of Endotracheal Suction Guidelines which reflected on patients' respiratory status. This means that inadequate educational program provided to nurse to refresh nurse's knowledge lead to these result pre intervention. While after applying educational intervention the knowledge improves that due to interaction, discussion between researchers and nurses.

Regarding to nurses' practice score before, during and after endotracheal suction. The present study explained that two thirds of nurses had improvement in practice post two interventions than pre intervention. At the same line Farsi et al., 2015 (18) who study the result of the scientific review process at level of endotracheal suctioning skill in nurses and anesthesia technicians working in intensive care units. This result clarified that the total score of nursing skill in endotracheal suction of the subjects in the intervention group in the post-intervention phase enhanced after weeks than pre intervention and had significantly different. Moreover the total score of nursing skill about endotracheal suction in the study group was higher than the control group after the intervention.

Furthermore Savita et al., 2014 (19) who study the efficiency of “endotracheal suctioning protocol” in terms of information and practices of nursing personnel, this findings clarified that the nurses who follow the ordinary practice strategies for open and closed suctioning were significantly increase in the mean knowledge and practice scores in all areas of knowledge questionnaire and observation checklist post application of guidelines than the mean knowledge and practice scores before application.

Also the current study exposed that significant association between total score of knowledge about endotracheal suctioning among nurses and their total
score of practice. This results supported by Majeed, 2017 (20) who found there was associated between nurses’ practice and training course, work training course for ICU nurses improve knowledge and practice toward efficient suctioning performance and reinforcement of nurses in promoting knowledge and practices in this field. However Zainib , 2017 (21) mentioned that there was a weak correlation between nurse’s knowledge and practice score in addition to there was not statistically significant. It means that nurses have knowledge about standard guidelines, but they do not put it into practice. The researcher explained these result that due to ongoing learning, open discussion and comments between researcher and participant allow them to understand the practice from their mistakes thus skills improved and reflected on patient outcomes.

Regarding to years of experience. The current research showed that there was statistically significant relation between years of experience among nurses in ICU & their knowledge about endotracheal suctioning, this result in contrast with the results (Milia , et al., 2015) (14) who stated that there was no major association between years of experience, knowledge and practice. On my view as a researcher the experience increases the level of information and practice increase from repeated procedure and training program. So recurrent education and guidelines among nurses help them to improve knowledge and reflect on practice among patient care.

Conclusion: Education intervention about Endotracheal Tube Suctioning has a positive effect on a nurse's knowledge and Practices about Endotracheal Tube Suctioning.

Recommendation: Educational intervention about endotracheal suction should be performed periodically. Colored booklet about technique of endotracheal suction should be performed. Recomm

References:


