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Knowledge of Endotracheal Suctioning among Critical Care Nurses in Teaching Hospital Intensive Care Unit, Malaysia

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Abstract: Endotracheal suctioning (ETS) is an intervention to remove accumulated mucus from the endotracheal tube, trachea, and lower airways in patients who require intubation. This intervention creates a large variety of heart-lung interferences which will cause serious complications to patients such as hypoxaemia, raised blood pressure, raised intracranial pressures and pneumothorax. It is imperative that nurses are aware of these risks and are able to practice according to current research recommendations. The main objective of this study is to explore nurses' knowledge to ETS. This is cross sectional studied by using self-administered questionnaire for nurse's knowledge in performing endotracheal suction to ICU patients.Data collection involving 127 nurses in ICUs. The results of this study showed that a majority of the nurses were knowledgeable about ETS with a mean score of 71.7±SD10.8. This study has also raised interesting issues concerning multiple aspects of endotracheal suctioning among the Critical care nurses (CCNs) and the results indicate the needs for teaching intervention to improve knowledge of ETS.

Keyword: Endotracheal Suctioning, Knowledge, Practice,

INTRODUCTION

Airway management is an important element in caring for critically ill patients who have to depend on mechanical ventilation. These patients are connected to mechanical ventilators via an artificial tube called endotracheal tube (ETT) Intubation with ETT and mechanical ventilation impair the transport of mucus in the airways, and interfere with effective expectoration by coughing since the glottis cannot be closed (Majeed, 2013).Therefore endotracheal suctioning (ETS) is needed for the patients to remove secretions and prevent obstruction of the ETT and lower airways. This can help to maintain a patent airway, enhancing ventilation and oxygenation for the patients (AARC, 2010).

Literature review: Critical care nurses (CCNs) play an important role in maintaining airway patency for critically ill patients by several means including performing ETS. However ETS exposed patients to several complications and risks if it not performed well and appropriately done (Maggiore et.al., 2013) such as disturbances in cardiac rhythm, hypoxemia, microbial contamination of airway and environment, and development of ventilator-associated pneumonia (VAP) (Maggiore et. al., 2013).In view of such hazards it is imperative that nurses are familiar with current research recommendations on all aspects of ETS (Nakstad, 2015; Sharma, Sarin, & Kaur Bala, 2014; Frota, Loureiro, & Ferreira, 2014).

Several studies (Akın Korhan et al., 2014; Jansson et al., 2013; Varghese& Moly, 2016; Ansari et. al., 2012) investigated how well endotracheal suction is performed in the ICU. Some nurse's practice were not based on current recommended practice (Ansari et. al., 2012; Özden&Görgülü, 2012). Maras et al., (2017) found in their study was conducted at a teaching hospital in İzmir, in western Turkey, nurses level of knowledge was good but the practice was fair. The correlation between the nurses' scores of knowledge and practice was not statistically significant. Similar with Majeed, (2017) practice are better than knowledge level among nurses while performing ETS.Therefore this study aims to determine on nurses' knowledge on ETS, thus it can help to guide the administration to plan for education and training in order to improve nurses' knowledge on ETS, and

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reducing the harm caused by ETS to patients, which can reduce length of stay, encourage faster recovery, thus reducing ICU morbidity and mortality rate (Kollef, Hamilton, & Ernst, 2012)

MATERIALS AND METHODS

Thiswas a cross-sectional study using self-administered questionnaire for nurse's knowledge on endotracheal suction to ICU patients adapted from Kelleher and Andrew (2008). Data were collected from July 2008 until April 2009.This study was conducted in teaching hospital, Hospital UniversitiSains Malaysia, Kelantan, Malaysia involving 127 CCNs working in four critical units at HUSM.

Universal sampling has been used in this study. Every participant has been given a set of the standardized questionnaire. They have to answer the entire question comprised of two sections. Section A contains of participants' data, and section B about their knowledge on endotracheal suction. They were given 3 choices of answers including true, false and don't know. They are requested to select only one answer.

Data was analyzed using statistical analysis of "Statistical Package for Social Science (SPSS)" version 14. Descriptive analysis such as frequency, percent, mean and SD were used for demographic data including age, gender, ethnicity, and length of service. The maximum possible score for knowledge items was 20 points and the mark was converted to 100%.

Ethical approval was obtained from the University Ethic Committee, Director of Hospital UniversitiSains Malaysia, and the Medical Research and Ethics Committee, Ministry of Health, Malaysia. In addition, written consent from each participant was gathered with special consideration that, each participant had the right to withdraw from study at any time; participants were first given explanation about the aim of the study

RESULTS AND DISCUSSION

There are 141 nurses in four critical care units in HUSM. The total number of nurses that had returned completed questionnaires about knowledge of endotracheal tube suctioning was 127(90.1%).

Socio-demographic profile of the respondents: The majority of the participants 52(40.9%) were working in the ICU. The age of participants ranged from 21 to 50 years old with a mean age of 28.7±SD6.4 years-old. The majority of the participants were Malays 122(96.1%) and 120(94.5%) were female. Most of the participants 66(52%) had less than 5 years working experience in the critical care units. Majority of participants 72(56.7%) had more than 5 years' experience as a registered nurse. Only 24(18.9%) of participants had post basic course and 43(33.9%) of participants had been exposed to ETS course. Details of their socio-demographic profile are presented in Table 1.

Knowledge on ETS: Majority of the nurses 120(94.0%) answered correctly regarding the needs for auscultation before ETS. Only 3(2.4%) of participants highlight ETS as semi sterile procedure. Regarding knowledge items in suctioning events, 41(32.3%) of participants knew the formula to calculate the ideal suction catheter. Majority 111(87.4%) know the correct duration of ETS at 10-15 seconds. The level of suction pressure for adult ETS is recommended at 80-150mmHg and 68(53.5%) of participants answered correctly. Majority 73(57.5%) of participants did not know the appropriate time to apply suction during the procedure. Normal saline instillation was still preferred by a majority of participants 92(72.4%) as a routine part of ETS. The questions on need of post suction auscultation and reassurance were answered correctly by a majority of the participants, 120(94.5%) and 113(89%) respectively. More than half of participants 71(56%) think that they can change their gloves to proceed to another procedure after they have finished ETS.The distribution of respondent's knowledge towards ETS shows in Table 2.

Total knowledge scores: The maximum possible score was 100%. The mean score for knowledge is 71.7 ±10.8 and the scores ranged from 45 to 95 percent. The majority of the participants 84(66.1%) scored between 60 to 80 percent (see Figure 1)

Overall, the results of this study showed that the majority of the nurses were knowledgeable about ETS with a mean score of 71.7±SD10.8. Findings that were of concern to patients' safety in this study were the setting of the suction pressure, duration of suction applied and the selection of the accurate size of suction catheter also on nosocomial infection.

High negative suction pressure can cause mucosal trauma, which in turn predisposes the bronchial tree to a higher risk of infection (Maggiore et al., 2013; Varghese & Moly, 2016).Jansson et al., (2013) found in an interview that the high suction pressure set by nurses may be due to the lack of knowledge or carelessness in not checking the pressure gauge, or nurse's belief that more secretions will be removed with a stronger suction.

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The finding concerning to patient safety is duration of ETS. A majority of 73(89%) of participants knew that the duration of ETS had to be limited to 10 to15 seconds. The rest of participant did not knew and it will expose the patient to danger and complications due to increased risk of hypoxaemia and trauma longer the duration of ETS (Maggiore et. al., 2013).The size of the suction catheter selected also important to prevent trauma (Maggiore et al., 2013) hypoxaemia (Beuret et al., 2013) if the large are used. Only 25(30.5%) participants knew how to calculate the size of the suction catheter using the formula of [(ID-2) x 2)].EM Zahran, (2011) stated that the external diameter of the suction catheter should not exceed one-half of the internal diameters of the endotracheal tube.

Nosocomial infections are among the most common complications affecting hospitalized patients (Behnia et. al., 2014). According to Occupational Safety and Health Administration (OSHA) (2008), Personnel Protective Equipment (PPE) must be worn by staff when they could be potentially exposed to blood and other potentially infectious materials. Personal Protective Equipment (PPE) includes disposable latex gloves, disposable protective gowns, eye shield/face mask or goggles with appropriate mask, pocket mask, antiseptic towelettes, and biohazard bags. In this studiedonly 61(48%) of nurses indicated they knew the needs to wear it. Therefore there is a need to add this practice in the standard of procedure (SOP) with the hope that nurses will be more aware of the issue.

CONCLUSION

This study has raised interesting issues concerning multiple aspects of endotracheal suctioning and the results indicates the needs for teaching intervention about ETS specifically, and invite the authority concerned in developing the positive working environment to make the nurses knowledge can be turn into practice in optimum level.

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Table I: Demographic characteristics of participants (n=127)

Characteristic		**n (%)**	**Mean ±SD**
Type of ICU	General	52(40.9)	
	Neurological	35(27.6)	
	Cardiothoracic	23(18.1)	
	Coronary Care	17(13.4)	
Age			**28.7± 6.4**
	21-25	48(37.8)	
	26-30	48(37.8)	
	31-35	9(7.1)	
	36-40	13(10.2)	
	41-45	8(6.3)	
	≥ 46 years	1(0.8)	
Ethnicity	Malay	122(96.1)	
	Chinese	5(3.9)	
Gender	Female	120(94.5)	
	Male	7(5.5)	
Length of service in nursing			**6.9±5.4**
	<5years	55(43.3)	
	≥5years	72(56.7)	

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Length of service in current unit			**5.3±3.8**
	<5years	66(52%)	
	≥ 5 years	61(48%)	
Undergone Post Basic course	Yes	24(18.9)	
	No	103(81.1)	
Exposure to ETS course	Yes	43(33.9)	
	No	84(66.1)	

Table 2: Percentages of responses for each knowledge items

	Knowledge Item	Correct Choice (%)	Incorrect Choice (%)	Don't Know (%)
Pre suctioning				
1.	Pre-suctioning auscultation needs	120(94.5)	3(2.4)	4(3.1)
2.	Patient preparation	106(83.5)	19(15)	2(1.6)
3.	Pre suctioning hyper oxygenation	121(95.3)	3(2.4)	3(2.4)
4.	Wash hand prior to suctioning	126(99.2)	NIL	1(0.8)
5.	Wear protective sterile gloves	123(96.9)	4(3.1)	NIL
6.	Put on disposable apron	125(98.4)	2(1.6)	NIL
7.	Wear protective mask	127(100)	NIL	NIL
8.	Wear goggle	61(48)	41(32.3)	25(19.7)
9.	ETS is a sterile procedure	124(97.6)	3(2.4)	NIL
Suctioning event				
10.	Size of suction catheter (ID-2) x 2	41(32.3)	39(30.7)	47(37)
11.	Number of suction passes (≤3)	48(37.8)	75(58.9)	4(3.1)
12.	Duration of each suction (10 - 15 seconds)	111(87.4)	9(9.5)	4(3.1)
13.	Level of suction pressure (80–150 mmHg).	68(53.5)	52(40.9)	7(5.5)
14.	Appropriate time to apply suction is while introducing catheter	51(40.2)	73(57.5)	3(2.4)
15.	Instillation of Nacl is routine in ETS	31(24.4)	92(72.4)	4(3.2)
16.	Technique to minimize risk of trauma to tracheal wall (Gently introduce the catheter until it stops. Withdraw approximately 2 cm).	78(61.4)	43(33.9)	6(4.7)
Post suctioning				
17.	Post suction hyper oxygenation	75(59)	38(30)	14(11)
18.	Post suction auscultation	120(94.5)	7(5.5)	NIL
19.	ETS is one of most traumatic procedure. Patient must be assured	113(89)	8(6.3)	6(4.7)
20.	The nurse can just change glove before proceed other procedure	51(40.2)	71(56)	5(3.94)

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Figure 1: Knowledge score among participants