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ENDOTRACHEAL TUBE PRESSURE INJURY: NURSING PREVENTIVE MEASURES

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ABSTRACT

The aim of this study was to examine the effect of evidence based nursing, and preventive measures to minimize the incident of Endotracheal Tube (ETT) pressure injury, by controlling the predisposing factors. A prospective, quasi-experimental research design was used. A convenience sample of 100 adults Critically Ill Patients, who are admitted to the selected Intensive Care Unit, within the continuous 6 months, will be recruited to the study. Three adapted tools were utilized to collect data (Demographic and medical data sheet, Glasgow Coma Scale, and Pressure ulcer staging system checklist). Patients were divided into two separated groups (experimental and control). The investigators implemented the evidence based nursing preventive measures to the experimental group, and compared the results (outcome of the given interventions) to control group. The result of this study shows a highly statistically significant difference, between experimental and control group, in relation to incidents of Endotracheal Tube pressure injury (p 0.004). Additionally, significant correlations were found between incidents of Endotracheal Tube pressure injury and "elderly of (ETT) insertion, (p 0.013). The current study concluded that, the examined evidence based nursing preventive measures demonstrate a highly useful effect, on minimizing the incident of Endotracheal Tube pressure injury.

KEYWORDS: Endotracheal Tube, Pressure injury, Evidence Based, Nursing Preventive Measures, Incident

INTRODUCTION

Pressure injury or ulcers are a serious complication of treatment in intensive care. They cause pain and suffering, impair quality of life, are expensive to treat and healing requires months to two years of treatment, after discharge from the intensive care unit (ICU) (Gorecki C, et al. 2009). To date, limited attention has been given to medical device-related (MDR) injury ((NPUAP, 2009). MDR injury differs from classic PUs in that, they are caused by essential therapeutic equipment, occur on both the skin [skin medical device-related (MDR-S) injury] and mucous membranes' [mucous membrane medical device related (MDR-MM) injury] and do not usually lie over a bony prominence. Those (MDR) injury that is mucous injury are found on mucous membranes of the respiratory and gastrointestinal tract , where a medical device has been located at the ulcer site (NPUAP, 2013).

Furthermore, as identified by a recent National Pressure Ulcer Advisory Panel position statement (NPUAP, 2013), such MDR injury cannot be staged using the PU staging system, for skin injury. Although, these injuries may be caused by pressure (from a medical device), similar descriptors of the skin and mucous membrane tissue cannot be used as mucous membrane injury, it is open and visually impossible to tell, apart from deeper injury. Also, the coagulum formed in mucous membranes resembles slough seen in stage III Pus, but is a soft blood clot (NPUAP, 2013).

MDR injury in adults is an important type of PU, with a reported prevalence of 0·85% (VanGilder C. 2009)

through 1·4% (Black J. 2010) to 34·0% (Chendrasekhar A. 1998). MDR ulcer prevalence has also been reported in 8·1% of hospitalized tracheostomy-dependent children (Boesch R. 2012) and 8·6% of Japanese neonatal intensive care babies (Fujii K. 2010), 34·5% in a large series of prevalence studies, from a major midwestern US medical center (Black J. 2010) and 29% of serious injury that required reporting to the state (Apold J. 2012). More data are needed to document the significance of the problem and provide the basis for appropriate prevention.

Devices causing MDR injury is quite variable. Respiratory equipment is often linked with these injuries, including Endotracheal Tubes (ETT), tracheotomy tubes and oxygen masks/delivery systems (Fujii K. 2010) & (Apold J. 2012). ETT is considered as an artificial tube, inserted oral or nasal in the trachea, when the patient can't maintain airway patent (Adair, C. 1999). ETT is frequently implicated with Mechanical ventilation and indicated when patient is unconscious, sedated, during surgery, or for suctioning (Brochard, L. 1991), ETT pressure injury are recognized as a common negative iatrogenic outcome of intensive care, where the use of ETT is high (Black J. 2010). Yet, the prevalence of these injuries may be underestimated because, systematic evaluation of (ETT) pressure incident is not a part of routine skin assessment. Prevention of pressure injury caused by either Medical Device or continuous bony prominent pressure, is one of daily routine activities. Lacking of knowledge and practices, in relation to latest evidence based practices, lead to nursing malpractices and increase the incidence of complication (Youssef, W. 2013).

Nurses, who working in Egypt at this hospital are from various institutions of training, with different educational levels (diploma and bachelor level), and all are registered with the Egyptian Nurses Council. The current study was to examine the effect of evidence based nursing preventive measures, to minimize the incident of Endotracheal Tube (ETT) pressure injury by; identify predisposing factors, reviewing the latest evidence nursing intervention preventive measures, educate the nurses about these factors and how to control, and provide clinical observation, training, and supervision for nurse.

METHODS

Hypothesis

The implementation of evidence based nursing preventive measures will minimize the incident of Endotracheal Tube (ETT) pressure injury, among Intensive Care Patients.

Research Design

A prospective, quasi-experimental research design was used. The researchers provided an experimental intervention, but randomization was lacking (Allison, Terry, 2014).

Setting & Sample

This study, was conducted at the Intensive Care Unit (ICU), at Cairo University Hospitals. The maximum capacity is 30 beds. A convenience sample of 100 adult ICU Patients, who are admitted to the selected Unit within constant 6 months, will be included to the study. The calculated sample size is 96 patients from G Power analysis.

Tools of Data Collection

Three tools were used to collect data, related to the current study A – Demographic and medical data sheet: it includes data, such as diagnosis of admission, smoking, age, gender, past medical history, body mass index (BMI)

estimated by Adolphe Quetelet formula and date of insertion of oral (ETT). B - Glasgow Coma Scale; it's used to estimate the conscious level, C - Pressure ulcer staging system checklist (PUSS): developed by the National Pressure Ulcer Advisory Panel (NPUAP, 2014).

Pilot Study

Pilot study conducted on 10% of the total sample who fulfilled the inclusion criteria, to evaluate the content and test the feasibility, objectivity, clarity, relevancy and applicability of the study tools. Also test retest reliability was calculated to check the reliability of the study tools.

Ethical Consideration

Before data collection, primary approval of the ethical committee of medical, institutional sector was obtained, to carry out the study (IRPNO.FON000196673). Also, an official permission was obtained from the General Medical Director.

Procedure

The study was implemented in three phases; preparation, implementation, and evaluation phase. The preparatory phase was concerned with achieving the ethical approval. Likewise, it includes a recent review of related literatures, for developing the evidence based nursing preventive measures, and preparation of the different study tools.

Once the Prepare phase had been established, implementation phase was initiated into two parts. 1st Part was initiated by reviewing the medical archives of patient admitted to the selected (ICU) in three months. The data will be related to; Demographic and medical data sheet (tool 1) was filled out, then, the researchers were checking the nursing notes and skin assessment sheet for observing the occurrence of pressure ulcers that caused by oral (ETT) by using the pressure ulcer staging system (tool 2). The result of this retrospective observation was considered as a control set which providing baseline data crucial for the next part of the implementation phase.

Subsequently, the researchers were starting the next part of implementation phase, which involving; daily records of all admitted patients to the selected (ICU), for a continuous three months. The purpose, nature, and benefits of the study were explained to the subjects, if they are oriented; otherwise the researcher will explain the study to the significant and eligible persons, from the patient's family. Then, the evaluation phase was started by daily observation of the incident of pressure injury, that was caused by oral (ETT). The researcher will provide the needed guidance and supervision, to the co-researchers. Finally, the researcher will compare the results (outcome of the given protocol), to the collected baseline data (control group), that elicited from the patient's medical records.

Statistical Analysis

Upon completion of data collection, the data were scored, tabulated and analyzed by computer, using the "Statistical Package for Social Science" (SPSS). The reliabilities of instruments were examined, using Cronbach' alpha and were reported earlier.

Descriptive statistics, such as frequency, percentage distribution, mean score and standard deviation were utilized in analyzing data, pretended in this study. Relative statistical tests of significance were used, to identify the relationships among the study variables. Threshold of significances is fixed at 5 percent (P value ≤ 0.05), using an independent t test

analysis, to identify the difference among study variables.

RESULTS

Table 1 demonstrates that, the mean age (47.42) years, (25%) diagnosed as cardiac, (38%) had no any Comorbidity. (29%) of the patients were considered as overweight. Finally, (52%) were deliberated as nonsmokers.

Table 1: Demographic Characteristics of Study Sample (N=100)

Item	Entire group	Control group	Experimental group	P value
Total number:	**100**	**52 (52%)**	**48(48%)**	
Age (Mean±SD):	47,42 ±10.44	48.18 ± 10.13	46.97± 10.33	0.677
19-30 years	6 (6%)	4 (7.7%)	2 (4.2%)	
31-40 years	11 (11%)	4 (7.7%)	7 (14.6%)	
41-50 years	46 (46%)	25 (48.1%)	21 (43.8%)	
51-60 years	33 (33%)	19 (36.1 %)	14 (29.2%)	
More than 60 years	4 (4%)	0	4 (8.3%)	
Gender:				0.529
Male	55(55%)	28 (53.8 %)	27 (56.3%)	
Female	45(45%)	24 (46.2 %)	21 (43.8%)	
Diagnosis of (ICU) admission:				0.629
Respiratory infection	21(21%)	11 (21.1%)	10 (20.8%)	
Trauma	10 (10%)	6 (11.5%)	4 (8.3%)	
Hemodynamic problem	23 (23%)	13 (25%)	10 (20.8%)	
Cardiac	25 (25%)	10 (19.4%)	15 (31.3%)	
Organ failure	16 (16%)	9 (17.3%)	7 (14.6%)	
Others	5 (5%)	3 (5.7%)	2 (4.2%)	
Period of oral (ETT) insertion:				0.157
Days 0-5	37 (37%)	21(40.4%)	16 (33.3%)	
Day 6-10	43 (43%)	23 (44.2%)	20 (41.7%)	
Days 11-15	13 (13%)	4 (7.7%)	9 (18.8%)	
Days 16-20	7(7%)	4 (7.7%)	3 (6.3%)	
Co-morbidity Diseases:				0.127
None	38 (38%)	21 (40.4%)	17 (35.4%)	
Cardiac	5 (5%)	2 (3.8%)	3 (6.3%)	
Respiratory	26 (26%)	14 (27%)	12 (25%)	
Diabetics	13 (13%)	7 (13.4%)	6 (12.5%)	
Hypertension	8 (8%)	5 (9.6%)	3 (6.3%)	
Others	10 (10%)	3(5.8%)	7 (14.6%)	
Body Mass Index (BMI):	24.52 ± 5.58	24.8 ± 5.68	24.31 ± 5.61	0.215
Under weight	21(21%)	9 (17.3%)	12 (25%)	
Normal	31 (31%)	18 (34.6%)	13 (27.1%)	
Over weight	29 (29%)	14 (26.9%)	15 (31.3%)	
Obese	19 (19%)	11 (21.2%)	8 (16.7%)	
Smoking:				0.609
Smoker	48 (48%)	25 (48%)	23 (47.9%)	
Non smoker	52 (52%)	27 (52%)	25 (52.1%)	

Figure 1, shows the incident of (ETT) pressure injury was (9/48) from experimental group, while the incident of (ETT) pressure injury was (42/52) from the control group, with statistical significance (p 0.004).

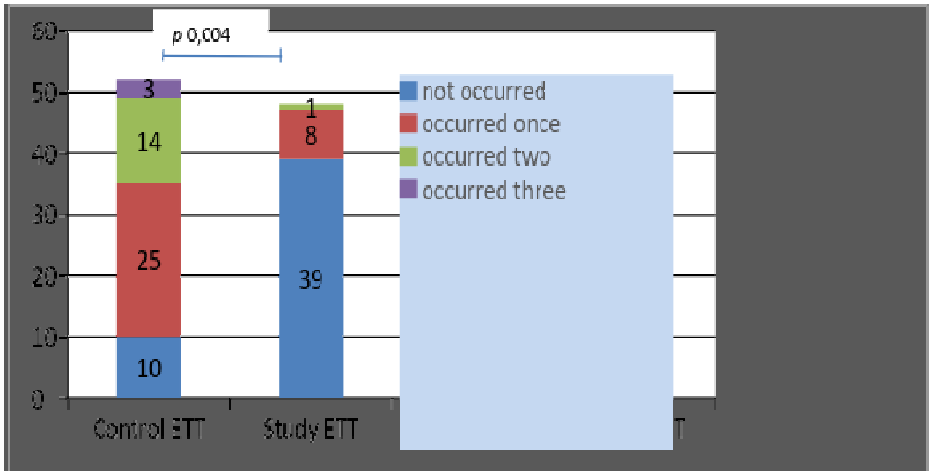

Figure 1: Incident of (ETT) Pressure Injury between the Experimental and Control Groups

There is statistical significance, between length of duration (ETT), connection and incidence pressure injury (p 0.013).

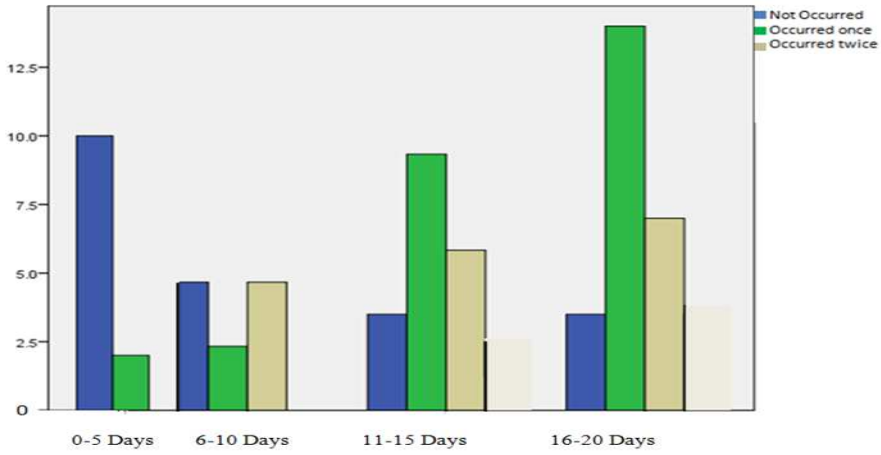

Figure 2: Length Duration of ETT Insertion and Incidence Pressure Injury

DISCUSSIONS

This is the first study, to report prospective data on patient characteristics, monitoring and prevention of (ETT) pressure injury. The prevalence of (ETT) pressure injury was low, in this sample of patients from six ICUs in two large medical centers, in AU and the USA, and similar to that, reported by others (Black J. 2010). Specifically, we found that, most ETT pressure injury, developed in men who were white, at increased overall PU risk, were overweight, at low risk of multi-organ failure and who had a long ICU stay. Total number of devices Size (cm Most patients did not report MDR ulcer-related pain and there was no MDR ulcer infection. ETT, pressure injury were quite small, but deep and about half of them were mucous ulcers, a finding not previously reported in relevant literature (VanGilder C. 2009). Treatment of the (ETT) pressure injury was limited in experimental group, in comparison of some control group (p 0.004), within 1 week of study enrolment.

Patients in this study, who developed (ETT) pressure injury had an average of 8·6 days, suggesting that, the potential risk of (ETT) tissue injury was high. There were many similarities between the sites related to equipment,

patient/staff ratios and general patient management. The ICUs at both sites, used the same equipment for mechanical ventilation, patient monitoring and providing fluids by infusion pumps. Notably, the patient/staff ratio, across both sites was one registered nurse per one mechanically ventilated patient; although there were many other non-intubated patients, where one registered nurse was often responsible for two patients. Patients with (ETT) pressure injury, at both sites were similar in age, gender and LOS; those in the US units were at greater PU risk (lower Braden Scale score) and had a greater body mass index. The Braden Scale score was not related to MDR ulcer development. Comparison of our data with that of other studies is difficult. Only three studies were identified, that addressed (ETT) pressure injury in a general population of hospitalized adults (VanGilder C. 2009). VanGilder et al. reported an observational, crosssectional cohort study, as part of the International Pressure Ulcer Prevalence Survey™. Data from the USA, from 2008 to 2009 were compared with previously collected data, from 2006 to 2007. Given this large study, we considered the most recent 2009 data, provided by the researchers. In 2009, the total US sample was 86 932 acute care patients, across multiple settings. ETT pressure injury comprised of 9·1% (1631/17 811) of the ulcers, and 785 of 1631 ulcers were facility acquired. Prevalence of (ETT) pressure injury, calculated from the VanGilder et al.'s report shows that, acute care MDR ulcer prevalence was only 0·85% (740/86 932). Across the hospital, the most common sites for (ETT) pressure injury, were the ears (20%), the sacrum/coccyx (17%), the heel (12%) and the buttocks (10%). ICU prevalence of (ETT) pressure injury is calculated from VanGilder et al.'s data, the prevalence of facility-acquired (ETT) pressure injury, in adult surgical ICU (44/1842), general ICU (132/4830), medical ICU (22/1940) and general coronary care unit (CCU) (42/2199) is 2·2% (240/10 811). Specific medical devices that caused the ICU ulcers were not reported.

CONCLUSIONS

(ETT) pressure injury is common and more multifaceted, this is why the (ETT) itself increase the pressure, humidity and change the acid mantle of the mucus. This study shows the evidence based nursing preventive measures shared strongly, in prevention iatrogenic (ETT) pressure injury.

We recommend continued evaluation of the prevalence of (ETT) pressure injury, in routine prevalence studies in intensive care, to monitor their rate and cause. Both skin and mucous membranes sites, adjacent to devices require ongoing assessment. Nurses need to be vigilant in prevention of (ETT) pressure injury, in ICU patients, especially in those with ET tubes.

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