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Research Article

Endotracheal Tube Suctioning: A Brief Analysis of a Lifesaving Procedure

Noorul Amin[1], Sajad Hussain Naik[2]

[1,2]Nursing Officer, Sher-i-Kashmir Institute of Medical Sciences, Soura, Srinagar, Jammu and Kashmir, India.
DOI:

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Corresponding Author:
Noorul Amin, Sher-i-Kashmir Institute of Medical Sciences, Soura, Srinagar, Jammu and Kashmir, India.
E-mail Id:
noorul.amin@skims.ac.in
Orcid Id:
https://orcid.org/0000-0002-9631-376X
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A B S T R A C T

Endotracheal suctioning is one of the main procedure that is commonly seen in critical care areas like ICUs, CCUs, SICUs, etc. This is done in order to remove the excessive respiratory secretions from patient's respiratory system in which is present an artificial airway particularly an endotracheal tube. Vergenia Henderson has considered respiration as one of the basic physiological need of a human being, though being ignored when one feels laboured breathing or breathlessness. A person is said to be alive or his proof of being alive is breathing process or respiration itself. Thus, a patient has trouble in breathing as a threat to life itself. Child's airway is very essential for effective breathing. Airway patency is usually maintained by action of the mucocilliary system when normal function of mucus is produced. When airway clearance cannot be accomplished via involuntary physiological mechanism then collaborative nursing intervention is needed such as endotracheal suctioning to achieve optimal patient outcomes.

Keywords: ET tube, Suctioning, Open and Closed Suctioning, Automated Cuff Pressure Management

Introduction

Endotracheal tubes have been used early in previous times and have been evolved continuously to its present form. Eisenmenger (1893) was the first to describe the use of a cuffed ETT, as well as the concept of a pilot balloon to monitor intracuff pressure. Franz Kuhn made significant contributions in the early 1900s. He also used metal tubes, preferred the oral route to tracheostomy, and popularized orotracheal anaesthesia. Kuhn was the first to stress the importance of the ETT as a route of removing pulmonary secretions. Endotracheal intubation is commonly performed in respiratory failure and shock, and most commonly, procedure performed in the Intensive Care Unit (ICU). It is an essential life-saving procedure. Endotracheal intubation and the institution of invasive mechanical ventilation are resources, which are widely used in the management of critically ill patients, to provide sufficient gaseous exchange for those with some sort of respiratory insufficiency. However, these devices can cause detrimental effects inflammation, infections, and traumatic lesions to the airways, which requires preventive measures. Endotracheal suctioning is defined as process of removal of secretions from tracheobronchial tree through endotracheal tube with the help of a mechanical suction device. Endotracheal tube suctioning is process of applying negative pressure to the distal ETT or trachea by introducing a suction catheter to clear excess or abnormal secretions. Suctioning of an artificial airway (ET tube) clears the airway by removing pulmonary secretions, blood, vomitus, saliva other foreign material, potentially improving oxygenation and ventilation. Usually endotracheal suctioning is done to maintain airway patency and is frequently carried out as routine nursing practice in the paediatric ICU, theatres and emergency departments. Normally Children and babies will keep their

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airway patency clear by coughing, sneezing, blowing their noses and by protective mechanisms of the gag reflex. Where as in intubated child airway potency is achieved through intervention of endotracheal suctioning, which is prerequisite for child on mechanical ventilator.

Types

Open Suctioning

Open suctioning is defined as suctioning the airway after the endotracheal tube has been disconnected from the ventilator.

Closed Suctioning

Closed suctioning is defined as suctioning through a tight-fitting device on the endotracheal tube that allows the ventilator to be connected and working during suctioning. The suctioning system has a manually operated suction flow switch.

Routine instillation of normal saline is highly controversial. One RCT showed that the instillation of isotonic saline, before tracheal suctioning decreases the incidence of microbiological proven VAP. Saline solution hardly emulsifies thick and tenacious secretions and alternative strategies are available for airway obstruction. Furthermore, thick tenacious secretions normally imply inadequate humidification of ventilatory gases and/or a negative fluid balance.

Routine instillation of saline has been associated with increased airway pressure, desaturation, asynchrony and cardiovascular compromise. In addition, the volume of fluid instilled is never recovered during the subsequent suctioning attempt, ultimately resulting in an increase in retained secretions.

Manual ventilation before suctioning results in a loss of PEEP, pulmonary collapse and desaturation, especially with high PEEP. This is recovered by manual ventilation with PEEP. The clinician has no idea of the level of pressure being applied to the lung. Lung Protective ventilation should be applied to all patients requiring ventilatory support. When pressures have been measured during manual ventilation pressure commonly exceeds 60 cm H_2O, establishing a plateau pressure ≥ 50 cm H_2O increasing the likelihood of ventilator-induced lung injury.

Indications for Suctioning

- Excessive secretions, if the child's oxygen saturation is low i.e 92% in child without cyanotic heart lesion
- Any obstruction in the respiratory tract and in the children who are having decreased effectiveness of the cough mechanism
- Over production of mucus like cystic fibrosis, arterial oxygen desaturation, cardiac arrhythmias, tracheoesophageal fistula before surgery
- ENT and oral surgery in child may bleed which may require ET tube suctioning post-surgery
- Suspected aspirations of gastric or upper-airway secretions
- Auscultation of adventitious lung sounds over the trachea or main-stem bronchi or both
- Increase in peak airway pressure when the patient is on mechanical ventilation
- Increase in respiratory rate or frequent coughing or both
- Gradual or sudden decrease in arterial blood oxygen, arterial blood oxygen saturation or arterial saturation via pulse oximetry levels
- Sudden onset of respiratory distress when airway patency is questioned

Principles Techniques

There are three primary suctioning techniques

- Oropharyngeal/Nasopharyngeal suctioning
- Orotracheal/Nasotracheal suctioning
- Suctioning an artificial airway

Precautions with ETT Suctioning

The four Ps of precaution are:

- Pressure-raised ICP
- Pulmonary hypertension
- Pulmonary oedema
- Pulmonary haemorrhage

Potential Complications of ETT Suctioning

While tracheal /endotracheal suctioning may be a necessary procedure, it can be associated with some potentially harmful effects. These may include:

Respiratory Complications

Hypoxia, Bronchospasm, Tracheobronchial mucosal trauma resulting in potential pulmonary haemorrhage, contamination of airway leading to nosocomial infection, unplanned extubation atelectasis (loss of ciliary function/ glottis closure) and pneumothorax.

Neurological Complications

Changes in cerebral blood flow velocity, Raised ICP, Decreased oxygen availability, Increased risk of IVH, Hypoxic - ischemic encephalopathy

Cardiovascular Complications

Vagal response bradycardia, Haemodynamic unstability, pulmonary vasoconstriction.

Other Complications

Nosocomial infections, VAP pain, Behavioural pain response in infants.

Research Review

Kobra A et al. (2020) conducted a quasi-experimental study in intensive care unit at Ilam's educational hospital of western cities of Iran. Aim: To investigate and compare the effect of education through video and performance feedback (PF) on nurses' skills in performing ETS. The sample size comprised of all nurses (n = 49) working in the intensive care unit at Ilam's educational hospital of western cities of Iran. Nurses were assigned to either one of educational video (EV) and PF groups. The data collection tool encompassed of two parts. First part was related to sociodemographic variables (age, gender years of working in ICU and working shift on airway suctioning).The second part was a 25-item structured best practices information sheet related to tracheal suctioning. The checklist comprises of four main parts (practice before ETS event, infection control practices, practices during and post ETS event). Intervention: At first stage, the nurses ETS practices of intubated patients (morning, evening and night) even on holidays based on checklist. Next, the nurses ETS practices was recorded in the checklist. Data were analysed using SPSS software version 20 (SPSS Inc., Chicago, IL, USA). Findings: After the interventions, no significant difference was found in the total mean score of nurses' practice in ETS between those who received education through EV and those who received through PF (16.3 vs. 15.1) ($P > 0.05$). Before and after the intervention, a significant improvement was observed in the total mean score and other dimensions of nurses' practice in endotracheal suctioning ($P < 0.0001$).

Qaiser K et al. (2019) conducted a study in Institute of Nursing, Wah Medical College, Wah Cantt Pakistan. The study was aimed to evaluate the effectiveness of structured training program in enhancing performance knowledge of ICU nurses in terms of ETT suctioning. For the evaluation of knowledge and skill, a questionnaire and observational checklist was developed along with the protocol of ETT suctioning in the context of evidence-based guidelines. Quasi-experimental design was chosen with purposive sampling technique. The sample size was 50 students of Post Basic Diploma in ICU/CCU from various college of nursing of Lahore and Islamabad. Findings of the study proposed that post implementation knowledge and practices of ICU nurses were immensely improved with p value of 0.00, respectively. Henceforth, the structured training program proved to be promising and had a meaningful influence to enhance the performance knowledge of ICU nurses in relation to ETT suctioning guidelines.

Kaur H et al. (2016) at GGS Medical Hospital Faridkot Punjab conducted a pre-experimental one-group pre-test, post-test research design for the study. The aim of the study was to assess the teaching intervention on knowledge and practice regarding endotracheal tube suctioning among staff nurses working in above-mentioned hospital. Convenient sampling technique was used to select 35 staff nurses to assess the effectiveness of teaching intervention. The tool used was a structured questionnaire for assessing the knowledge and observational checklist was used to assess the practice regarding endotracheal tube suctioning. The findings of the study revealed that the teaching intervention was effective and increasing the knowledge and practice regarding ET tube suctioning. The mean pre-test knowledge score of nurses who was 19.23 ± 4.180 and after teaching intervention, the mean post-test knowledge was 27.26 ± 4.046. The mean pre-test practice score of staff nurses was 6.91 ± 1.772 and teaching intervention, the mean post-test score was 10.54 ± 1.686. The study concluded that the teaching intervention (independent variable) brought about a significant change in the level of knowledge and practice (dependent variable) among staff nurses regarding ET tube suctioning.

Lema-Zuluaga GL et al. (2018) at University Hospital Pablo Tobon Uribe in Medellin Colombia conducted a Pragmatic randomized controlled trial an as needed endotracheal suctioning protocol vs a routine endotracheal suctioning in Paediatric Intensive Care Unit (PICU). The objective of the study was to compare two endotracheal suctioning protocols according to morbidity, days of mechanical ventilation, length of stay in (PICU) incidence of ventilator-associated pneumonia (VAP) and mortality. 45 children underwent an as needed endotracheal suctioning protocol and 45 underwent a routine endotracheal suctioning protocol. Composite primary end point was the presence of hypoxia, arrhythmias, accidental extubation and heart arrest. A logistic function through generalized estimating equations (GEE) were used to calculate the Relative Risk for the main outcome. The findings of the study showed that the characteristics were similar between groups. The composite primary end-point was found 22 (47%) of intervention group and 25 (55%) children of control group (RR=0.84; 95% Cl: 0.56-1.25), as well in 35 (5.8%) of 606 endotracheal suctioning performed to intervention group and 48 (7.4%) of 649 performed to control group (OR=0.80, 95% Cl: 0.5-1.3). The conclusions were that there were no difference between an as needed and a routine endotracheal suctioning protocol.

Aboalizm SE, Abd Elhy AH (2019) at Faculty of Nursing, Menoufia University- Egypt conducted a study to determine the effect of education intervention on nurse's knowledge and practices about endotracheal tube suctioning. A quasi-experimental research design with pre-post test was utilized and a convenience sample (nurses who working in intensive care units) of 100 nurses at Menoufia University were taken to fulfil the aim of this study. Most of the studied sample had bad knowledge regarding 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. Education intervention about endotracheal tube suctioning has a positive effect on a nurse's knowledge and Practices about endotracheal tube suctioning.

Management

The appropriate management of the artificial airway has a direct impact on the patients' prognosis, including reduction of morbidity, mortality, length of hospitalization, and hospital cost. This is one of the important skill of a clinical nurse to provide endotracheal suctioning. It includes securing endotracheal tube, checking position of endotracheal tube, maintenance of patency of the tube and regulation of appropriate cuff pressure. There are a number of methods for securing tubes from simple adhesive tape to more complex devices that combine bite block, a method for moving the tube to prevent skin breakdown and mucosal ulceration, and a fixation system. In order to maintain patency of airway, we can use routine intervention lens like humidification of inspired gases and suctioning. It also includes steps to reduce the chances of obstruction or biofilm. Monitoring cuff pressure is a time-honoured activity to maintain a balance between adequate lower airway protection from silent aspiration and minimising mucosal damage.[5] One of the method that is gaining popularity nowadays is automated cuff pressure management, that maintains a balance between airway protection and minimises mucosal damage.

Conclusion

Nursing interventions are directed to maximise the health effects of suctioning on clinical improvement of patients be it an adult or children. Therefore, nurses should not only know the uses, purposes and correct procedure but they must be aware of the risks of endotracheal suctioning and receive continuous education. The nursing officers should be taught the auscultation skills to assess a patient's need for suctioning and all the professional nurses should receive educational training regarding endotracheal suctioning. Short-term ventilated patients should be allocated to receive endotracheal suctioning either when the need for it was determined by assessment only, or routinely, using a standardized suctioning technique.

Conflict of Interest: None

References

1. Nakstad ER, Opdahl H, Heyerdahl F, Borchsenius F, Skjønsberg OH. Manual ventilation and open suction procedures contribute to negative pressures in a mechanical lung model. BMJ Open Respir Res. 2017 May;4(1):e000176. [PubMed] [Google Scholar]
2. Caruso P, Denari S, Ruiz SA, Demarzo SE, Deheinzelin D. Saline instillation before tracheal suctioning decreased the incidence of ventilator associated pneumonia. Crit Care Med. 2009 Jan;37(1):32-8. [PubMed] [Google Scholar]
3. Sutherasan Y, Vargas M, Pelosi P. Protective mechanical ventilation in the non-injured lung: review and meta-analysis. Crit Care. 2014 Mar;18(2):211. [PubMed] [Google Scholar]
4. Li Bassi G, Martí JD, Comaru T, Aguilera-Xiol E, Rigol M, Ntoumenopoulos G, Terraneo S, De Rosa F, Rinaudo M, Fernandez-Barat L, Battaglini D, Meli A, Ferrer M, Pelosi P, Chiumello D, Torres A. Short-term appraisal of the effects and safety of manual versus ventilator hyperinflation in an animal model of severe pneumonia. Respir Care. 2019 Jul;64(7):760-70. [PubMed] [Google Scholar]
5. National Heart, Lung, and Blood Institute Acute Respiratory Distress Syndrome (ARDS) Clinical Trials Network, Matthay MA, Brower RG, Carson S, Douglas IS, Eisner M, Hite D, Holets S, Kallet RH, Liu KD, MacIntyre N, Moss M, Schoenfeld D, Steingrub J, Thompson BT. Randomized, placebo-controlled clinical trial of an aerosolized β2-agonist for treatment of acute lung injury. Am J Respir Crit Care Med. 2011 Sep;184(5):561-8. [PubMed] [Google Scholar]