



بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ



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Assessment of Nurses' knowledge & practice regarding infection control in Endotracheal intubated patient in SHARRGELNNEELHospital between (September-November) 2018.

A Dissertation Submitted in Partial Fulfillment of the Requirements for the Award of Master Of science Degree inMedical-Surgical Nursing.

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الآية

﴿ أَلَمْ يَأْتِ الْدِينَارَ مَنْوَا أَنْتَخَشَعُوا لَهُمْ ذِكْرَ اللَّهِ مَا نَزَلَ مِنَ الْحَقِّ لَا يُكَفِّرُونَ كَالَّذِينَ آتُوا الْكِتَابَ مِنْ قَبْلُ فَطَالَعَتْهُمْ أَلَمْ دَفَقْتُمْ لَوْ بِهِمْ كَثِيرٌ مِّنْهُمْ فَاسِقُونَ ﴾

الآية 17 سورة الحديد

DEDICATION

I dedicate this work to my family; my father and my mother for their support and understanding , being patient, my brothers and my sisters for their encouragement, to my friends for their enduring support, and encouragement throughout the study, to whom all I respect and love.

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Abbreviation List:

AARC: American Association for Respiratory Care

ATS: American Thoracic Society

BIPAP: Bilevel Positive Airway Pressure

BTS: British Thoracic Society

CCU: Critical Care Unit

e.g.: Example

ET: Endotracheal Tube

ETS: Endotracheal Suctioning

Fio₂: Friction Of Inspired Oxygen

GRADE: Grading Recommendation Assessment Development and Evaluation

HAIs: Hospital Associated Infections

ICU: Intensive Care Unit

IDSA: Infectious Diseases Society OF America

KNHs: Kenia National Hospitals

PEEP: Positive End Expiratory Pressure

SARI: The Strategy for the Control Of Antimicrobial Resistance In Ireland

SHEA: Society of Health Care of America

SPSS: Statistical Package for Social Science

VAE: Ventilator Associated Events

VAP: Ventilator Associated Pneumonia.

WHO: World Health Organization

ABSTRACT:

Background information: An intubated patient is in high risk for getting infection due to several factors which include: severe illness, weak immune system, loss of body defense (e.g. cough) also tube itself. This participates to transmission of infection to him from environment, contaminated equipment or healthcare provider himself.

Infection control and prevention is the most factor that shortening hospital stay and decrease mortality rate in those patient admitted to ICU. Many strategies and guidelines are established to ensure infection control when dealing with intubated patient. **Objectives:** To evaluate Nurses' knowledge and practices regarding infection control in intubated patient. **Methodology:** Descriptive cross sectional design was undertaken where 30 nurses were recruited in the study using convenience method. Statistical package for social sciences (SPSS) version 20 was used and data analyzed using both descriptive and inferential statistics to describe and show the relationship between the variables. **Result:** This study shows half of responders 50% had good knowledge regarding infection control and near to half of responders 46.7% had good knowledge regarding prevention of contamination of equipment, 46.7% of responders had good knowledge regarding CDC standard precaution of infection control and 36.7% had fair knowledge regarding transmission based precaution, The majority (91.1%) of the studied sample had Good practice (>80%) 77% of nurses do oral care while 67% did not do Subglottic suctioning, less than half 47% of nurses done of Hand hygiene done prior suctioning while 30% of nurses does not use facemask during suctioning the endotracheal tube, only 10% of nurses does not perform Hand hygiene after ETT suctioning, the study show no relation between education level and knowledge and practice. **Conclusion:** Based on the finding of this study, most of the study population have a good knowledge about infection control guidelines and strategies to word intubated patient and their practice on it is good also **Recommendations:** Review of infection control curriculum, staffs progressive development, emphasize practicing of VAE care bundles, hospital must help and guide implementation of preventive measures.

ملخص البحث

مقدمة: عوامل تجعل من امريض الذي تم تركيب انبوب رغامى له اكثر عرضة للإصابة بالعدوى ومن هذه العوامل: شدة المرض الذي ادخل بسببه إلى وحدة العناية المكثفة، ضعف جهازه المناعي، فقدان المريض لوسائل الدفاع الطبيعية (كالحة مثلا) و انبوب الرغامى نفسه، هذا يساهم في انتقال العدوى من البيئة او المعدات الملوثة او مقدمة الخدمة الصحية نفسه.

مكافحة العدوى و الوقاية منها اهم العوامل التي تؤدي الى تقليل معدل الامراضية في المرضى الذين يتم ادخالهم الى وحدة العناية المكثفة و الى تقصير مدة الإقامة في المستشفى، العديد من الاستراتيجيات و القواعد الارشادية تم وضعها لضمان التحكم في انتقال العدوى و منعها من الحدوث عند التعامل مع المريض الموصل بجهاز التنفس الاصطناعي عبر انبوب الرغامى. **اهداف الدراسة:** تهدف الدراسة لتقييم معرفة المرضين و تطبيقهم لاستراتيجيات مكافحة العدوى و القواعد الارشادية لمنع إنتقالها في المريض الذي تم تركيب انبوب رغامى له. **طرائق البحث:** هذه دراسة وصفية عرضية تم فيها اخذ عينة مكونة من ثلاثين ممرض ، تم جمع البيانات باستخدام استبيان احصائي و قائمة ملاحظة و تم التحليل بواسطة برنامج الحزم الاحصائية للعلوم الاجتماعية SPSS النسخة العشرون. تم استخدام الاحصاء الوصفي و الاستنتاجي لوصف البيانات و اظهار الارتباط بين المتغيرات. **النتيجة:** وجدت الدراسة ان اكثر من 50% من المرضى الذين يعملون بوحدة العناية المكثفة بمستشفى شرق النيل يمتلكون معرفة جيدة عن استراتيجيات مكافحة العدوى و ارشادات التحكم في انتقالها، و ما يقرب من نصفهم 46.7% يمتلكون المعرفة عن استراتيجيات و لوائح مركز التحكم بالامراض (CDC)، كما وجدت الدراسة ان 91.1% يطبقون وسائل مكافحة العدوى بصورة من رعاية الفم و لبس القفازات و شطف السوائل تحت سان المزمار بينما 10% فقط منهم لا يهتمون بغسل الايدي بعد انتهاء عملية شفط السوائ من انبوب الرغامى. **الخلاصة:** بناء على نتائج هه الدراسة يمكننا القول بان معظم المرضى العاملين بوحدة العناية المكثفة لمستشفى شرق النيل يمتلكون قدرا كافيا من المعرفة المتعلقة بسبل و طرائق مكافحة العدوى حينما يتعلق الامر بتقديم الرعاية لمريض تم تركيب انبوب رغامى له و يطبقون المقاييس و اللوائح الارشادية هذه بصورة جيدة. **التوصيات:** توصي الدراسة بضرورة التدريب المستمر للعاملين بوحدة العناية المكثفة حول مكافحة العدوى و توفير كل الوسائل التي من شأنها تسهيل تطبيق اللوائح و المقاييس التي من شأنها تقليل نسبة انتقال العدوى و اجراء المزيد من الدراسات حول الموضوع.

CHAPTER 1:

INTRODUCTION

BACKGROUND INFORMATION

PROBLEM STATEMENTS

JUSTIFICATIONS

OBJECTIVES

-GENERAL OBJECTIVES

- SPECIFIC OBJECTIVES

RESEARCH QUESTIONS

HYPOTHESES

SIGNIFICANCE

1-INTRODUCTION:

1.1 Background information:

Majority of patients in the Critical Care Unit (CCU) are admitted for Mechanical ventilatory support. This requires a tracheostomy or endotracheal intubation hence vulnerability to infection, both impaired host immunity and the introduction of an endotracheal tube, contributes to development of lung infection and or complications to the critically ill patient.

According to Military Health System [MHS], VAE is the leading cause of death among hospital-acquired infections; it increases ventilators support and ICU stay by an average of 4.3 days and hospital length of stay by 4 to 9 days. VAE has been estimated to increase mortality by 30% and even two fold in critically ill patients, it is also noted to cost higher than those patients without. (1)

The risk factors of infection in endotracheal intubated patient are thought to develop from the aspiration of oropharyngeal secretions containing potentially pathogenic organisms, aspiration of gastric secretions, supine position, and prolonged use of ventilator support or potential exposure to contamination of ventilatory accessories such as ventilator tubing, as well as poor infection control techniques by health care staff, and poor oral hygiene.(2)

The American Thoracic Society(ATS) recommended numerous preventive measures and this recommendation include: education and training of healthcare worker, high compliance with alcohol-based handrubbing as main measure for hand hygiene, keeping teeth and mouth clean, limiting the use of continuous sedation and paralytic agent that decrease cough, avoiding of unnecessary or repeated intubation and use Non-invasive Positive Ventilation(NIPPV), and maintain cuff pressure to prevent leakage of contaminated secretion. (3)

Hand hygiene is the single most important activity for preventing and controlling infection. The WHO has chosen as the first “global patient safety challenge” the reduction of HAIs, with the theme “clean care is safer care.” They have made hand hygiene the cornerstone strategy because it is simple, standardized, low cost, and based on solid scientific evidence. In a nonsurgical setting, wash the hands vigorously for at least 15 seconds, longer if hands are visibly soiled. Using warm water and rinse off soap completely. Hot water and soap increase the potential for skin breakdown. (4)

Tracheostomy care is performed at least every 8 hours, the ventilator circuit and in-line suction tubing is replaced periodically, the nurse administers oral hygiene frequently because the oral cavity is a primary source of contamination of the lungs in the intubated and compromised patient. Nurse positions the patient with the head elevated above the stomach as much as possible. Antiulcer medications such as sucralfate (Carafate) are given to maintain normal gastric pH; research has demonstrated a lower Incidence of aspiration pneumonia when sucralfate is administered. (4)

Spillage of the contaminated condensate into the patient's tracheobronchial tree can occur with procedures during which the tubing may be moved (e.g., the suctioning, adjusting the ventilator setting, or feeding or giving hygienic care to patient) and may increase the patient's risk for pneumonia. (5)

Endotracheal suctioning (ETS) is the removal of secretion from tracheobronchial tree through the endotracheal tube with the help of mechanical suction device to maintain the patent airway to prevent infection of respiratory tract from aspiration. Improper techniques may cause complications, ranging from trauma and hypoxemia to, in extreme cases, cardiac arrest and death. In 2010 the

American association of respiratory care (AARC) published the AARC clinical guidelines on endotracheal tube suctioning of mechanically ventilated patients with artificial airway, which is based on 10 guidelines recommendations. (6)

Oral care to a patient receiving mechanical ventilation Provide oral cleansing, including subglottic suctioning, at least every 2 hours and prn. Brush the teeth at least twice a day, keeping the oral cavity clean and clear of secretions has been proved to decrease the incidence of ventilator-associated pneumonia (VAP). Pooled oral secretions become rapidly colonized with pathogens contribute to infection. Avoid tap water, Use normal saline or a half-strength solution of saline for oral rinses Studies show hospital plumbing and tap water are often colonized with microbial organisms, Apply a 0.12% chlorhexidine gluconate solution twice daily to complement oral care, also use appropriately diluted sodium bicarbonate to dissolve viscous mucus. (4)

1.2 Problem statement:

An intubated patient is in high risk for getting infection due to several factors which include: sever illness, weak immune system, loss of body defense (e.g. cough) also tube itself. This participates to transmission of infection to him from environment, contaminated equipment or healthcare provider himself.

Infection control and prevention is the most factor that shortening hospital stay and decrease mortality rate in those patient admitted to ICU. Many strategies and guidelines are stablished to ensure infection control when dealing with intubated patient. Nurses are the most healthcare provider who in direct contact with those patient, and without following these measures and guidelines they make patient more venerable to infection beside tube that placed into patient trachea it self which make him more espouse to infection . This study is stablished to assess level of ICU nurses knowledge and if they follow infection control and prevention guidelines in their practice.

1.3 JUSTIFICATION:

Since intubated patient is in high risk for getting infection due to multiple factors and also these infection do not affect only the patient or his family but it will affect country's income by: increase duration of mechanical ventilation and mortality, intensive care unit and hospital stay, So infection control guidelines and prevention strategies must be addressed to ensure high quality infection-free health care.

Nurses are in direct contact with intubated patient and for long periods of time so they should be knowledgeable and skillful about infection control and prevention guidelines and strategies, this study will assess ICU nurses of knowledge and practice regarding infection control and prevention guidelines and strategies to determine need for educational and training programs and guide it. Also it will undertaken to fulfillment of requirement for the award of master degree in Nursing Science Medical-Surgical Nursing Specialty.

1.4- OBJECTIVES:

1.4.1 Broad Objective

To assess Nurses' knowledge and practices regarding infection control in intubated patient.

1.4.2 Specific Objectives:

-To assess the nurse's knowledge regarding infection control guidelines and strategies for intubated patient.

-To evaluate the nurse's practices of infection control guidelines and strategies for intubated patient.

-To find out the relationship between nurse's Knowledge and practices on Infection control and prevention guidelines and strategies in intubated patient.

1.5 RESEARCH QUESTIONS:

Do nurses in ICU have adequate knowledge regarding infection control and prevention?

DO nurses in ICU practice guidelines of prevention adequately?

Is there relationship between nurse's age, gender, education level, experience and their Knowledge and practices on infection control and prevention?

1.6 HYPOTHESIS:

There is relationship between nurse's age, gender, education level, experience and their Knowledge and practices of infection control and prevention guidelines and strategies

1.7 SIGNIFICANCE:

This study will enhance awareness in infection control and prevention guidelines and strategies toward intubated patient and encourage the nurses to participate in infection prevention in intubated patient. This will enhance elimination of these morbidities which in turn will lead to quality specialized care, reduced mortality and morbidity. This will in turn lift the image of the Hospital hence become a role model Hospital in the country.

CHAPTER 2:

LITRETUER REVIEW

2-LITTRETURE REVIEW:

2.1 INDOTRACHEAL TUBE:

Endotracheal intubation involves the oral or nasal insertion of a flexible tube through the larynx into the trachea for the purposes of controlling the airway and mechanically ventilating the patient. Performed by a physician, anesthetist, respiratory therapist, or nurse educated in the procedure, endotracheal intubation usually occurs in emergencies, such as cardiopulmonary arrest or in diseases such as epiglottitis. However, intubation may also occur under more controlled circumstances such as just before surgery. In such instances, endotracheal intubation requires patient teaching and preparation.

Endotracheal intubation can result in apnea caused by reflex breath-holding or interruption of oxygen delivery; bronchospasm; aspiration of blood, secretions, or gastric contents; tooth damage or loss; and injury to the lips, mouth, pharynx, or vocal cords. It can also result in laryngeal edema and erosion and in tracheal stenosis, erosion, and necrosis. Nasotracheal intubation can result in nasal bleeding, laceration, sinusitis, and otitis media. (60)

2.2 PATHOGENESIS:

Inhalation of contaminated aerosol is particularly hazardous for intubated patients because endotracheal tubes provide direct access to the lower respiratory tract. In contrast to nebulizers that were used as humidification devices for ventilated patients, bubble through or wick humidifiers primarily increase the water-vapor (or molecular-water) content of inspired gases during mechanical ventilation. Although heated bubble-through humidifiers generate aerosol droplets, they do so in quantities that may not be clinically important wick humidifiers do not generate aerosols.

Bacteria may invade the lower respiratory tract by micro- or bolus-aspiration of oropharyngeal organisms, inhalation of aerosols containing bacteria, or, less frequently, by hematogenous spread from a distant body site.

The high incidence of Gram-negative bacillary pneumonia in hospitalized patients appears to be the result of factors that promote

colonization of the pharynx by Gram-negative bacilli and the subsequent entry of these microorganisms into the lower respiratory tract. Bacteria can also gain entry into the lower respiratory tract of patients through inhalation of aerosols generated primarily by contaminated nebulization devices.(23)

2.3 RISK FACTORS:

- 1- Factors that enhance colonization of the oropharynx and/or stomach by microorganisms: Administration of antimicrobial agents, admission to the ICU, or presence of underlying chronic lung disease.
- 2- Conditions favoring aspiration into the respiratory tract or reflux from the gastrointestinal tract: Initial or repeat endotracheal intubation, Insertion of nasogastric tube, Supine position.
- 3- Conditions requiring prolonged use of mechanical ventilatory support with potential exposure to contaminated respiratory devices and/or contact with contaminated or colonized hands, mainly of health-care personnel.
- 4- Host factors such as extremes of age, malnutrition, and severe underlying conditions, including immunosuppression. (5)
- 5- Mechanically Assisted Ventilation and Endotracheal Intubation:

The increased risk for pneumonia in intubated, mechanically ventilated patients is partly due to the carriage of oropharyngeal microorganisms via passage of the endotracheal tube into the trachea during intubation, as well as to depressed host defenses secondary to the patient's severe underlying illness (16; 17; 18; 19). In addition, bacteria can aggregate on the surface of the endotracheal tube over time and form a glycocalyx (i.e., biofilm) that protects the bacteria from antimicrobial agents or host defenses (20). Some investigators believe that these bacterial aggregates may become dislodged by ventilation flow, tube manipulation, or suctioning and subsequently embolize into the lower respiratory tract and cause focal pneumonia. (21; 22)

5.4 Guidelines and strategies to infection control in intubated patient:

The Strategy for the Control of Antimicrobial Resistance in Ireland (SARI) national committee established a working group to produce national guidelines on the prevention of ventilator-associated pneumonia. The committee first met in January 2009 and agreed terms of reference. A draft document was sent for consultation in June 2010 to a range of professional groups, this committee review several international evidence-based guidelines for nosocomial pneumonia and update where new evidence was available and produce single guidelines for prevention VAP in adult, and this guidelines are:

*Implementation of standard precautions should be the primary strategy for the prevention of transmission of infectious agents among patients and healthcare workers

*Hand hygiene, in accordance with national hand hygiene guidelines, should be part of the routine clinical care of mechanically ventilated patients

*Hands should be decontaminated appropriately with soap and water or alcohol hand rub before and after every episode of direct patient contact, after any activity that potentially results in hands becoming contaminated and after removal of gloves

*Adherence to hand hygiene should be monitored regularly to ensure compliance and results regularly fed back to healthcare staff

*Personal protective equipment (e.g., gloves, aprons, face masks, goggles) should be worn appropriately and disposed of correctly in the appropriate healthcare waste stream.

*Transmission-based precautions (contact, droplet and airborne) should be used in addition to standard precautions when caring for patients who are known or suspected to be colonized or infected with organisms which can be transmitted via direct or indirect contact, or by droplet and airborne routes.

*The critical care environment should be cleaned regularly to reduce the possibility of transmission of organisms from the environment to the patient.

*All hospitals should have in place Legionella control strategies, in accordance with national guidance. (8)

An electronic literature search for articles published between January 1990 and October 2009 was conducted by using MEDLINE, CINAHL, and Cochrane Library databases. The update of this clinical practice guideline is the result of reviewing a total of 114 clinical trials, 62 reviews and 6 meta-analyses on endotracheal suctioning. The following recommendations are made following the Grading of Recommendations Assessment, Development, and Evaluation (GRADE) criteria:

1- It is recommended that endotracheal suctioning should be performed only when secretions are present, and not routinely.

2- It is suggested that pre-oxygenation be considered if the patient has a clinically important reduction in oxygen saturation with suctioning.

3- Performing suctioning without disconnecting the patient from the ventilator is suggested.

4- Use of shallow suction is suggested instead of deep suction, based on evidence from infant and pediatric studies.

5- It is suggested that routine use of normal saline instillation prior to endotracheal suction should not be performed.

6- The use of closed suction is suggested for adults with high FIO₂, or PEEP, or at risk for lung decruitment, and for neonates.

7- Endotracheal suctioning without disconnection (closed system) is suggested in neonates.

8- Avoidance of disconnection and use of lung recruitment maneuvers are suggested if suctioning-induced lung decruitment occurs in patients with acute lung injury.

9- It is suggested that a suction catheter is used that occludes less than 50% the lumen of the endotracheal tube in children and adults, and less than 70% in infants.

10- It is suggested that the duration of the suctioning event be limited to less than 15 seconds. (9)

Important bundle components for prevention of VAP:

1. Active surveillance for VAP.
2. Ventilator weaning protocols.
3. Proper hand hygiene.
4. Wearing gloves.
5. Use oral decontamination such as Chlorhexidine gluconate antiseptic rinse
6. Appropriate antibiotic use.
7. Use of stress ulcer prophylaxis.
8. Use of deep vein thrombosis prophylaxis.

9. Sedation interruption and spontaneous breathing trials of a patient's readiness to be weaned from mechanical ventilation.
10. Minimized duration of mechanical ventilation.
11. Avoided intubation and re-intubation if possible (Use of noninvasive, BiPAP or other strategies) and improving planned extubations with the design of protocols to improve quality of weaning.
12. Avoid saline lavage with suctioning.
13. Thoroughly suction the oropharynx.
14. Subglottic suctioning prior to deflating the cuff of an endotracheal tube or moving the tube.
15. Maintenance of endotracheal and tracheostomy cuff pressures between 20 and 30 cmH₂O.
16. Planned tracheostomy for long-term ventilation.
17. Education of healthcare workers regarding nosocomial infection prevention.
18. Turn patients at least every 2 hours.
19. Elevation of the head of bed 30°-45°, if not contraindicated.
20. Monitor gastric residual volumes for over distention.
21. Change the ventilator circuit when visibly soiled. (10)

2.5 CONTROL MEASURES:

In theory, handwashing is an effective way of removing transient bacteria from the hands. (23; 24) However, in general, personnel compliance with handwashing has been poor. (25; 26) New guidelines for hand hygiene that promote the use of alcohol-based antiseptic preparations

may result in increased personnel compliance and decreased incidence of hand-transmitted infections. (27)

Gloving also helps prevent cross-contamination (28). Routine gloving (in addition to gowning) was associated with a decrease in the incidence of health-care-related RSV infection and infections occurring in the ICU (29). Gloves, however, can be colonized by pathogens prevalent in the health-care setting (30), and outbreaks have been traced to healthcare personnel who did not change gloves after contact with one patient and before providing care to another (31). In addition, gloved hands may get contaminated via leaks in the gloves. (32) Thus, personnel should use gloves properly and decontaminate their hands after gloves are removed. (27; 28)

2.6 Cross-Colonization via Hands of Personnel:

Pathogens causing health-care-related pneumonia, such as Gram-negative bacilli and *S aureus*, are ubiquitous in health-care settings, especially in intensive- or critical-care areas. (33; 34) Transmission of these microorganisms to patients frequently occurs via health-care personnel's hands that become contaminated or transiently colonized with the microorganisms. (35; 36) Procedures such as tracheal suctioning and manipulation of ventilator circuit or endotracheal tubes increase the opportunity for cross-contamination (35; 37). The risk of cross-contamination can be reduced by using aseptic technique and sterile or disinfected equipment when appropriate and eliminating pathogens from the hands of personnel. (23; 24; 35; 38)

2.7 Contamination of Devices Used on the Respiratory Tract:

Devices used on the respiratory tract for respiratory therapy (e.g., nebulizers, endotracheal tubes), diagnostic examination (e.g., bronchoscopes or spirometers), or administration of anesthesia are potential reservoirs or vehicles for infectious microorganisms. (38; 46; 47)

Routes of transmission may be from device to patient, from one patient to another, or from one body site to the lower respiratory tract of the same patient via hand or device. (48; 49; 50; 51)

Proper cleaning and sterilization or disinfection of reusable equipment is important components of a program to reduce infections associated with devices used for respiratory therapy. Thus, after they are thoroughly cleaned, they can be subjected to high-level disinfection by either using liquid chemical disinfectants that are cleared by the Food and Drug Administration (FDA) for use on medical instruments (52), or by pasteurization at >70 C for 30 minutes. (52; 53)

Sterile water is preferred to tap or unsterilized distilled water for rinsing off residual liquid chemical disinfectant from a respiratory device that has been chemically disinfected for reuse, because tap or distilled water may harbor microorganisms that can cause pneumonia, However, when rinsing with sterile water is not feasible, rinsing with tap water or filtered water (water passed through 0.2: filter), followed by an alcohol rinse and forced-air drying, may be done. (52) Forced-air drying has been shown to markedly lower the level of microbial contamination of stored endoscopes, most likely by removing the wet environment favorable for bacterial growth. (54; 55)

2.8 Prevention of Oropharyngeal, Tracheal, and Gastric Colonization by:

-Local bacterial interference and aerosolized antimicrobial agents;

Bacterial interference (with alpha-hemolytic streptococci) was successfully used by some investigators to prevent oropharyngeal colonization by aerobic Gram-negative bacilli (56). However, the efficacy of this method for general use has not been evaluated.

-Selective oropharyngeal decontamination with antimicrobial agents;

Recently, a study was conducted to determine the effect of selectively modulating the bacterial colonization of the oropharynx only

(without modulating the gastric and intestinal colonization and without the concomitant use of systemic antimicrobial agent[s]. (57)

-Oropharyngeal cleaning and decontamination with an antiseptic agent;

Two clinical studies (one in ICU with temporal controls and another in a multi-nursing home setting using random controls) have shown a decrease in rates of pneumonia, including VAP, upon implementation of a comprehensive oral-hygiene program for patients or residents respectively (58 ;59). The oral hygiene programs consisted of frequent tooth brushing and mouth-swabbing with an antiseptic agent; and in the ICU, frequent suctioning of the mouth and subglottic areas of patients receiving mechanically assisted ventilation.

2.9 Drainage of subglottic secretions:

In the intubated patient, leakage around the cuff of the endotracheal tube allows bacteria laden secretions (which pool below the glottis and above the endotracheal-tube cuff) direct access to the lower respiratory tract (39; 40).

The effect of using an endotracheal tube that has a separate dorsal lumen which allows drainage (i.e., removal by suctioning) of the subglottic secretions has been compared to that of a conventional endotracheal tube (41-42). In the first study in ICU patients, intermittent (i.e., hourly) subglottic secretion drainage was associated with a lower incidence (13% vs 29%) as well as a delayed onset (16.2 +11 days vs 8.3 +5 days) of VAP. Subsequent studies corroborated these findings: lower VAP incidence: 14/76 (18.4%) vs 25 (32.5%) / and 3/49 (4%) vs 12/56 (16%) (43); and delayed onset of VAP: 12.0 +7.1 days vs 5.9 +2.1 days (43), and +2.3 days vs 2.9 +1.2 days (44); albeit the decrease in VAP incidence was not statistically significant: 8/160 (5%) vs 15/183 (8.2%) in one study of patients who had undergone cardiac surgery. (41)

Although these randomized, controlled studies showed the beneficial effect of suctioning of subglottic secretions on the incidence of VAP, none

showed a corresponding effect on mortality length of stay in the ICU, or duration of mechanical ventilation. And, although a decision-model cost-effectiveness analysis has shown that as a VAP-prevention strategy, the use of endotracheal tubes that allow aspiration of subglottic secretions may result in savings, the study was hypothetical and based on data extrapolated from several studies instead of one study. (44) Larger randomized controlled studies with cost-benefit analysis are needed to determine the exact role of the use these tubes in the overall scheme to prevent VAP and improve secondary outcomes.

2.10 Suction Catheters:

Endotracheal suction catheters can introduce microorganisms into a patient's lower respiratory tract. Currently, two types of suction-catheter systems are used in U.S. hospitals: the open single-use catheter system and the closed multi-use catheter system. The closed-suction system has the potential advantages of decreased environmental contamination as well as lower costs, especially if it can be corroborated that, notwithstanding the manufacturer-recommended daily catheter changes, the catheter can remain unchanged for an indefinite period without increasing the patient's risk of VAP (45).

2.11 Nurses knowledge about Endotracheal Suctioning:

A descriptive cross sectional study was conducted among ICU nurses regarding knowledge and practice of endotracheal suctioning in Tertiary care private and public sector hospitals of Peshawar. Participants were selected through convenient sampling technique.

A well-structured questionnaire was used for data collection. The autonomy and confidentiality was assured through a well-defined informed suctioning in Tertiary care private and public sector hospitals of Peshawar. Participants were selected through convenient sampling technique. The study identified that nurses working in ICUs of Tertiary care hospitals in the region have average knowledge

of ET suctioning, though their practice was good. Still there is need of policies for improving nurses' knowledge and practice regarding ET suctioning. The study identified that nurses working in ICUs of Tertiary care hospitals in the region have average knowledge of ET suctioning, though their practice was good. Still the authorities of these hospital may improve their knowledge and practice by arranging special sessions, workshops and training for ICU Nurses on the stated topic to improving their knowledge and practice regarding ET suctioning, it will prevent patients from getting infections and other complications. (8)

Quasi-Experimental design study aimed to evaluate the effective ness of endotracheal suctioning protocol in term of knowledge and practice of nurses' personnel, structured questioner and observational checklist are used to collect data, endotracheal suctioning protocol developed and educated as pre-protocol.

Pre and post-implementation data from 30 purposively selected nursing personnel of Mashrishi Markendeshwar institute of medical sciences & research Hospital, Mullana was collected, subsequent reinforcement are given until >80%practice score was achieved. The study revealed that the mean post-implementation knowledge score and practice score of nursing personnel regarding endotracheal suctioning was significantly higher than mean pre-implementation knowledge and practice score ($p<0.001$). Hence the protocol was effective in enhancing knowledge and practice of nursing personnel regarding endotracheal suctioning. (15)

2.12 Nurses' knowledge and practice regarding infection control in intubated patient:

A cross sectional study was conducted between November, 2014 and January, 2015 in governmental hospitals found in North West bank districts.

Data were collected using pre tested questionnaire on 271 nurses selected by purposive sample. Collected data were checked, coded and transferred to SPSS version 20 for analysis. Frequency, Mean and other statistics were calculated. P-value less than 0.05 were set as statistically significant. Results: the current study revealed that, approximately half (53.9%) of the studied sample had fair knowledge level (>80%). However, the majority (91.1%) of the studied sample had Good practice (>80%). Based on findings of the current study, it can be concluded that inspite of having good practice level regarding infection control, nurses had fair knowledge level. (11)

A quantitative descriptive study was conducted at a government tertiary hospital in Zambia. Sample: a Stratified random sampling was performed. A total of n= 196 nurses of all categories (70% from each category) were recruited in the study. Tools of data collection: a self-developed validated close-ended questionnaire guided by hospital policies, procedure standards, World Health Organization and Zambian Centers for infection prevention and control, was used to collect data. This study find out that The majority of participants had good knowledge in infection prevention and control with the mean score of 83.21. The attitude towards infection prevention and control was good with the mean score of 81.37. The practice in infection prevention and control was poor with the mean score of 48.88.

Based on the findings of this study, it can be concluded that, despite performing well in knowledge and showing a positive attitude towards infection prevention and control, nurses had unsatisfactory practice levels regarding infection prevention and control, exposing the patients to infection-related diseases. (12)

To investigate nurses' knowledge and practice toward evidence-based guidelines for the prevention of ventilator associated pneumonia in pediatric intensive care units A quasi- experimental pre-post intervention study was done on 51 nurses of different categories working in medical, neurology and surgical ICU at Mansoura University children's Hospital, Egypt. Three tools were used; An interview questionnaire sheet was developed by the researcher in Arabic language. Nurses' knowledge of evidence-based guidelines for the prevention of VAP, multiple choice questionnaire and observational checklist for nurses' performance to ventilator bundles for VAP prevention.

The study found that the mean score level of nurses general knowledge about VAP, Knowledge of Evidence-based guidelines for VAP prevention and nurses performance to ventilator bundled for VAP prevention where the mean score were 8.6078 ± 1.9908 , 2.4706 ± 1.3469 , 2.1400 ± 1.4287 respectively before program implementation compared to 12.1569 ± 1.0464 , 7.2941 ± 1.7005 , 5.5800 ± 1.5265 respectively after program. There is a highly significant difference between nurses knowledge and practices to Evidence-based guidelines for prevention of VAP before and after the program ($t = -11.059$, -22.106 , -13.796 and $p = .000$, 0.000 , 0.000 respectively) so Adequate improvement in nurses' knowledge and practice after applied evidence based guidelines for prevention of ventilator associated pneumonia in pediatric intensive care unit. (7)

To evaluate Nurses' knowledge and prevention practices on VAE in CCU, KNH& To enhance awareness of VAE prevention and encourage its surveillance in the Hospital. A descriptive cross sectional design was undertaken where 82 nurses were recruited in the study using convenience method and all patients who were in the unit in the month of April were censured.

Statistical package for social sciences (SPSS) version 20 was used and data analyzed using both descriptive and inferential statistics to describe and show the relationship between the variables.

This study figure out that the prevalence of VAE in CCU, KNH can be explained by a large percentage that lacked adequate knowledge and omission of some care interventions by the most of the nurses working in the unit. Enhancing knowledge and VAE prevention practices can reduce the VAE prevalence. (13)

To evaluate the extent to which nurses working in intensive care units implement best practices when managing adult patients receiving mechanical ventilation through Nurses attending education seminars in the United States and completed a 29-item questionnaire about the type and frequency of care provided, Twelve hundred nurses completed the questionnaire study show that guidelines for the prevention of ventilator-associated pneumonia from the Centers for Disease Control and Prevention are not consistently or uniformly implemented. Practices of nurses employed in hospitals with oral care protocols are more often congruent with the guidelines than are practices of nurses employed in hospitals without such protocols. Significant reductions in rates of ventilator-associated pneumonia may be achieved by broader implementation of oral care protocols. (14)

CHAPTER 3:

METHODOLOGY

3-RESEARCH METHODOLOGIES

3.1 Study Design

Descriptive cross sectional design hospital based was used.

3.2 Study Areas

SHARG ELNEEL HOSPITAL is located in Khartoum state, Jieraif Sharg, East Nile locality, Manshia Bridge Street. The hospital was established at 2006 to provide healthcare to people how live there, now a day it consider one of the important hospital in the country which specialized in orthopedic surgery, it consist of: Emergency and Trauma Department, orthopedic surgery, General Surgery Department, Medicine Department, Obstetrics and Gynecology Department and Intensive Care Unit.

3.3 Study setting

The setting of this study is intensive care unit of Sharg Elneel hospital which contain 10 beds

3.4 Study duration

September-November 2018

3.5 Study Population

The study population covers all nurses working in ICU unit total number is 34.

3.6 Inclusion and Exclusion Criteria

3.6.1 Inclusion criteria:

Nurses working in ICU unit, Sharg Elneel hospital at the period of study

3.6.2 Exclusion criteria:

- One nurse she is in charge nurse.
- Nurses working in other department of sharg Eleel hospital.

3.7 Sampling /Sample size:

Total coverage sample from all Nurses working in ICU unit 30 nurses are recruited.

3.8 Data collection techniques

Data was collected within week in three night shift and two morning shift in the nurses rest time, after explanation of the purpose of the study every nurse was allowed to fill the question by himself, then was observed using checklist while the practice infection control measures and perform endotracheal suctioning as routine patient care, ten of them was asked to perform it on their colleague patient because they was assigned to no intubated patient. One nurse refuse to participate in the study, two were absent.

3.9 Data collection tools

Structured questionnaire & chick list used to the study population.

3.10 Data analysis

Data were analysis by using the Statistical Package for Social Sciences program (SPSS) version 20. Descriptive statistics such as the percentages, frequency distributions and means were generated to show the distribution of Nurses by their key background Characteristics, study assess the level of knowledge according to the score that nurses ae achieved on each question as : good for whom achieved $\geq 75\%$ fair to 25-75% and poor for $\leq 25\%$. The study further used inferential statistics namely the regression and correlation analysis to

show the relationship between the variables. The findings of the study were presented in tables.

3.11 Variables:

Nurses age, gender, qualification, experience, training are dependent variables while knowledge and practice are independent variable.

3.12 Ethical Consideration

Permissions were taken from the matron of SHARRG ELNNEEL hospital, nurses informed about study and its purpose, also they asked to fill the questioner and allow me to observe their performance.

CHAPTER 4:

RESULT

4-RESULT:

Table (1): Characteristic of the study population:

Items	TOTAL OF NURSES	
	Frequency	Percent
<i>AGE (years)</i>		
• 20-30 years	28	93,3
• 31-40 years	2	6.7
• Total	30	100.0
<i>Gender</i>		
• male	14	46.7
• female	16	53.3
• Total	30	100.0
<i>marital status</i>		
• single	25	83.3
• married	5	16.7
• Total	30	100.0
<i>years of experience in general</i>		
• one year	1	3.3
• more than one year	29	96.7
• Total	30	100.0
<i>the years of practice in ICU</i>		
• less than 2 years	24	80
• 3-5 years	5	16.7
• more than 5 years	1	3.3
• Total	30	100.0
<i>the training about endotracheal tube</i>		
• Yes	9	30
• no	21	70
• Total	30	100.0

4.1.1 Level of knowledge:

Table (2): Level of Nurses Knowledge Regarding infection control guidelines and strategies

	knowledge of nurses regarding;	Good		Fair		poor	
		Frequency	%	Frequency	%	Frequency	%
1	prevention of aspiration	15	50	7	23.3	8	26.7
2	prevention of contamination of equipment	14	46.7	8	26.6	8	26.6
3	risk for pneumonia	7	23.3	7	23.3	16	53.3
4	CDC stander precaution	14	46.7	10	33.3	6	20
5	transmission based precaution	10	33.3	11	36.7	9	30
6	concept of endotracheal suction	19	63.3	7	23.3	4	13.3
7	endotracheal suction	12	40	11	36.7	7	23.3
8	avoid recurrence of VAI	6	20	18	60.0	6	20
9	Patient s oral care	13	43.3	11	36.7	6	20.0
10	handing washing	16	53.3	8	26.7	6	20

4.1.2 Correlation:

Table (3): Relationship between education level and knowledge of nurses regarding prevention of aspiration

Count		knowledge of nurses regarding prevention of aspiration			Total	P value
		good	fair	poor		
level of education	Diploma	6 _a	2 _a	2 _a	10	.752
	Bachelor	7 _a	5 _a	5 _a	17	
	MCS	2 _a	0 _a	1 _a	3	
Total		15	7	8	30	

Table (4): Relationship between education level and knowledge of nurses regarding the potential risk for pneumonia in patient using mechanical ventilator with heated bubble through humidifier primarily

Count		knowledge of nurses regarding the potential risk for pneumonia in pt using mechanical ventilator with heated bubble through humidifier primarily			Total	P value
		good	fair	poor		
level of education	diploma	3 _a	2 _a	5 _a	10	.792
	Bachelor	3 _a	5 _a	9 _a	17	
	MCS	1 _a	0 _a	2 _a	3	
Total		7	7	16	30	

Table (5):Relationship between education level and knowledge of nurses regarding when you providing oral care for mechanically ventilated patient

Count		knowledge of nurses regarding when you providing oral care for mechanically ventilated patient			Total	P value
		good	fair	poor		
level of education	Diploma	5 _a	4 _a	1 _a	10	.020
	Bachelor	6 _a	6 _a	5 _a	17	
	MCS	2 _a	1 _a	0 _a	3	
Total		13	11	6	30	

4.2 PRACTICE:

Table (6): Practice of infection control measures (Checklist)

Number	Assessment	Done		Not done	
		F	%	F	%
1	Head of bed elevated between 30-45 degree	27	90	3	10
2	Cuffed endotracheal tube used	30	100	0	0
3	Endotracheal tube cuff pressure maintained	21	70	9	30
4	Oral care done	23	77	7	23
5	Subglottic suctioning done	10	33	20	67
6	Hand hygiene done prior suctioning	14	47	16	53
7	Use of face mask during suctioning	21	70	9	30
8	Auscultate chest before endotracheal suctioning	6	20	24	80
9	Hyper oxygenate before suctioning	24	80	6	20
10	Lubricate the suction catheter with normal saline	26	87	4	13
11	Maintain sterility of suction catheter until ended	19	63	11	37
12	Reconnect oxygen immediately after suctioning	30	100	0	0
13	Dispose the catheter and gloves in manner that prevent contamination from secretion	11	37	19	63
14	Hand hygiene after ETT suctioning	28	93	2	7
15	Check ventilator circuits for condensate formation	15	50	15	50
16	Activity and early mobilization done in patient	15	50	15	50

4.2.2 Correlation

Table (7): Relationship between the years of experience and Head of bed elevated between 30-45 degree

Count		Head of bed elevated between 30-45 degree		Total	P value
		done	not done		
years of experience	less than 2 year	21 _a	3 _a	24	.659
	3-5 years	5 _a	0 _a	5	
	more than 5 years	1 _a	0 _a	1	
Total		27	3	30	

Table (8): Relationship between the years of experience and Oral care done

Count		Oral care done		Total	P value
		Done	not done		
years of experience	less than 2 year	17 _a	7 _a	24	.319
	3-5 years	5 _a	0 _a	5	
	more than 5 years	1 _a	0 _a	1	
Total		23	7	30	

Table (9): Relationship between the years of experience and Hand hygiene done prior suctioning

Count		Hand hygiene done prior suctioning		Total	P value
		done	not done		
years of experience	less than 2 year	9 _a	15 _b	24	.123
	3-5 years	4 _a	1 _a	5	
	more than 5 years	1 _a	0 _a	1	
Total		14	16	30	

CHAPTER 5:

DISCUSSION

CONCULOSION

RECOMMENDATIONS

5- DISCUSSION, CONCLUSION AND RECOMMENDATION:

5.1 DISCUSSION:

5.1.1 KNOWLEDGE:

Majority of patients in the Critical Care Unit (CCU) are admitted for Mechanical ventilatory support. This requires a tracheostomy or endotracheal intubation hence vulnerability to infection, the introduction of an endotracheal tube, contributes to development of lung infection and or complications to the critically ill patient.

This study is conducted to evaluate the level of knowledge and practice of nurses how working in sharg Elneel Hospital ICU unit regarding infection control guidelines and strategies in endotracheal intubated patient , the study find that the majority of responders 93.3% regarding age from age group 20-30 years, More than half of responders 53.3% was female, 56.7% are bachelor holder, majority of responders 83.3% was single, 80% have years of experience less than 2 years and the majority of responders 70% regarding training about endotracheal tube was responded with no.

This study shows half of responders 50% had good knowledge regarding prevention of aspiration and near to half of responders 46.7% had good knowledge regarding prevention of contamination of equipment, more than half of responders 53.3% had poor knowledge the potential risk for pneumonia in patient using mechanical ventilator with heated bubble through humidifier primarily. The study showed that near to half of responders 46.7% had good knowledge regarding CDC stander precaution of infection control which Include: Hand hygiene; use of gloves, gown, mask, eye protection, or face shield (depending on expected exposure); and safe injection practices and more than one third of responders 36.7% had fair knowledge regarding transmission based precaution that used for patients known or suspected to be infected or colonized with infectious agents which divided into three categories: Contact Precautions, Droplet Precautions, Airborne Precautions.

Study tells that more than two third of responders 63.3% had good knowledge regarding the concept of endotracheal suction. Regarding oral care for mechanically ventilated patient the study showed near to half of responders 43.3% had good knowledge (the procedure and it is frequency) and more than half of responders 53.3% had good knowledge regarding hand washing.

This study showed result neat to other study conducted in KENYATTA NATIONAL HOSPITAL CCU (2015) which reveals that 54.9% of nurses had adequate Knowledge of VAE prevention , current conducted in the Palestinian Hospitals to evaluate the Knowledge and Practice of Nursing Staff towards Infection Control Measures revealed that, approximately half (53.9%) of the studied sample had fair knowledge level (>80%).

5.1.2 PRACTICE:

The majority (91.1%) of the studied sample had Good practice (>80%) this is the finding of the study was conducted in the Palestinian Hospitals to evaluate the Knowledge and Practice of Nursing Staff towards Infection Control Measures.

our study reveals that 90% of nurses elevated the head of bed between 30-45 degree near to finding of study in Zambia (2015) which found maintaining head of bed elevated between 30-45 degree 92.7% (n=76) and 10% of nurses not done and 100% of nurses used cuffed endotracheal tube. Regarding the maintenance of cuff pressure 70% of nurses maintained endotracheal tube cuff pressure

Other finding of this study 77% of nurses do oral care while 67% did not do Subglottic suctioning, less than half 47% of nurses done of Hand hygiene done prior suctioning while 30% of nurses does not use facemask during suctioning the endotracheal tube, 63% of nurses Maintain sterility of suction catheter until ended and 63% of them does not dispose the catheter and gloves in manner that prevent contamination from secretion, the study find that only 10% of nurses does not perform Hand hygiene after ETT suctioning and this is good when compared with study in Zambia which reveals most of the nurses 95.1(n=79) practiced aseptic technique during the ETT/tracheostomy suctioning and 96.3(n=79) used face masks during the procedure which contradicted with the low percentage 48.8% (n=40) of those who performed hand hygiene prior suctioning and the lowest

percentage 19.5% (n=16) on the respondents who performed hand hygiene after the procedure.

5.1.3 Correlation between variables:

The study found There is no significant between education level and knowledge of nurses regarding prevention of aspiration (P value = .05), and is no significant between education level and knowledge of nurses regarding the potential risk for pneumonia in patient using mechanical ventilator with heated bubble through humidifier primarily while there is significant between education level and knowledge of nurses regarding oral care for mechanically ventilated patient.

There is no significant between the years of experience and Head of bed elevated between 30-45 degree (p value= 0. 659), years of experience does not affect Oral care performing (p value = 0. 319), other finding that There is no significant between the years of experience and Hand hygiene done prior suctioning.

5.2 Conclusion:

Based on the finding of the study, 53.3% of responders are females from age group 20-30 years, 56.7% of responders are bachelor holder and their experience less than two years and only 30% had training on endotracheal tube. Half of responders had good knowledge regarding prevention of aspiration.

46.7%, 36.7% had good knowledge regarding CDC stander precaution and fair knowledge regarding transmission based precaution respectively. Forty of responders had good knowledge regarding endotracheal suction.

Most of the responders are good in practicing infection control measures while only 10% of nurses do not perform Hand hygiene after ETT suctioning. There is no significant between education level and knowledge of nurses regarding infection control , and the years of experience and their practice.

5.3 RECOMMENDATION:

Based on the finding of the study I recommend to:

1. Periodic in service training programs based on the practice guidelines and updated researches finding.
2. ICU setting should be improved and resources to be provided to facilitate the translation of knowledge and guidelines into practice.
3. Multi-disciplinary team to assess and review the guidelines and provide the up to date guidelines.
4. More researches should be conducted.

ANEX:

REFERANSES

APPENDIX I

APPENDIX II

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APPENDIX:

APPENDIX I: QUESTIONER:

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

UNIVERSITY OF SHANDI

FACULTY OF POSTGRADUATE STUDY

MSc of Nursing

Assessment of Nurses' knowledge & practice regarding infection control in intubated patient in Sharg Elneel hospital between September and November 2018.

Questioner

No: ()

Section (1): demographic data:

Please check on what represent you without writing name

Age: 20-24 () 25-29() 30-34()

sex: Male () Female ()

Marital Status: single () married () divorce () widow ()

Level of education: diploma () bachelor () MCs ()

Experiences: 1-3 years () 3_5 years () > 5 years ()

Did you attend any course about Endotracheal Tube: Yes: () No: ()

If yes, specify:

Section (2): draw (T) for correct statement and (F) for wrong one.

1. to prevention of aspiration:

- The cuff inflation pressure should be adjusted until there is no audible air leak while using normal inspiratory airway pressures. ()
- Patient should be nursed in sitting position. ()
- Aspiration of subglottic secretions should be considered in patients who are expected to be mechanically ventilated for more than 24 hours. ()
- Gastric distension should be avoided in mechanically ventilated patients who are being fed enterally. ()

2. Prevention of contamination of equipment , we have to consider the following:

- Humidifier systems should never be changed tell weaning ()
- Sterile water should be used to rinse reusable noninvasive respiratory equipment. ()
- Nebulizers and resuscitation equipment may use for all patient simeteanuosly. ()
- The ventilator circuit should be changed only if damaged. ()

3. The potential risk for pneumonia in patients using mechanical ventilators with heated bubble-through humidifiers primarily:

- Results from the formation of condensate in the inspiratory phase tubing of unheated ventilator circuits. ()
- The difference in the temperatures of the inspiratory-phase gas and ambient air does not cause condensate to form. ()

- Spillage of the contaminated condensate into the patient's tracheobronchial tree can occur with procedures during which the tubing may be moved. ()

-

4. Regarding CDC Standard Precautions :

- Standard Precautions Use with all clients, in all settings, regardless of suspected or confirmed presence of infection. ()
- Completely protect against microorganisms spread by contact, droplets, or through the air. ()
- Include: Hand hygiene; use of gloves, gown, mask, eye protection, or face shield. ()
- One of the new Elements of Standard Precautions added: Respiratory hygiene and cough etiquette. ()

5. Transmission-based precautions is:

- Use for patients known or suspected to be infected. ()
- The first tier of protection, apply to care of all patients. ()
- Are used because Routes of transmission for some microorganisms are not completely interrupted using standard precautions alone. ()
- It assigned by Center of Disease Control and Prevention (CDC). ()

6. Endotracheal suctioning (ETS):

- Is the removal of secretion from tracheobronchial tree. ()
- to prevent infection of respiratory tract from aspiration. ()
- It is safe and never causes complication. ()

- It done through the endotracheal tube with the help of mechanical suction device. ()

7. Regarding endotracheal suctioning (ETS):

- Endotracheal suctioning should perform routinely. ()
- Routine use of normal saline instillation prior to endotracheal suctioning should not be performed. ()
- The duration of suctioning events should be limited to less than 15 seconds. ()
- Pre-oxygenation is not necessary. ()

8. To avoid occurrence of VAI :

- Environment should be cleaned weekly to reduce the possibility of transmission of organisms from the environment to the patient. ()
- Personal protective equipment should be used according to the type of infection. ()
- Maintain hand hygiene, in accordance with national hand hygiene guidelines. ()
- Hands should be decontaminated appropriately with soap and water or alcohol hand rub before and after every episode of direct patient contact. ()

9. When you are providing oral care for mechanically ventilated patient :

- Avoid normal saline or a half-strength solution of saline for oral rinses and use tap water. ()
- Provide oral cleansing, including subglottic suctioning, at least every 2 hours and prn. Brush the teeth at least twice a day. ()
- Apply a 0.12% chlorhexidine gluconate solution twice daily to complement oral care. ()

- Use appropriately diluted sodium bicarbonate to dissolve viscous mucus. ()

10.Regarding to hand washing:

- Use alcohol-based hand rub (at least 60% alcohol) for routine hand hygiene and if hands are not visibly soiled. ()
- Use soap and water when hands are dirty or visibly soiled. ()
- Use cold water. ()
- Alcohol-based solutions are not effective against spores ()

ALL THE BEST

APPINDIX II: CHECKLIST:

Practice assessment chick list ():

Statement	Yes	No
Head of bed elevated between 30-45 degree		
Cuffed endotracheal tube used		
Endotracheal tube cuff pressure maintained		
Oral care done		
Subglottic suctioning done		
Hand hygiene done prior suctioning		
Use of face mask during suctioning		
Auscultate chest before endotracheal suctioning		
Hyper oxygenate before suctioning		
Lubricate the suction catheter with normal saline		
Maintain sterility of suction catheter until ended		
Reconnect oxygen immediately after suctioning		
Dispose the catheter and gloves in manner that prevent contamination from secretions		
Hand hygiene after ETT suctioning		
Check ventilator circuits for condensate formation		
Activity and early mobilization done on patient		
Total		

