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Knowledge of Pediatric Critical Care Nurses Regarding Evidence Based Guidelines for Prevention of Ventilator Associated Pneumonia (VAP)

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Abstract
ventilator associated pneumonia (VAP) is a costly, preventable, and often fatal consequence of medical therapy that increases hospital and intensive care stays in mechanically ventilated patients. The prevention of VAP is primarily the responsibility of the bedside nurse whose knowledge, beliefs, and practices influence the health outcome of ICU patients. Unfortunately little is known about the degree of nursing knowledge on evidence based guidelines for the prevention of VAP. This descriptive study aimed to assess knowledge of pediatric critical care nurses regarding evidence based guidelines for prevention of VAP in both pediatric and neonatal intensive care units. The current study revealed inadequate knowledge of pediatric critical care nurses regarding evidence based guidelines for prevention of ventilator associated. There is strong correlation between years of experiences, previous training on guidelines of prevention of VAP and knowledge of nurses on the evidence based guidelines for prevention of VAP. Moreover, there is no correlation between age and knowledge of nurses on evidence based guidelines for prevention of VAP. The study concluded that written unit protocols should be present and reviewed regularly as updates and new evidence for best practice are constantly emerging and staff should be educated on the updated protocols.
Keywords: Knowledge, pediatric critical care nurses, evidence based guidelines, Ventilator Associated Pneumonia (VAP)

1. Introduction

Ventilator-associated pneumonia (VAP), the second most common hospital-acquired infection in pediatric intensive care units, is linked to increased morbidity, mortality, and lengths of stay in the hospital and intensive care unit, adding tremendously to health care costs (Cooper & Haut, 2013). VAP is defined as a hospital-acquired pneumonia that develops in patients who have been treated with mechanical ventilation for 48 hours or longer who had no signs or symptoms of lower respiratory infection before they were intubated and treatment with mechanical ventilation began (CDC, 2012).

Risk factors for VAP in children currently include use of opiates for sedation, sustained neuromuscular blockade, use of enteral nutrition, previous antibiotic therapy, the technique used for endotracheal suctioning, reintubation, ventilator circuit changes, gastroesophageal reflux, subglottal or tracheal stenosis, and trauma or surgical problems. Primarily, unlike adults, children have developmental and physiological differences for a wide range of ages. Age is also a factor in immunity, so younger or preterm infants are more likely than older children or adults to experience infection and to have more frequent episodes of infection (Srinivasan, et al. 2009). In a study by (Liu , et al,2013), to identify risk factors of VAP in pediatric intensive care unit (PICU), they found that , risk factors of VAP as follows: genetic syndrome, steroids, reintubation or self-extubation, bloodstream infection, prior antibiotic therapy and bronchoscopy.

Currently, pneumonia is a leading cause of death of children worldwide (WHO, 2012). VAP is a marked health risk for hospitalized infants and children and the mortality rate for patients of all ages with VAP is approximately 33% to 50%. More ever, in the PICU, 20% of nosocomial infections are VAP, with an incidence of 4 to 44 per 1000 intubated children (Casado, et al, 2011). It is one of the top causes of hospital-acquired infection (HAI) in the PICU, accounting for 18% to 26% of all HAIs in the unit and resulting in a mortality rate of about 10% to 20 % (Foglia, Meier, Elward, 2007). VAP is associated with increased mortality and morbidity, increased length of hospital stay, and high health care costs (Srinivasan et al, 2009).

According to Dontje (2007), the use of evidence-based practice and guidelines improves the quality of patient care and closes the gap between research outcomes and practice. To discuss the evidence based guidelines for the prevention of VAP, one has to first understand what Evidence Based Practice (EBP) is and how it relates to nursing care. Evidence based practice is the use of current research evidence combined with clinical expertise as well as patient values to formulate sound interventions that ultimately improve the quality of patient care. The first step in the evidence based process is to identify a problem in current practice which would represent a trigger for change in practice. The first step is followed by the second step which entails a review and critique of relevant literature. The third step is to identify research evidence that supports the change in clinical practice. The final step is to implement the change in practice and monitor the outcomes. Evidence based

practice and nursing can be embraced and jointly practiced without losing the art and the caring side of nursing while still providing care that is individualized and patient centered.

The process of evidence based practice resembles the components of the nursing process which include: identifying the clinical practice question or problem; assessing the clinical appraisal components; planning the implementation; implementing the practice change; and evaluating the practice change (Collins & et al., 2007). By looking at the above steps one can link the evidence based practice (EBP) process to the nursing process and easily find the similarities between the two. In other words, the EBP process would not be such an unknown measure for nurses in the management of critically ill patients. The use of evidence based practice can improve the processes, outcomes and costs of clinical care (Muscedere, Dodek & Keenan, et al., 2008).

Although evidence-based guidelines for the prevention of VAP have been developed and have been promoted by programs and campaigns of authoritative organizations, VAP continues to be a common and potentially fatal complication of ventilator care and it is an ongoing challenge for critical care nurses as they use current evidence-based strategies to decrease its incidence and prevalence. Recently, lack of knowledge was indicated as a barrier for adherence to evidence-based practice. Although knowledge does not ensure adherence, misconceptions about effective prevention strategies can be important in decision making. The reductions in the rates of hospital-acquired infection that occurred after educational programs on strategies to prevent infection provide indirect evidence for the value of knowledge (O'Keefe-McCarthy, Santiago & Lau, 2008).

According to Gomes,(2010), availability of resources, training of staff members, staff motivation and compliance, team work, updated protocols and more nursing staff would contribute in the implementing the evidence based guidelines for prevention of VAP. As well as, unavailability of resources as well as cost represents a barrier to the implementation of evidence based guidelines on prevention of VAP. Understanding the importance of recommended practices increases the likelihood of adherence and may overcome barriers to implementation. If the nurse does not have enough knowledge on measures proven to decrease VAP rates she may not have the necessary confidence to take action and make decisions regarding such practices. Patient recovery may be delayed and other risks of complications from mechanical ventilation can be prevented. Prevention and control of ventilator associated pneumonia are dependent on education and awareness of ICU staff towards the problem and on the application of evidence based strategies. Adherence to the evidence based guidelines on prevention of ventilator associated pneumonia will occur once staff involved directly with the patient's care has knowledge of such guidelines and can put them into practice (Biancofiore, et al., 2007).

Prevention of VAP in Infants; the challenge faced when dealing with the pediatric population is the lack of evidence to support best practice. Most of the practices are extrapolated from the adult literature. This requires assessing each of the adult recommendations based on risk and potential benefit (Canadian ICU Collaborative Faculty, 2012). VAP avoidance strategies which vary between adults and infants have been created in an attempt to find a solution to the problem of VAP. These strategies incorporate a number of evidence based strategies proved in the literature to decrease VAP and increase positive patients' outcomes (Lachman & Yuen, 2009).Those strategies include; head of bed (HOB) and infant positioning should be maintain at 10-15 degree elevation, bedside maintenance; perform routine environmental decontamination with germicidal wipes. Change resuscitation bags every week and hang at bedside rather than left in the bed. Moreover, endotracheal tube (ETT) and gastric tube should be placed orally rather than nasally to prevent sinusitis in infants and to inhibit pathogens from entering the oral pharynx from the nasal pharynx. Oral care is recommended to inhibit bacteria from colonizing the mouth. In addition, one best practice strategy hand hygiene, which is universally essential to the prevention of infection. Documentation; document HOB elevation, oral care provided, suctioning and ventilator changes as indicated(Aly & et al, 2008 & Norris, Barnes, & Roberts, 2009, Bockhim, 2011, Canadian ICU Collaborative Faculty, 2012).

2. SIGNIFICANCE OF THE STUDY

Mechanical ventilation is one of the major supportive modalities in the intensive care unit but it carries a lot of risks and complications, the most common one being ventilator associated pneumonia. The lungs are usually amongst the major organs involved in multiple organ failure and thus the challenge of delivering appropriate ventilation with as little complications as possible is extremely important. To ensure the highest standards of nursing care, nursing practice must be based on a strong body of scientific knowledge. This can be achieved through adherence to the evidence based guidelines for prevention of ventilator associated pneumonia, ultimately improving patients' outcomes. Improved outcomes will shorten patient's ICU length of stay, hospitalization as well as benefit the patient financially with decreased hospital costs. Hospitals also gain benefits as they are continually faced with the challenge of providing cost effective services to patients and communities (Hugonnet, et al., 2007).

Ventilator-associated pneumonia (VAP) is associated with additional complications for patients in the intensive care units. Despite the volume of published information on VAP in adults, the amount of research on VAP in children is limited. Health care providers need to be aware of the risk for VAP in infants and children

and should have preventive programs in place. Evidence-based protocols that outline preventive and therapeutic treatments for specific situations for adults treated with mechanical ventilation have been developed, but little has been offered for the care of children receiving mechanical ventilation. Prevention is the most appropriate intervention, but little research has been done in children to identify necessary skills and strategies. Critical care nurses play an important role in identification of risk factors and prevention of ventilator-associated pneumonia.

In Egypt; where there is shortage of nursing staff, skilled and knowledgeable nurses are extremely important and needed to make appropriate decisions in patient care and minimize risks to patients. Knowledge on evidence based practices should bring confidence to intensive care nurses to make appropriate decisions and prevent poor outcomes in the recovery of mechanically ventilated patients.

3. Research questions

The following research questions are posed:

- Do pediatric critical care nurses have adequate knowledge on evidence based guidelines for prevention of ventilator associated pneumonia?
- Is there association between level of education, years of experience and knowledge of pediatric critical care nurses on prevention of VAP?

4. Aim of the study

The aim of the study was to assess knowledge of pediatric critical care nurses regarding evidence based guidelines for prevention of ventilator associated pneumonia (VAP) in the pediatric and neonatal intensive care units.

5. Methodology

5.1.Research design:

The current research design was a descriptive design aimed to assess knowledge of pediatric critical care nurses regarding evidence based guidelines for prevention of ventilator associated pneumonia (VAP) in both pediatric and neonatal intensive care units.

5.2.Setting:

The study was conducted at Pediatric Intensive Care Unit (PICU) and neonatal intensive care unit (NICU) of Children's University Hospital in Mansoura, Egypt.

5.3.Subjects:

The study involved 28 nurses from Pediatric Intensive Care Unit (PICU) and 21 nurses from Neonatal Intensive Care Unit (NICU). Number of beds in both units was more than 15 beds. The data was collected at the end of 2014.

5.4.Instrument:

The data was collected using the following tools:-

(A) -The structured questionnaire sheet was developed by the researchers. The questionnaire was concerned with gathering data related to:

1- Nurses' demographic characteristics that include age, level of education, years of experience in the critical unit and number of beds in both units.

2- Nurses' knowledge regarding evidence based guidelines for preventing ventilator associated pneumonia in both pediatric and neonatal intensive care units, was collected using a multiple-choice questionnaire consisting of 14 items that had been developed, validated, and tested by Blot et al, (2007) and Labeau et al, (2007). Data were collected at the end of 2014. During this period, one of the researchers distributed the questionnaire by hand to all critical care nurses, participants were given 20 minutes to complete the questionnaire. Participants were asked to mark which interventions listed on the questionnaire were recommended in the evidence based guidelines for prevention of VAP. For each item of the questionnaire, the percentage of correct answers was determined, knowledge was considered satisfactory if the percent score was 60% or more and unsatisfactory if less than 60%.Relation between level of education, years of experience and knowledge of critical care nurses on prevention of VAP was estimated, SPSS for windows 15.0 (SPSS, Chicago, Illinois) was used for statistical analysis. Statistical significance was set at $P < 0.05$.

6. Results

Percentages distribution of nurses according to their characteristics, their knowledge regarding evidence based guidelines for preventing ventilator associated pneumonia. In addition, this section will also discuss relation

between nurses' characteristics and their level of knowledge regarding evidence based guidelines for preventing ventilator associated pneumonia.

Table (1): Percentage distribution of nurses according to their characteristics.

Demographic variables	***Frequency***	***Percent***
Age:		
▪ From 20 to less than 25 years	22	44.9
▪ From 25 to less than 30 years	12	24.5
▪ From 30 to less than 35 years	15	30.6
X ± SD	26.94 ± 4.04	
Years of experience in the intensive care unit:		
▪ Less than 5 years	21	42.9
▪ From 5 to less than 10 years	15	30.6
▪ More than 10 years	13	26.5
X ± SD	6.45 ± 3.54	
Level of education		
▪ Diploma	1	2.00
▪ Bachelor	48	98.00
Previous training on guidelines of prevention of VAP:		
▪ Yes	10	20.4
▪ No	39	79.6
Total	**49**	

This table shows that, the highest percent (44.9%, 42.9%) of studied nurses, their age were ranged from 20 to less than 25 years, and they had less than 5 years of experience in the intensive care unit. The majority (98 %) of them had bachelor degree in nursing. In relation to previous training, 79.6% of them they didn't take any previous training about guidelines of prevention of VAP.

Table (2): Percentage distribution of nurses' knowledge regarding evidence based guidelines for preventing ventilator associated pneumonia.

Items	***Frequency***	***Percent***
1- Oral versus nasal route for endotracheal intubation		
▪ Oral intubation is recommended	**41**	**83.6**
▪ Both routes of intubation can be recommended	4	8.2
▪ Nasal intubation is recommended	0	0.0
▪ I do not know	4	8.2
2- Frequency of humidifier changes		
▪ It is recommended to change humidifiers every 48 hours(or when clinically indicated)	17	34.7
▪ It is recommended to change humidifiers every week(or when clinically indicated)	**25**	**51.0**
▪ It is recommended to change humidifiers every 72 hours (or when clinically indicated)	0	0.0
▪ I do not know	7	14.3
3- Kinetic versus standard beds		
▪ Kinetic beds increase the risk for VAP	3	6.1
▪ Kinetic beds reduce the risk for VAP	**36**	**73.5**
▪ The use of kinetic beds does not influence the risk for VAP	7	14.3
▪ I do not know	3	6.1
4- Oral care		
▪ It is recommended to perform appropriate routine oral care one time per shift with swab moistened with sterile water	**32**	**65.3**
▪ It is recommended to perform developmentally appropriate routine oral care every 3 to 6 hours with a swab moistened with water	17	34.7
▪ Routine oral care does not influence the risk of VAP	0	0.0
▪ I do not know	0	0.0
5- Patient positioning		
▪ Supine positioning is recommended	7	14.3
▪ Semi recumbent positioning is recommended	**33**	**67.3**
▪ The position of the patient does not influence the risk for VAP	9	18.4
▪ I do not know	0	0.0
Total	**49**	

It is observed from this table that, the highest percentage of studied sample reported the correct answer regarding oral intubation , changing humidifiers , kinetic beds , appropriate routine oral care and positioning as

evidence by (83.6%,51%, 73.5, 65.3, 67.3%) respectively.

Table (2): continued;

Items	*Frequency*	*Percent*
1- Frequency of ventilator circuit changes		
▪ It is recommended to change circuits every 48 hours(or when clinically indicated)	11	22.5
▪ It is recommended to change circuits every week(or when clinically indicated)	**28**	**57.1**
▪ *It is recommended to change circuits for every new patient (or when clinically indicated)*	7	14.3
▪ I do not know	3	6.1
2- Condensation in the ventilator circuit		
▪ *It is recommended to drain tubing condensation away from patient routinely before care and before position changes*	19	38.8
▪ It is recommended to drain tubing condensation away from patient frequently	**25**	**51.0**
▪ Condensation in the ventilator circuit does not influence the risk of VAP	3	6.1
▪ I do not know	2	4.1
3- Ventilator and bed side maintenance		
▪ *It is recommended to decontaminate respiratory and bedside equipment with germicidal wipes routinely every shift and whenever soiled*	15	30.6
▪ It is recommended to decontaminate respiratory and bedside equipment with germicidal wipes whenever soiled	**27**	**55.1**
▪ Decontamination of respiratory and bedside equipment with germicidal wipes does not influence the risk of VAP	7	14.3
▪ I do not know	0	0.0
4- Type of air way humidifier		
▪ Heated humidifiers are recommended	13	26.5
▪ *Heat and moisture exchangers are recommended*	**15**	**30.6**
▪ Both types of humidifiers can be recommended	**15**	**30.6**
▪ I do not know	6	12.3
5- Open versus closed suction system		
▪ Open suction systems are recommended	**18**	**36.7**
▪ *Closed suction systems are recommended*	16	32.7
▪ Both systems can be recommended	11	22.4
▪ I do not know	4	8.2
6- Frequency of change in suction systems		
▪ Daily changes are recommended(or when clinically indicated)	**19**	**38.8**
▪ Weekly changes are recommended(or when clinically indicated)	16	32.6
▪ *It is recommended to change systems for every new patient(or when clinically indicated)*	9	18.4
▪ I do not know	5	10.2
7- Endotracheal tubes with extra lumen for drainage of subglottic secretions		
▪ *These endotracheal tubes reduce the risk for VAP*	18	36.7
▪ These endotracheal tubes increase the risk for VAP	**24**	**49.0**
▪ These endotracheal tubes do not influence the risk for VAP	2	4.1
▪ I do not know	5	10.2
8- Head of the bed HOB		
▪ *It is recommended to elevate the HOB 15-30 degrees*	9	18.4
▪ It is recommended to elevate the HOB 30-45 degree	**37**	**75.5**
▪ HOB elevation does not influence VAP risk	0	0.0
▪ I do not know	3	6.1
9- Hand hygiene and gloving		
▪ *Gloves are recommended when exposure to secretions is likely during oral care and oral and ETT suctioning*	13	26.5
▪ Hand hygiene is recommended before and after oral care, oral and ETT suctioning	5	10.2
▪ Glove use and hand hygiene is recommended before and after oral care and ETT suctioning	**31**	**63.3**
▪ I do not know	0	0.0
Total	**49**	

Regarding evidence based guidelines for preventing ventilator associated pneumonia, this table illustrates that, the highest percent of studied sample reported incorrect answer regarding frequency of ventilator circuit changes, condensation in the ventilator circuit, ventilator and bed side maintenance, type of air way humidifier, type of suction system, frequency of change in suction systems, type of endotracheal tubes, head of the bed and hand hygiene and gloving as evidence by (57.1%,51%,55.1%,30.6%,38.8%,49%,75.5%,63.3%)

respectively.

Table (3): Percentage distribution of nurses' level of knowledge regarding evidence based guidelines for preventing ventilator associated pneumonia.

Items	***Frequency***	***Percent***
Level of knowledge		
▪ Satisfactory	17	34.7
▪ Un satisfactory	32	65.3
Total	**49**	

This table illustrates that, more than two third (65.3%) of studied sample had unsatisfactory level of knowledge regarding evidence based guidelines for preventing ventilator associated pneumonia.

Table (4): Relation between nurses' characteristics and their level of knowledge regarding evidence based guidelines for preventing ventilator associated pneumonia.

Characteristics	***Level of Knowledge regarding evidence based guidelines for preventing VAP***	
	T- test	**P. value**
▪ Age	.729**	.000
▪ Level of education	.198	.173
▪ Years of experience in the intensive care unit	.747**	.000
▪ Previous training on guidelines of prevention of VAP	.695**	.000

** Correlation is significant at the 0.01 level (2-tailed).

This table clarifies that there is strong correlation between years of experiences, previous training on guidelines of prevention of VAP and knowledge of nurses on the evidence based guidelines for prevention of VAP. Meanwhile, there is no correlation between age and nurses' level of knowledge regarding evidence based guidelines for preventing ventilator associated pneumonia.

7. Discussion:

Ventilator-associated pneumonia (VAP) is a common nosocomial infection in critically ill patients that is associated with poor clinical and economic outcomes, including longer duration of mechanical ventilation, longer ICU and hospital stay, increased mortality, and increased hospital charges (Napolitano & Wip, 2009).VAP is preventable, and many practices have been demonstrated to reduce the incidence of VAP and its associated burden of illness. Despite efforts to prevent ventilator-associated pneumonia (VAP), this disease continues to occur frequently in critically ill patients and is associated with significant morbidity and mortality. Although prevention is paramount, when VAP does occur, optimal management is important to reduce further morbidity, mortality, and health care costs (Muscedere & et al. 2008).

Javed & et al. (2011), stated that nurse working at critical unit are having knowledge gap to be able to prevent incidence of VAP among ventilated patients. Studies have shown that nurses lack knowledge of evidence based guidelines for the prevention of VAP, a lack of knowledge may be a barrier to adherence. The safety of children within our hospitals is increasingly an area of focus for all involved in child health. Ventilator associated pneumonia (VAP) is the second most common health-care-associated infection (HCAI) in pediatric intensive care (PICU) accounting for 20% of nosocomial infections (Brierley, 2012).The aim of this study was to assess knowledge of pediatric critical care nurses regarding evidence based guidelines for prevention of ventilator associated pneumonia in both pediatric and neonatal intensive care units.

The results of this study showed that, the highest percent (42.9%) of studied nurses had less than 5 years of experience in the intensive care unit and the majority (79.6%) of them didn't take any previous training about guidelines of prevention of VAP. This result is in agreement with Said, (2012) who found that more than two third were working in ICU for less than 10 years and the majority had no ICU training.

In relation to nurses' knowledge regarding evidence based guidelines for preventing ventilator associated pneumonia, the result of the present study revealed that the highest percentage of studied sample reported the correct answer regarding oral intubation , changing humidifiers , kinetic beds , appropriate routine oral care and positioning ,this result is congruent with the result of a study done in South Africa on 83 nurses working in ICU showed that, the majority of participants answered correctly regarding oral intubation(69.88%), kinetic beds (55.42%) and positioning (68.67%) (Gomes, 2010).

Moreover, most of the studied sample reported incorrect answer regarding frequency of ventilator circuit changes, condensation in the ventilator circuit, ventilator and bed side maintenance, type of air way humidifier, type of suction system, frequency of change in suction systems, type of endotracheal tubes, head of the bed and hand hygiene and gloving. This result is not correspondent with El-Khatib et al,(2010) who found

that the participants were most frequently correct about using an endotracheal tube with a larger lumen than usual for drainage of subglottic secretions and about using open versus closed suction systems and respondents had the least knowledge about the frequency of humidifier changes and the optimal frequency of ventilator circuit changes.

Unfortunately little is known about the degree of nursing knowledge on evidence based guidelines for the prevention of ventilator associated pneumonia and about factors that can contribute or represent barriers to their implementation. In relation to nurses' level of knowledge regarding evidence based guidelines for preventing ventilator associated pneumonia, the result of this study revealed that, more than two third (65.3%) of studied sample had unsatisfactory level of knowledge regarding evidence based guidelines for preventing ventilator associated pneumonia. This may be due to no written protocol regarding evidence based guidelines for prevention of VAP in both units. This lack of knowledge is considered a huge barrier to implementation of evidence based guidelines for VAP prevention as resources are available at times but nurses are not aware of the importance of such interventions and its implementation. This result supported by the result of Gomes, (2010) who found that, the majority of participants had in adequate knowledge regarding evidence based guidelines for prevention of VAP.

Regarding the relation between nurses' characteristics and their level of knowledge regarding evidence based guidelines for preventing ventilator associated pneumonia, the results of the present study showed that, there is strong correlation between years of experiences, previous training on guidelines of prevention of VAP and knowledge of nurses on the evidence based guidelines for prevention of VAP. Moreover, there is no correlation between age and nurses' level of knowledge regarding evidence based guidelines for preventing ventilator associated pneumonia. This result is congruent with Gomes, (2010) who found that, there is no correlation between age and knowledge of nurses on the evidence based guidelines for prevention of VAP. There is a weak correlation between years of experience and knowledge levels of nurses on evidence based guidelines for prevention of VAP.

Furthermore Blot et al,(2007) mentioned that more experienced nurses have a higher knowledge level than do nurses with less than 1 year of experience. Similarly, the finding of the present study is congruent with El-Khatib et al,(2010) who conducted a study to evaluate knowledge of critical care providers about evidence-based guidelines for preventing ventilator-associated pneumonia, found that adequate knowledge of the non pharmacological guidelines for the prevention of VAP can be gained within the first 5 years of ICU experience. Meanwhile, these results are not correspondent with Said, (2012) who conducted a study on 118 nurses working in ICU, found that, no association between years of working experience, level of education and knowledge of nurses.

8. Conclusion:

The current study revealed inadequate knowledge of pediatric critical care nurses regarding evidence based guidelines for prevention of ventilator associated. There is strong correlation between years of experiences, previous training on guidelines of prevention of VAP and knowledge of nurses on the evidence based guidelines for prevention of VAP. Moreover, there is no correlation between age and knowledge of nurses on evidence based guidelines for prevention of VAP.

9. Recommendations:

- Written unit protocols should be present and reviewed regularly as updates and new evidence for best practice are constantly emerging and staff should be educated on the updated protocols.
- Orientation of new staff members in ICU's should include education on strategies for prevention of VAP.
- ICU training programmes should include evidence based guidelines for prevention of VAP. Learning resources such as articles, journals and electronic resources such as computers and internet should be made accessible in the units for staff members.
- ICU's environment should enable a nurse to translate knowledge into practice by ensuring availability of facilities.
- Similar study is recommended to include large sample size in other hospitals which provide care for critically ill pediatric patients, further research on factors affecting implementation of VAP prevention strategies is recommended.

10. Reference:

Aly, H., Badawy, M., El-Kholy, A., Nabil, R., & Mohamed, A. (2008): Randomized, controlled trial on tracheal colonization of ventilated infants: Can gravity prevent ventilator-pneumonia? Pediatrics, 122(4), 770-774.

Biancofiore, G., Barsotti, E. & Catalani, V., et al. (2007): Nurses' knowledge and application of evidence-based guidelines for preventing ventilator associated pneumonia. Minerva Anestesiologica, (73), 3,

129 – 134.
Blot S, Labeau S, Vandijck D, Van Aken P, Claes B. (2007): Evidence based guidelines for the prevention of ventilator-associated pneumonia: results of a knowledge test among intensive care nurses. Intensive Care Med; 33:1463-1467.
Bockhim, E.D. (2011): Effect of a nursing educational intervention on the prevention of ventilator associated pneumonia in the neonatal intensive care unit. A research paper submitted to the graduate school in partial fulfillment of the requirements for the degree masters of Science. Ball State University Muncie, Indiana.
Brierley,J., Highe, L., Hines.,S. &Dixon,G. (2012): Reducing VAP by instituting a care bundle using improvement methodology in a UK Pediatric Intensive Care Unit .Eur J Pediatr,171:323–330.
Canadian ICU Collaborative Faculty. (2012): Safer Healthcare Now! Prevent Ventilator Associated Pneumonia Getting Started Kit. www.saferhealthcarenow.ca.
Centers for Disease Control and Prevention. Ventilator-associated pneumonia (VAP) event. Device Assoc Events. January 2012:6:1-6:13. http:// www.cdc.gov/nhsn/pdfs/pscmanual/6pscvapcurrent.
Collins, P., Golembeski, S. & Selgas, M., et al. (2007): Clinical excellence through evidence based practice – a model to guide practice changes. Topics in Advanced Practice Nursing Journal, 7(4).
Cooper,V.B. & Haut,C. (2013): Preventing Ventilator- Associated Pneumonia in Children: An Evidence- Based Protocol. Critical Care Nurse; 33(3):21-30.
Dontje, K. (2007): Evidence – Based Practice: Understanding the process. Topics in advanced practice nursing e Journal, 7(4).
El-Khatib,M., et al.(2010): Critical care clinicians' knowledge of evidence based guidelines for preventing ventilator associated pneumonia .American Journal of Critical Care, 19(3) : 272 – 276
Foglia, E., Meier, M.D& Elward, A. (2007): Ventilator-associated pneumonia in neonatal and pediatric intensive care unit patients. Clin Microbiol Rev; 20(3):409-425.
Gomes,V.P.R.(2010): knowledge of intensive care nurses of evidence based guidelines for prevention of ventilator associated pneumonia. A research report submitted in partial fulfillment of the requirements for the degree of Master of Science in Nursing, Faculty of Health Sciences, University of the Witwatersrand, , Johannesburg.
Hugonnet, S., Uckay, I. & Pittet, D. (2007): Staffing level: a determinant of late onset ventilator associated pneumonia. Critical Care,(11), 4.
Javed,F., & et al. (2011): Nurses' knowledge of evidence-based guidelines for prevention of ventilator – associated pneumonia in critical care areas: a pre and post test design.J Ayub Med Coll Abbottabad ;23(1):146-149.
Labeau S, Vandijck D, Claes B, Van Aken P, Blot S. (2007): Critical care nurses' knowledge of evidence-based guidelines for preventing ventilator-associated pneumonia: development and validation of an evaluation questionnaire. Am J Crit Care; 16:371-377.
Lachman, P., & Yuen, S. (2009): Using care bundles to prevent infection in neonatal and pediatric ICUs. Current Opinion in Infectious Diseases, 22, 224-228. doi: 10.1097/QCO.0b013e3283297b68.
Liu B, Li SQ, Zhang SM, Xu P, Zhang X, Zhang YH, Chen WS, Zhang WH.(2013): Risk factors of ventilator-associated pneumonia in pediatric intensive care unit: a systematic review and meta-analysis. J Thorac Dis; 5(4):525-31.
Muscedere, J., Dodek, P. & Keenan, S., et al. (2008): Comprehensive evidence-based clinical practice guidelines for ventilator-associated pneumonia: Prevention. Journal of Critical Care, 23: 126 -137.
Napolitano,L. & Wip,C.(2009): Bundles to prevent ventilator-associated pneumonia: how valuable are they? Curr Opin Infect Dis 22:159–166. Wolters Kluwer Health | Lippincott Williams & Wilkins.
Norris, S. C., Barnes, A. K., & Roberts, T. D. (2009): When ventilator-associated pneumonias haunt your NICU: One unit's story. Neonatal Network, 28(1), 59-66.
O'Keefe-McCarthy,S. , Santiago,C.& Lau,G. (2008): Ventilator-Associated Pneumonia Bundled, Strategies: An Evidence-Based Practice. Worldviews on Evidence-Based Nursing, 5(4):193–204.
Said,A.T.(2012): Knowledge and practice of intensive care nurses on prevention of ventilator associated pneumonia at Muhimbili national hospital, MSc Nursing (Critical Care and Trauma) Dissertation. Muhimbili University of Health and Allied Sciences, Daressalaam, Tanzania.
Srinivasan, R., Asselin. J., Gildengorin, G, et al. (2009): A prospective study of ventilator-associated pneumonia in children. Pediatrics; 123(4): 1108-1115.
World Health Organization Media Centre. Pneumonia. Fact sheet 331. http://www.who.int/mediacentre/factsheets/fs331/en/index.html. Published November 2012.

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