

Application of CDC Standards for Prevention of Ventilator Associated Pneumonia (VAP) by Paramedical Personnel working in Tertiary Care Hospitals of Karachi, Pakistan

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Abstract

Objectives Ventilator associated pneumonia (VAP) is one of the infectious complications in those patients who receive mechanical ventilator in critical care unit. About 47% patients develop pneumonia due to prolong stay in critical care units and develop multiple infections. The objective of this study is to observe the extent to which paramedical personnel apply CDC guideline for the prevention of ventilator associated pneumonia.

Methodology: 29 itemed questionnaires were distributed among two hundred nurses of adult critical care areas in different tertiary care hospitals in Karachi.

Results: Two hundred nurses answered the questionnaire completely regarding their compliance with the CDC guidelines. Almost 64% nurses were not aware of the rate of ventilator associated pneumonia in their unit. Out of the 200 participants, 79% of nurses were compliant with wearing gloves, whereas 47.5% reported hand washing, 37.5% reported performing subglottic suctioning and 16 % reported that they always elevate head end of the bed. Only 24% do oral sectioning 2 hourly, 22.5% do oral swabbing 2 hourly and 34.5% do oral brushing. Most of them 64% prefer mouthwash for oral cleaning. With regards to yankauers device most of them were not properly using cleaning and storing it.

Conclusion: CDC guideline for the prevention of ventilator associated pneumonia are not consistently and uniformly implemented and followed by paramedical staff.

Key words: Pneumonia; Ventilator-Associated; Standards; Paramedical Personnel

Introduction:

Ventilator-associated pneumonia (VAP) is the commonest complications in patients with artificial respiratory assistance. It is approximately observed in about 28% of patients kept on ventilator for more than 48 hours. VAP not only prolongs the patient stay in intensive care unit but also intensify the

expences and increased risk of death in such critically ill patients.¹

Approximately 24-50% of ventilated patients lost their lives due to Ventilated associated lethal pneumonia and the increases the possibility of death 2-4 folds.^{2,3,4} The Institute for Healthcare Improvement (IHI) has targeted prevention for VAP with the slogan, “a national initiation to improve patient care and decrease

in deaths in hospitals”.³ Normal defence mechanisms keep the lungs away from such problems. But endotracheal intubation, continuous supine position, use of ventilation and loss of gag reflux are associated factors for development of VAP. Centres for disease control and prevention has design certain practical strategies to decrease the morbidity and mortality in the patients kept on ventilators for life, known as CDC (Centers for disease control and prevention) guidelines (summarized in Table 1).^{4,5}

The data summary from 1992 to 2004 by the National Nosocomial Infections Surveillance System stated that VAP rate was about 2.2 to 14.7 cases per 1000 patients on artificial ventilation in adult ICUs⁶. It was later described that 63% of patients acquire an oral colonization with multiple pathogen associated with development of VAP, So require additional microbial coverage.⁷

In most of VAP cases in order to diminish the risk of aspiration, the CDC guideline suggests that for most patients kept on mechanical ventilation, the head end of the bed needs to be elevated to lessen the possibility of aspiration.⁸ The CDC guidelines also focus on maintenance of essential oral hygiene for patients on assisted ventilation who are at high risk for developing hospital acquired infections .⁸ Other proposals detailed in CDC guidelines for hospital staff are to regularly ensure the patient’s capability to breathe on his own , also nursing staff need to wash their hands properly before and after touching the patient receiving mechanical ventilation and finally clean or replace used equipment before reuse on patients.^{9,10}

Large disparity occurs between the requirements and expectations from nursing staff for use of regulations for ventilation safe handling, and the actual level of attention and care which

seriously ill patients on ventilator receive. The purpose of this study is to detect knowledge and current practices of nursing staff about the implementation of CDC guide lines for ventilation use and also give a view of possible causative factors for VAP in relation to the negligence of already defined precautionary measures for such serious patients.

Methodology:

This cross sectional survey was carried out in four main tertiary care hospitals of the city. After taking consent, 29 items questionnaire was filled from 200 nurses who were working in the critical care in the above mentioned hospitals. Only those nurses who have worked in intensive care unit for at least one year were included in the study. All the data collected was formulated using SPSS version 16 and results were tabulated accordingly.

Results

Total 200 surveys forms were distributed among critical care unit’s nurses and results shows that the mean age of participants was 27 years (± 2.571). Among all, about 27.5% nursing staff had worked about 4-6 years in the health care units. 73% were diploma holders, baccalaureate nurses were 32% and CCRN certified nurses were 58.5%. Although nurses worked in multiple special units but the largest percentage was 69% of staff worked in general ICU. (Table 2)

Regarding hand wash and use of gloves, our results indicated that 79% nurses were always using gloves to provide oral care and 47.5% nurses reported they had always washed their hands between the patients. About 37.5%

reported that they always suction and clear secretion from airways before deflating endotracheal tube cuff. When they were inquired about following standard operating procedures, about 75% reported that their intensive care unit has well detailed written protocol as standard operating procedures for ventilation use as shown in table 3.

According to the results regarding oral care, 29.5% staff members reported that they have oral suctioning only as needed. 52.0% uses swabbing the teeth every 4 hourly while 24.5% nurses use teeth brushing. Regarding use of antiseptic solution for oral care 25.5% reported that they use chlorohexidine, while 68.5% reported that they use mouthwash for oral care as shown in table 4. The results also indicates that 51.0% staff members clean the used yankauer suction device every time, 48.0% store yankauer in its original packing and 31.0% respondent report the replacement of suction yankauer device every 12 hourly as shown in table 5.

Discussion

Ventilation associated pneumonia is the leading cause of death for patients kept on ventilation for more than two days. Many research conducted have proven that VAP was the most frequent cause of nosocomial infections.¹¹ In the United States of America, where the advanced facilities are available still it is the second commonest cause of mortality in critical condition patients.¹²

VAP enhances the stay and expenses of the patient stay in intensive care units.¹³ Multiple studies have emphasis the fact that the staff members handling these patients should trained and should also follow the described guide lines in order to decrease infections particularly ventilation associated pneumonia. In a study

done by Cason shows that 18% nurses do not always wash their hands between patients while our study results show 52% of the staff member show negligence in properly washing their hands between the patients and 23% nurses do not every time use gloves while providing oral care where as in our study results 21% of the nurses reported such negligence.¹⁴

It has been observed that subglottic suctioning is an important tool practice to clear away the secretions and in a study by Muscedere et al in which they emphasized on the fact that subglottis secretion drainage is an effective measure and is highly associated with the decrease in VAP.¹⁵ Cason declared that 69% nurses reported such practice whereas in our study unfortunately only 37.5% nurses reported that they provide subglottic suctioning of patients.¹⁴

Cason also stated that 27% nurses perform oral suctioning only when it is required whereas in our study 29.5% nurses pursue oral suctioning only when needed. Cason study showed that 68% nurses were unaware of the rate of ventilator associated pneumonia in their unit whereas our study declared the rate of such staff members as 64%.¹⁴

To decrease the chances of development of pneumonia, it has been well documented that keeping critically ill patients, such as on ventilators should have bed end raised up to 30-45 degrees unless contraindicated. Maintenance of head end of bed few degree from horizontal is contraindicated in certain conditions such as decubitus ulcers, hemo-dialysis, hypotension, pelvic or spine instability or in patients in palliative care due to terminal illness.¹⁶ Smudlers documented in his study that bed elevation from head end side decreases the gastric aspiration in these patients and hence is an important tool to decrease the chances of

pneumonia.¹⁷ Goncalves also stated in his study that 64% of staff members raise the bed end to avoid VAP. In our study the only 16% of the nurses follow this protocol strictly. He also documented that oral hygiene is maintained by 60% of the staff members.¹⁸ Another similar study conducted by Sole showed that only 26 % of the staff members perform oral suctioning when only needed¹⁹ whereas our study reports that 29.5% of the staff perform suctioning only as needed as mentioned earlier. As practically well stated that oral secretions contain multiple pathogens, such critical patients due to unconsciousness and lack of gag reflex easily aspirate these secretion leading to VAP. So it is extremely important to suction these oropharyngeal secretions.²⁰

Preventing ventilated associated pneumonia through oral care is a vital step to avoid the development and spread of antibiotic and multidrug-resistant pathogens. Research has emphasized that oral care is an important intervention in the reduction of VAP. Implication of oral care protocols and education programs has demonstrated positive outcomes on VAP rates. The application of proper oral care protocol has reduced up to 89.7% in the VAP rate in mechanically ventilated patients.²¹ Garcia also documented the same fact that use of oral hygiene protocol significantly reduces the rate of VAP and related cost of the patients.²² Munro in his study declared that oral swabbing with chlorohexidine (0.12%) twice daily is a better choice for maintain oral hygiene in patients kept on ventilators.²³ In addition to that Sole also stated that swabbing of oral cavity of patients receiving mechanical ventilator is an important fact to decrease oral pathogens. According to him 53% of patients receive oral swabbing every 4 hourly and in our study 52% of patients receive swabbing of teeth every 4

hourly. He also documented that 36% of healthcare providers change the tonsil suction device (Yankauer) device only when it required and 6% usually do not rinse it where as 73% of staff members store the device in original packing.²⁴ Whereas in our study, the percentage of nurses was 8%, 7.5% and 48% respectively.

Ricart documented that overall proper adherence of the staff members to the describe protocol is only 22.3% for prevention of ventilator associated pneumonia. The reason behind this small ratio is the lack of sources, patient discomfort, and fear of adverse effects and cost of the materials.²⁵

In addition to this it has been observed by Hawe that education of the staff members would decrease the rate of VAP and in his study the incidence was markedly decreased from 19.2 to 7.5 per 1000 patients on ventilator.²⁶ Therefore it has been suggested that the protocol and measures should be revised and audited on regularly basis. Workshops and face to face teaching and meetings should also be arranged and feedback should also be collected from the health care providers. These would not only decreases the quarries and problems of staff members but also give a strong impact on the staff and higher authorities for the implementation of the protocols and thus could possibly decrease the incidence of lethal ventilation associated pneumonia.²⁶⁻²⁸

Conclusion:

It has been observed that CDC guidelines are not properly followed and practiced by the paramedical staff members. Huge divergence present of what is being exercise and what should be implemented and practiced by the health care providers. Strong robust measures should be taken on every possible level to

decrease the numeral of such lethal hospital acquired ventilator associated infection.

Limitation

Since this is a limited sample size study it opens an avenue for other researcher to carry this out with large sample size to have the clear picture of the facts. Secondly, since it is a self-reported study with great possibility of bias from participants' therefore direct observational study could be a better option if possible to assess the facts directly.

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pneumonia in Thailand. Joint Commission journal on Quality and Patient Safety 2007; 33(7): 384-94.

Table 1

Guidelines for the prevention of ventilator-associated pneumonia by the Centres for Disease Control and Prevention

1. Wash hands after contact with mucous membranes, respiratory secretions, or objects contaminated with respiratory secretions. Wash hands before and after contact with Patients.
2. Educate healthcare workers about nosocomial bacterial pneumonias and infection control procedures used to prevent these pneumonias.
3. Wear gloves for handling respiratory secretions or objects contaminated with respiratory secretions.
4. Provide subglottic suctioning before deflating the cuff of an endotracheal tube or before moving the tube.
5. Elevate the head of the bed to 30° to 45° if not contraindicated.
6. Develop and implement a comprehensive oral hygiene program to provide oropharyngeal cleaning and decontamination with or without an antiseptic agent.
7. Use Chlorhexidine Gluconate antiseptic rinse during the perioperative period in adult patients who undergo cardiac surgery.

Table 2**Socio-Demographic characteristics Of Health Care Providers (n=200)**

Characteristics	Frequency	Percentage
Years of experience		
0-3	40	20.0
4-6	55	27.5
7-9	47	23.5
10-12	43	21.5
13-15	8	4.0
16-18	7	3.5
Nursing education level		
Diploma nurse	146	73.0
BSN	54	32.0
Hold CCRN certification		
yes	117	58.5
no	83	41.5
Type of working unit		
General ICU	138	69.0
CCU	26	13.0
Surgical or trauma ICU	16	8.0
pulmonary ICU	13	6.5
other	7	3.5
No of bed in a hospital		
<100	79	39.5
100-499	42	21.0
>500	70	35.0
not sure of it	9	4.5

Table 3

Practice Of CDC Guide Lines By Health Care Providers (n=200)

Nursing practices	Frequency	Percentage	By Cason et al ¹⁴ (%)
Hand washing between patients			
rarely	4	2.0	<1
Sometime	25	12.5	1
Frequently	76	38.0	17
Always	95	47.5	82
Use gloves			
Rarely	04	2.0	<1
Sometime	32	16.0	3
Frequently	06	3.0	19
always	158	79.0	77
Subglottic suctioning			
Rarely or not at all	26	13.0	10
Sometimes	26	13.0	8
Frequently	42	21.0	12
Always	75	37.5	36
Respiratory therapist intervention	31	15.5	32
Bed elevated 30-45 degree			
0%	35	17.5	52
25%	75	37.5	34
50%	37	18.5	9
75%	21	10.5	4
100%	32	16.0	<1
VAP rate in their unit			
Does not know the rate	128	64.0	68
Know the rate	72	36.0	32
Employer has oral written protocol			
Yes	150	75.0	56
No	20	10.0	25
Not sure of it	30	15.0	17

Table 4

Practice Of Oral Care By Health Care Providers (n=200)

Oral suctioning	Frequency	Percentage	By Cason et al ¹⁴
Every 2 hourly	48	24.0	50
Every 4 hourly	64	32.0	19
Every 8-12 hourly	29	14.5	3
Only as needed	59	29.5	27
Frequency of swabbing			
Every 2 hourly	45	22.5	46
Every 4 hourly	104	52.0	35
Every 8-12 hourly	43	21.5	10
Rarely or not at all	8	4.0	6
Frequency of teeth brushing			
Every 4 hourly	69	34.5	16
Every 8-12 hourly	50	25.0	49
Rarely or not at all	26	13.0	23
Only as needed	49	24.5	10
Use of antiseptic solution			
Chloralhexidine gluconate	51	25.5	26
Mouth wash	137	68.5	38
Hydrogen per oxide	9	4.5	27
Other	2	1.0	2
none	0	0	4
I m not sure	1	0.5	4

Table 5**Practices for the Use of Suction Devices by Health Care Providers (n=200)**

	Frequency	Percentage	By Cason et al ¹⁴
Cleansing of patient suction device			
Rarely	16	8.0	3
Only if visible mucus present	73	36.5	33
After each use	102	51.0	60
I do not usually rinse	9	4.5	3
Rinse yankauer device			
Tap water	44	22.0	57
Sterile water	99	49.5	209
Sterile saline	33	16.5	296
I do not usually rinse	15	7.5	17
Not applicable	9	4.5	0
Store yankauer suction device			
Original packing	96	48.0	74
Taped to the ventilator	78	39.0	17
Looped around the side rail	20	10.0	3
On a shelf	1	0.5	3
other	5	2.5	3
Replacement of suction yankauer device			
Every 12 hourly	62	31.0	13
Every 24 hourly	51	25.5	51
Every 48 hourly	45	22.5	4
Every 72 hours	1	0.5	3
Rarely or not	20	10.0	4
Only as needed	16	8.0	22
Not applicable	5	2.5	0