

**Assessing Clinical Practice to Prevent Ventilator Associated Pneumonia**

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**University Honors Program Research Project**

**APPROVAL PAGE**

Student Name: Alex M. Witcher

Department: Nursing

College: College of Nursing

Degree: Bachelors of Science Nursing

Project Advisor: Dr. Pamela O'Neal

Full title of project as it should appear in Graduation Program and transcript:

Assessing Clinical Practice to Prevent Ventilator Associated Pneumonia

Abstract:

**Background**

Development of VAP increases ventilator days, critical care and hospital lengths of stay (LOS), and results in greater \$11,000 additional costs / VAP case.

One recommended nursing strategy to reduce the risk of VAP is to increase the head of bed greater than 30 degrees. When a client needs the use of an artificial airway, a nursing implementation such as making sure the head of bed (HOB) is greater than or equal to thirty degrees can play a key role in the prevention of aspiration. **Methods**

In a descriptive study, observational data was obtained from the intensive care units of a southeast region hospital. The head of bed (HOB) was manually measured with a protractor and compared with the computerized bed measurement. The sample size was 95 HOB observations in the intensive care settings. University institutional review board and the hospital institutional review committee approvals were obtained.

**Results**

The protracted measurements (PM) ranged from six to forty degrees, while the reading from the computerized beds measurements (CBM) from two to forty-five degrees. Twenty one percent of the all PM and CBM readings from 168 observations measured HOB greater than or equal to the recommended thirty degrees. Findings indicate eighty percent of PM HOB readings were less than 30 degrees, and these patients are at a higher risk for VAP..

**Discussion**

The difference between PM and CBM readings is concerning in clinical practice because the majority of the patients in the study were less than thirty degrees, and evidence recommends improved patient outcomes when the head of bed is thirty degrees or higher. Further research is needed to identify quality standards of care related to head of bed computerized read-out accuracy.

Approved by:

Project Advisor: \_\_\_\_\_ Date: \_\_\_\_\_  
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Department Chair: \_\_\_\_\_ Date: \_\_\_\_\_  
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University Honors Program Director: \_\_\_\_\_ Date: \_\_\_\_\_  
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## **Abstract**

The purpose of this descriptive study was to examine common practices of head of bed (HOB) positioning in the intensive care and compare a HOB protracted measurement (PM) to a computerized bed measurement (CBM) reading.

### **Background**

Development of VAP increases ventilator days, critical care and hospital lengths of stay (LOS), and results in greater \$11,000 additional costs / VAP case.

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### **Discussion**

The difference between PM and CBM readings is concerning in clinical practice because the majority of the patients in the study were less than thirty degrees, and evidence recommends improved patient outcomes when the head of bed is thirty degrees or higher. Further research is needed to identify quality standards of care related to head of bed computerized read-out accuracy.

## **Assessing Clinical Practice to Prevent Ventilator Associated Pneumonia**

### **Introduction**

Polices and procedures that are implemented on evidence based nursing practice are in place for clinicians to safely implement care to provide a client with the best approach to his/her healing process. Implementations such as the clinicians washing his/her hands and having the client's head of bed (HOB) above thirty degrees can promote safety and prevent a hospital acquired nosocomial infection. It is very important for nurses to become educated about standard of care practices and implement these procedures safely in order to promote optimal outcomes. According to evidence based practice, if all the steps in preventing VAP were followed then a large percentage of VAP cases could be eradicated. A poll has shown between 250,000 and 300,000 cases per year occur in the United States alone, which is an incidence rate of five to ten cases per 1,000 hospital admissions (Koenig, 2006). Morbidity and mortality associated with the development of VAP is high, with mortality rates ranging from twenty to forty-one percent. Development of VAP increases ventilator days, critical care and hospital lengths of stay (LOS), and results in greater \$11,000 additional costs / VAP case (Warren 2008).

### **Literature Review**

#### *Why A Patient Would Need A Ventilator*

Clients needing a ventilator would be such cases as those who may become very ill and lose the ability to breath on his/her own such as Acute Respiratory Distress Syndrome or those that have elective/medical surgery performed. Any patient who has severe compromised gas exchange and difficulty breathing would need mechanical assistance to assist with effective and efficient gas exchange to maintain appropriate oxygenation of the tissues.

### *Ventilator Associated Pneumonia*

Ventilator associated pneumonia (VAP) is a lung infection or pneumonia that develops in a person who is on a ventilator and is classified as a nosocomial infection. Nosocomial infections are infections, which are a result of treatment in a hospital or a healthcare service unit.

Pneumonia is an inflammation of the lungs, usually caused by infection. Bacteria, viruses, fungi or parasites can cause pneumonia. A ventilator is a machine that helps a patient breathe by providing oxygen through a tube. The tube can be placed in a patient's mouth, nose, or through a hole in the front of the neck, known as a tracheotomy. The tube is then connected to a ventilator that is used to deliver oxygen to the patient in order to maintain life by providing oxygen to his/her tissues.

(VAP is one of the biggest problems faced in critical care nursing (Aragon, 2008). A combination of bacterial damage and consequences of the immune response lead to disruption of gas exchange with resulting symptoms hypoxemia, which is defined as a decrease in arterial O<sub>2</sub> tension and saturation (Lewis, 2007)

### *Preventing Ventilator Associated Pneumonia*

VAP remains one of the leading nosocomial illnesses to affect mechanically ventilated patients. Prevention of VAP is now considered a core measure for monitoring and improving patient care among critically ill patients according to Joint Commission on Accreditation of Healthcare Organizations (JCAHO). The prevention of VAP includes a list of protocols that in essence should be followed at all possible. It is suggested to keep the head of the patient's bed raised between thirty and forty-five degrees unless other medical conditions do not allow this to occur; check the patient's ability to breathe on his or her own every day so that the patient can be taken off of the ventilator as soon as possible; clinicians clean his/her own hands with soap and

water or an alcohol-based hand rub before and after touching the patient or the ventilator; clean the inside of the patient's mouth on a regular basis; and clean or replace equipment between use on different patients (Augustyn, 2007). Another intervention that has been added to the list is that of vibro-percussion on the clients back in order to break up the secretions when the nurse implements suctioning to promote optimal removal of secretions and facilitate effective gas exchange.

#### *Ventilator Associated Pneumonia: Head of Bed Elevation*

When a client needs the use of an artificial airway an implementation such as making sure the head of bed (HOB) is greater than or equal to thirty degrees can play a key role in the prevention of aspiration. When the HOB is lower than thirty degrees, this will place the client at risk for aspiration due to the angle of the esophagus. In a case such as if the client has gastroesophageal reflux disease (GERD) then they can simply aspirate stomach contents or acid and cause a translocation of bacteria from the gastrointestinal tract to the lungs. Another venue could occur from oral secretions that simply slide down into the oropharynx and down the endotracheal tube into a patient's lungs. In a study conducted in 1999 by Drakulovic, the use of semi-recumbent position, elevating the HOB equal to or greater than thirty degrees, was associated with a twenty-six percent absolute risk reduction of clinically suspected nosocomial pneumonia and an eighteen percent absolute risk reduction in aspiration pneumonia (Koenig, 2006). Something as simple as raising the head of the bed can help in the prevention of pneumonia. It is important for clinicians to understand that even basic implementations can be life saving to our patients.

### *Measuring the Head of Bed Correctly*

When measuring the degree of angle (DOA) of the HOB, often times we use the instruments that let us know the angle. Could this instrument be giving an incorrect DOA? Chad Hiner wrote in 2007 there are also many clinicians that determine the DOA by perception and conjecture. His study revealed that fifty percent of nurses and fifty-three percent of physicians correctly identified the DOA between 25 degrees and 35 degrees. The HOB needs to be measured in order to properly manage a hospital's protocol for the prevention of VAP. Many nurses do not understand the difference that a 5-10 degree increase in HOB can make in their ventilated clients outcome.

### **Methods**

In a descriptive study, observational data was obtained from the intensive care units of a southeastern region hospital. Institutional review board approval was obtained from the university, and Institutional Review Committee approval was obtained from the hospital. The HOB degree of elevation was measured for compliance with the current evidence based practice in the prevention of VAP. A protractor was used to verify the accuracy to that of the manufactured beds' reading. The HOB was manually measured by using a protractor at the backrest elevation gatch on the bed and compared with the reading from the bed's internal measuring device. The computerized bed measurement (CBM) is a digital readout on the bed.



Figure 1. HOB Elevation 30°

## Results

Regarding HOB elevation, the protracted measurements (PM) ranged from six to forty degrees, while the reading from the computerized beds measurements (CBM) from two to forty-five degrees. Twenty percent of the PM from a total sample of 95 measured HOB greater than or equal to the recommended thirty degrees. Findings indicate eighty percent of PM HOB readings were less than 30 degrees, and these patients are at a higher risk for VAP. A sample of 73 CMB readings indicated that seventy eight percent of the HOB observations were at or greater than thirty degrees. This is concerning in clinical practice because the majority of the patients in the study were less than thirty degrees, and evidence recommends improved patient outcomes when the head of bed is thirty degrees or higher. .

After cleaning of the data, all missing data were removed, and the remaining sample was 73 PM and CBM for a total of 146 measurements reviewed. The missing data was primarily related to some of the bed not having the digital readout of the HOB. Only fifteen percent of PM and CBM measurements were the same. This demonstrates inaccuracy between the PM and CBM readings leading to the question what is the correct measurement of HOB position of the client?

The HOB PM was compared to the CBM, and findings indicated that there were differences between these two measurements. Differences between the PM and CBM ranged from -9 to 20 degrees. HOB CBM revealed forty percent of the beds were at a higher backrest elevation than the PM. The HOB PM indicated forty-five percent of the beds were at a higher backrest elevation than the CBM.

Another measurement that was taken into consideration was how much does the measurement vary from the six different CBM as compared to the PM? The data showed that

Stryker beds had an average PM of 25° and average CBM of 20° giving the average difference of 4°. Renaissance bed type showed an average PM of 18° and average CBM of 19° with an average difference of -1°. Hill Rom bed manufacturer showed an average PM of 23° and average CBM 18° with an average difference of 5°. Epic II beds showed an average PM of 20° and CBM 26°, with an average difference of -4°. Stryker Zoom bed type showed an average PM of 22° and an average CBM of 22° and an average difference of 1°.

### **Limitations**

An assumption to this study that may be a limitation is that the PM is the most accurate measurement. An additional limitation of the study was all beds did not have CBM HOB readings. Another limitation was six different beds were used in the units. This heterogeneous sample and by nature of the number of different beds contributes to confounding variables not taken into consideration for purposes of this study.

### **Discussion/Implications for Practices**

While the current HOB elevation recommendation is greater than or equal to thirty degrees, the actual physical measurement and readout from the equipment varied widely a matter of twenty nine degrees. The study assessed accuracy with the assumption that the PM was more accurate than the CBM. The study finds that the reliability and validity of the CBM is questionable. Could it be that the beds need to be calibrated related to the HOB read out? Is this possible with all manufacturers? How is the bed HOB readout computed?

Further research is needed to identify quality standards of care related to oral suctioning placement and storage and head of bed computerized read-out accuracy. Clinical evaluation of the angle of head of bed elevation tends to overestimate the angle of elevation by use of the bed reading at the foot of the bed. Measurement of the head of bed elevation from the side of the bed

by use of a protractor, rather than the bed reading at the foot of the bed has shown to be more accurate. It is suggested that the use of the protractor will ensure that the ventilator associated pneumonia protocols related to HOB positioning are in effect.

### **Acknowledgements**

Thank you to Dr. O'Neal, Dr. Bernard Vogler, Dr. Harry Delugach, UAHuntsville College of Nursing, UAHuntsville Internal Review Board, and Huntsville Hospital Review Committee. The research was funded and supported by the UAHuntsville Research Experience for Undergraduates.

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Alex M. Witcher & Pam D. Terry  
c/o Dr. Pamela O'Neal  
College of Nursing  
University of Alabama in Huntsville  
Huntsville, AL 35899

July 2, 2009

Dear Mr. Witcher and Ms. Terry,

As chair of the IRB Human Subjects Committee, I have reviewed your proposal, *Comparison to Determine if Suction Tubing Length Compromises Suction Strength*, and have found it meets the necessary criteria for exemption from review according to 45 CFR 46. I have approved this proposal, and you may commence your research. Please note that this approval is good for one year from the date on this letter. If data collection continues past this period, a renewal application must be filed with the IRB.

Please contact me if you have any questions.

Sincerely,

A handwritten signature in black ink, appearing to read "Nicholas Jones".

Dr. Nicholaos Jones  
Chair, UHSC

OFFICE OF THE VICE PRESIDENT FOR RESEARCH  
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July 10, 2009

Mr. Alex M. Witcher  
Ms. Pam D. Terry  
UAH School of Nursing  
University of Alabama-Huntsville  
202 Nursing Building  
Huntsville, AL 35899

RE: Request for Institutional Review Committee Exemption of Study -  
Comparison to Determine if Suction Tubing Length Compromises Suction

Dear Mr. Witcher and Ms. Terry:

Thank you for forwarding the application for Institutional Review Committee exemption to me for your proposed nursing study. Dr. John Cox, Chair has reviewed your information and agreed that this study does qualify for exemption.

If you have any questions or I can be of further service, please feel free to call me at 265-6990.

Sincerely,

A handwritten signature in cursive script that reads "Allison E. Greene".

Allison E. Greene, Division Assistant/  
Institutional Review Committee Coordinator

cc: Karol Jones, Chief Nursing Officer



101 Sivley Road • Huntsville, Alabama 35801 • 256/265-1000

July 23, 2009

Mr. Alex M. Witcher  
Ms. Pam D. Terry  
UAH School of Nursing  
University of Alabama-Huntsville  
202 Nursing Building  
Huntsville, AL 35899

RE: Request for Institutional Review Committee Exemption of Study -  
Comparison to Determine if Suction Tubing Length Compromises Suction  
Revisions to Study (Attached)

Dear Mr. Witcher and Ms. Terry:

Thank you for forwarding the revisions to your nursing study. I have reviewed the information and agree that this study does continue to qualify for exemption with the revisions submitted.

If you have any questions or I can be of further service, please feel free to call me at 265-6990.

Sincerely,

A handwritten signature in cursive script that reads 'Allison E. Greene'.

Allison E. Greene, Division Assistant/  
Institutional Review Committee Coordinator

/Attachment

cc: Karol Jones, Chief Nursing Officer