Clinicians' Perception of Head-of-Bed Elevation
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**Background**  Head-of-bed elevation of 30° to 45° is important in preventing ventilator-associated pneumonia, but clinicians’ perception and determination of head-of-bed elevation are not widely reported.

**Objectives** To (1) document the accuracy of clinicians’ perception of head-of-bed elevation, (2) document methods clinicians use to determine the head-of-bed angle, and (3) assess knowledge of recommended head-of-bed elevation.

**Methods** Clinicians (n = 175) viewed a simulated patient with head of bed elevated 30° and elevation gauge concealed. They answered 3 questions: What is the level of the head of the bed? What head-of-bed elevation is associated with decreased incidence of ventilator-associated pneumonia? When providing care, how do you routinely determine the head-of-bed elevation?

**Results** Fifty percent of 89 registered nurses and 53% of 39 physicians identified head-of-bed elevation correctly (±5°). Head-of-bed elevation was perceived accurately by 86% of 21 respiratory therapists, 63% of 16 medical assistants, and 50% of 10 physical/occupational therapists. Ninety-five percent of nurses and respiratory therapists, 79% of physicians, 90% of physical/occupational therapists, and 46% of medical assistants correctly identified the head-of-bed angle associated with decreases in occurrence of ventilator-associated pneumonia. Techniques for determining the angle varied; 58% of respondents reported using the gauge.

**Conclusions** Head-of-bed angle was perceived correctly by 50% to 86% of clinicians. Nurses tended to underestimate the angle, whereas other clinicians tended to overestimate. Nurses, respiratory therapists, and physical/occupational therapists showed the best understanding of the correct angle for minimizing occurrence of ventilator-associated pneumonia. Elevation gauges were most often used to determine the angle.

Ventilator-associated pneumonia (VAP) is defined as pneumonia in a patient receiving mechanical ventilation that was neither present nor developing at the time of intubation. VAP increases patients’ mortality rate, length of stay, and cost. VAP is the leading cause of death due to nosocomial infections and the second most common nosocomial infection in the United States. Head-of-bed (HOB) elevation is one of the strategies included in clinical care bundles designed to reduce or prevent the occurrence of VAP. The 2003 guidelines of the Centers for Disease Control and Prevention recommend elevation of the HOB at an angle between 30º and 45º to prevent VAP. HOB elevation at this level is the first of 4 components recommended by the Institute for Healthcare Improvement for prevention of VAP. Most recently, HOB elevation was recognized by the Joint Commission as 1 of its “core measures” for monitoring and improving care among critically ill patients.

Despite current evidence that use of preventive care bundles that include HOB elevation effectively reduces VAP and professional recommendations and guidelines for care, compliance is poor when it comes to raising the HOB to an acceptable level. In some instances, recommendations for HOB elevation are not routinely implemented among intubated patients. Grap et al reported that the mean level of backrest elevation, randomly collected on 170 intensive care unit (ICU) patients, was 19.2º and that 70% of the patients were supine. Backrest elevation for intubated patients was lower than backrest elevation for nonintubated patients. In a recent study of 702 patients in 66 intensive care units in Canada that used several methods to evaluate the use of VAP-reducing interventions, the mean HOB elevation was less than 30º. Further, in a recent survey of implementation of best practices related to VAP prevention, only half of the 1200 nurses reported elevating the HOB.

Clinicians’ perception of HOB elevation may play a significant role in helping to achieve the goal of elevating the HOB 30º to 45º. Dillon et al reported that registered nurses were accurate in estimating bed angles. Critical care nurses have the primary responsibility of positioning patients and play a significant role in ensuring adherence to the guidelines. However, critically ill patients are seen by multidisciplinary teams who also participate in care and the translation of guidelines into practice. Perception of HOB elevation has not been compared among different types of clinicians.

Various clinicians’ knowledge of guideline recommendations for preventing VAP may play a role in meeting the guidelines for HOB elevation. Authors of a 2007 study on implementation of VAP guidelines reported that nurses who were formally educated about the guidelines were more likely to implement the recommended practice changes. The reported areas of most significant improvement were HOB elevation and charting of the HOB elevation. Education related to VAP prevention has been ongoing at our academic medical center and has focused on nurses practicing in the critical care units. It is therefore unknown how many clinicians from other disciplines are aware of the recommended HOB elevation levels.

Another potential component of the adoption and implementation of recommendations for HOB elevation is how clinicians determine the angle of the HOB. To our knowledge, data on this topic have not been reported. In our clinical experience, the methods used appear to vary widely because of the variety of beds used in ICUs. We conducted this study to evaluate the accuracy of clinicians’ perception of HOB elevation and the methods that clinicians use to determine the HOB angle. In addition, we assessed clinicians’ knowledge of recommended HOB elevation.

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of care for patients receiving mechanical ventilation. The angle was verified with an external measuring device, commonly referred to as an inclinometer, used primarily by carpenters for precise measurement of angles and not subject to the inaccuracies associated with digital readouts. The HOB elevation was verified each time the model was taken to a different unit for data collection. The gauge indicating HOB elevation on the bed frame was concealed, and the bed did not have a digital readout attached. The mannequin was prepared with an endotracheal tube, cervical collar, egg-crate headrest, hospital gown, blanket, and one pillow placed under each arm in order to simulate a critically ill patient. The bed was set with a knee bend of 15°.

Clinicians were asked to stand 2 feet (0.6 m) away from the foot or side of the bed and to ascertain the HOB angle. Clinicians were then asked to record their findings on a survey form and to answer 2 additional questions: (1) what is the HOB level that has been associated with decreasing the incidence of VAP? and (2) when caring for your patients, how do you routinely determine the angle of the patient’s HOB? The mannequin was transported to 7 ICUs at various times throughout the day, evening, and night shifts. When it was not in transport, the mannequin was kept on the surgical ICU, where staff nurses surveyed various clinicians while they were entering the unit. The survey took approximately 5 minutes to complete and data were collected for 2 weeks.

Results

Overall, the results ranged from 15° to 60°. HOB elevation was identified correctly (±5°) by 50% of nurses and 53% of physicians; the correct range was estimated at between 25° and 35°. Accuracy of perceptions of HOB elevation for other participants is shown in the Figure. Ninety-five percent of nurses and respiratory technicians, 79% of physicians, 90% of physical/occupational therapists, and 46% of hospital/medical assistants correctly identified the HOB angle associated with a decrease in VAP. The reported technique used in determining the angle of the HOB varied among providers. Overall, 58% of clinicians reported using the gauge on the bed, 30% reported guessing, 6% asked the nurse, and 6% were unsure. The level of training for all providers was not part of our data collection. However, all of our data were collected in the ICUs.

Discussion

The purpose of this study was to describe clinicians’ ability to estimate HOB elevation levels, to assess their knowledge of recommended HOB
guidelines, and to ascertain how they determine the angle of the HOB in their practice.

The roughly 50% accuracy of perceived HOB angle compared with the actual angle among nurse and physician providers suggests that clinicians cannot simply rely on “eyeballing” HOB elevation levels. Results of this study differ from a previous study done by Grap et al., in which nurses estimated HOB angles. Their findings indicated that nurses do not need additional assistance to estimate bed angle accurately. One interesting finding in our study was that nurses had a tendency to underestimate the angle whereas other clinicians overestimated the angle.

A high percentage (95%) of nurses in this study demonstrated accurate knowledge of the recommended HOB elevation levels associated with VAP prevention. This result suggests that education related to VAP prevention and associated recommendations for HOB elevation is quite effective and that most nurses are aware of the recommendations. We were not surprised that nurses and respiratory therapists showed the most consistent and highest percentage with accurate knowledge, because these groups have received focused education about VAP prevention therapies. Although understanding may be high, actual implementation in practice varies.a The fact that the Joint Commission is weighing in with their mission’s guidelines play.


Abbott CA, Dremsa T, Stewart DW, Mark DD, Swift CC. Adoption of a ventilator-associated pneumonia clinical practice guideline. Worldviews Evid Based Nurs. 2006;3:139-152.


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**Conclusion**

Our findings suggest that clinicians cannot simply rely on observing the HOB angle to establish the correct HOB in practice. Results also suggest that ongoing education related to VAP prevention and recommendations for HOB elevation is effective in ensuring that clinicians know the best practices. Further studies are needed in order to understand clinicians’ behavior related to implementation of VAP guidelines. It is difficult to explain the low compliance rate despite clinicians’ adequate knowledge and to understand what role the Joint Commission’s guidelines play.