

Oral Care and Ventilator Bundle Reduces VAP

Linda Bugg, RN, Manager ICMS ; Laurie Downs, CCRN, Manager Coli Critical Care; and Paula Blankenship, RN, Infection Control Specialist ■ Mission Health System, Asheville, NC

Objective of the intervention

The goal of the project was to reduce rates of ventilator-acquired pneumonia (VAP) by 50% in combined adult intensive care units (ICUs) within 6 months of project initiation.

Inspiration behind the intervention

VAP is the leading cause of death of all hospital-acquired infections, exceeding the rate of death due to central line infections, severe sepsis, and respiratory tract infections in non-intubated patients. Perhaps the most serious aspect of VAP is the high rate of associated mortality. The mortality rate for ventilated patients who develop VAP is 46%, compared with 32% for ventilated patients who do not develop VAP. Additionally, each case of VAP is associated with \$40,000 in increased costs. Therefore, a reduction in VAP rates will save lives and reduce hospitalization costs.

Background

- VAP is a nosocomial infection that occurs in patients receiving mechanical ventilatory support for at least 48 hours.¹
- The mortality rate of ventilated patients with VAP is 46% compared with 32% for ventilated patients who do not develop VAP.²
- It is estimated that each case of VAP increases hospitalization costs by about \$40,000.³
- To reduce the occurrence of VAP, the Institute for Healthcare Improvement (IHI) developed a series of interventions known as the “ventilator bundle.” The intervention involves elevation of the head of the bed to 30°, daily breaks in sedation, daily assessment of the readiness to extubate, peptic ulcer disease prophylaxis, and deep venous thrombosis prophylaxis.⁴⁻⁶
- Proper education of the health care staff and daily monitoring of compliance with the ventilator bundle are crucial to the success of this intervention program.⁷⁻⁹
- Routine oral care with the use of a hydrogen peroxide-containing kit administered in conjunction with the ventilator bundle results in a further reduction in VAP rates.^{10,11}

Intervention methods

- The rate of VAP, calculated as the number of cases per 1000 ventilator days, in patients in adult ICUs was compared with the historical control rate.
- An IHI VAP team was established to review current VAP initiatives.
- Health care staff was educated on the ventilator bundle, oral care, and prevention of VAP.
- The ventilator bundle was implemented in all adult ICUs and step down units caring for adult ventilated patients. All members of the patient care team collaborated to implement the ventilator bundle.
- A formal process was developed to evaluate compliance with the following IHI ventilator bundle initiatives:
 - Elevate the head of the bed to 30°
 - Provide a daily sedation vacation and assess the readiness to extubate
 - Provide peptic ulcer disease prophylaxis
 - Provide deep vein thrombosis prophylaxis (unless contraindicated)
 - Review current oral care procedures, add oral care to the ventilator bundle, and change oral care procedure to an oral cleansing and suction system
 - Perform oral care every 2 hours with an oral care kit that contains a hydrogen peroxide-containing oral rinse and a mouth moisturizer
 - Perform tooth brushing twice daily
- Daily audits of ventilator bundle compliance were performed, and the audit results were communicated weekly to all involved units.
- Audit results were reported to individual ICUs, the IHI VAP Team, the Adult Critical Care Committee, and the Infection Control Surveillance Committee.

Results

- **Reduced incidence of VAP as a result of the prevention interventions**
 - The rate of VAP was 0% for 471 consecutive days in the medical-surgical ICU (Memorial Campus) and for 430 consecutive days in the Coli ICU (St. Joseph's Campus).

Lessons learned

- The intervention program (education of staff, daily checks of compliance with the ventilator bundle, and implementation of a new oral care protocol) resulted in a decrease in VAP rates in all adult ICU patients (including the neurotrauma and cardiovascular ICUs). After the bundle was implemented, no cases of VAP occurred for 471 consecutive days at the Memorial Campus medical-surgical ICU and for 430 consecutive days at the Coli medical-surgical ICU (St. Joseph's Campus).
- Education of the staff about the benefits of VAP prevention, the proper implementation of the VAP bundle, and routine oral care procedures improved the rate of compliance needed to prevent VAP.
- The implementation of a formal procedure to evaluate compliance with the IHI ventilator bundle initiatives (elevate the head of the bed to 30°, daily sedation vacation, assessment of readiness to extubate, peptic ulcer disease prophylaxis, and deep venous thrombosis prophylaxis when indicated) helped to reduce the risk of VAP.
- The addition of an oral care procedure (tooth cleansing twice daily and oral care every 2 hours—suctioning secretions, rinsing the mouth with an anti-plaque solution, and applying moisturizer) to the ventilator bundle and the change to the Q2 oral cleansing and suction system reduced oral bacterial counts, which helped to reduce the risk of VAP.
- The implementation of weekly audits and the dissemination of the audit results to the other team members encouraged compliance and reinforced the benefits of the prevention interventions.

References:

1. Rello J, Ollendorf DA, Oster G, et al. VAP Outcomes Scientific Advisory Group. Epidemiology and outcomes of ventilator-associated pneumonia in a large US database. *Chest*. 2002;122(6):2115-2121.
2. Ibrahim EH, Tracy L, Hill C, et al. The occurrence of ventilator-associated pneumonia in a community hospital: risk factors and clinical outcomes. *Chest*. 2001;120(2):555-561.
3. Tablan OC, Anderson LJ, Besser R, et al. Guidelines for preventing health-care-associated pneumonia, 2003: recommendations of CDC and the Healthcare Infection Control Practices Advisory Committee. *MMWR Recomm Rep*. 2004;53(RR-3):1-36.
4. Burger CD, Resar RK. “Ventilator bundle” approach to prevention of ventilator-associated pneumonia. *Mayo Clin Proc*. 2006;81(6):849-850.
5. Cocanour CS, Peninger M, Domonoske BD, et al. Decreasing ventilator-associated pneumonia in a trauma ICU. *J Trauma*. 2006;61(1):122-129.
6. Tolentino-DelosReyes AF, Ruppert SD, Shiao SY. Evidence-based practice: use of the ventilator bundle to prevent ventilator-associated pneumonia. *Am J Crit Care*. 2007;16(1):20-27.
7. DuBose JJ, Inaba K, Shifflet A, et al. Measurable outcomes of quality improvement in the trauma intensive care unit: the impact of a daily quality rounding checklist. *J Trauma*. 2008;64(1):22-27; discussion 27-29.
8. Westwell S. Implementing a ventilator care bundle in an adult intensive care unit. *Nurs Crit Care*. 2008;13(4):203-207.
9. Institute for Healthcare Improvement 5 Million Lives Campaign. Available at: <http://www.ihc.org/IHI/Programs/Campaign/Campaign.htm?TabId=1>. Accessed November 5, 2008.
10. Fields LB. Oral care intervention to reduce incidence of ventilator-associated pneumonia in the neurologic intensive care unit. *J Neurosci Nurs*. 2008;40(5):291-296.
11. Blamoun J, Alkafir M, Rella ME, et al. Efficacy of an expanded ventilator bundle for the reduction of ventilator-associated pneumonia in the medical intensive care unit. *Am J Infect Control*. [Epub ahead of print 20 October 2006].

