

Comprehensive Quality Improvement Program in Magnet Facility ICU Significantly Reduces Incidence of Ventilator-Associated Pneumonia (VAP)

Kara Heck BSN, RN-BC, Clinical Nurse Educator ICU/TU; Holland Hospital

ABSTRACT

Issue: Ventilator acquired pneumonia (VAP) is a serious hospital acquired infection associated with increased patient length of stay, morbidity and mortality, and expenditures. National health prevention initiatives are underway to prevent the development of VAP, such as the Keystone Intensive Care Unit (ICU) program. The Keystone ICU program has a toolkit which assists facilities in implementing a "Plan, Do, Study, Act" (PDSA) quality improvement (QI) intervention to improve outcomes in mechanically ventilated patients.

Project: Our hospital is an ANCC Magnet facility with an 8-bed ICU. The ICU delivers care to a broad spectrum of diagnoses. This facility does not provide open heart surgeries or care of high level trauma patients. The ICU had an oral care program in place but VAP incidence rates were elevated. The facility implemented the recommendations of the Keystone ICU Program, which included a revised oral care policy and procedure that was instituted on 10/01/08. The oral care program consisted of the following procedures: 1) Staff performed tooth brushing and application of 10 ml of chlorhexidine gluconate to all surfaces of the mouth Q12H; 2) staff performed oral care with antiseptic swabs, mouth moisturizer, and removal of secretions from on top of the endotracheal cuff Q4H; 3) staff used an oral care kit at the patient's bedside to assist with the above requirements.

Results: The time periods were balanced to 13 months each, with pre-intervention from 09/07 to 09/08, and post-intervention 10/08 to 10/09. With data from over 1,200 observations there was adequate statistical power to detect the difference of 10 in VAP rate as statistically significant with an alpha level of 5% and a beta level of 20%. Fisher's exact test was used to assess the change in the VAP rate over time. The data revealed a statistically significant reduction in the VAP rate from 10 (1000x[7/670]) to 0 (1000x [0/623]);(test statistic = 6.5, P=0.016).

Lessons Learned:

- VAP is preventable with implementation of a comprehensive oral care program
- The PDSA methodology for QI initiatives is successful for bringing a QI program to fruition
- Ongoing caregiver education is necessary to ensure consistent adherence to VAP prevention efforts

ISSUES

1 An estimated 1.7 million healthcare-associated infections occurred in US hospitals in 2002.¹ One such infection is ventilator-associated pneumonia (VAP), an infection that develops in an estimated 9-27% of patients after prolonged endotracheal intubation. In addition to the extra \$40,000 that VAP can add to hospital costs, it is associated with a mortality rate of 25-50%.² Medical/surgical critical care units (non-teaching hospitals) from 187 locations in the United States had a pooled mean VAP rate of 2.3 cases per 1,000 ventilator-days during a 1-year period (2006-2007).³

2 The Keystone Intensive Care Unit (ICU) program, a Michigan-based initiative dedicated to keeping patients safe, is now implemented in more than 100 ICUs. Each participating facility forms a team composed of at least 5 members: physician leader, nurse leader, staff nurse, pharmacist, and senior executive. The goal of creating a safer ICU is achieved with the help of a plan⁴ to:

- Develop a comprehensive patient safety program with web-based error reporting
- Use specialists to coordinate ICU care and a checklist approach for daily rounds
- Ensure the use of evidence-based interventions to eliminate bloodstream infections and VAP
- Ensure that evidence-based interventions are implemented in patients with severe infections

The overall focus of the project is the collection of meaningful data that enlightens team members and clarifies what they need to do to make the ICU safer.⁴

3 The Keystone ICU developed a toolkit that assists facilities in implementing a "Plan, Do, Study, Act" (PDSA) cycle.⁵

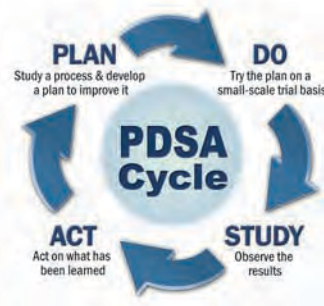


Figure 1. PDSA Cycle

The Institute for Healthcare Improvement (IHI) promotes and recommends the PDSA cycle in the healthcare setting. The IHI further expands upon this method and advocates it in conjunction with a "model of improvement," which recommends that healthcare workers ask the following 3 questions:

- What are we trying to accomplish?
- How will we know that a change is an improvement?
- What changes can we make that will result in an improvement?

4 We successfully used the IHI model of improvement with the PDSA cycle to achieve a drastic reduction in our incidence of VAP. We accomplished this goal by implementing a strict program of mouth care and oral decontamination. Providing proper oral care for intubated or unconscious patients is essential to decreasing their risk of VAP. The three risk factors for VAP are as follows:

- bacterial colonization of the oropharyngeal area
- aspiration of subglottic secretions
- colonization of dental plaque with respiratory pathogens

Some studies have demonstrated that the use of chlorhexidine gluconate (CHG) decreases the risk factors associated with VAP rate. If left to coat and allowed to sit without rinsing, CHG may inhibit bacterial growth and may decrease the amount of bacteria in the oral mucosa.⁶

We used a bedside oral care kit* to help initiate a program that included the following:

- tooth brushing
- application of CHG to all surfaces of the oral cavity
- use of antiseptic swabs
- use of mouth moisturizer
- removal of secretions above the endotracheal cuff



RESULTS

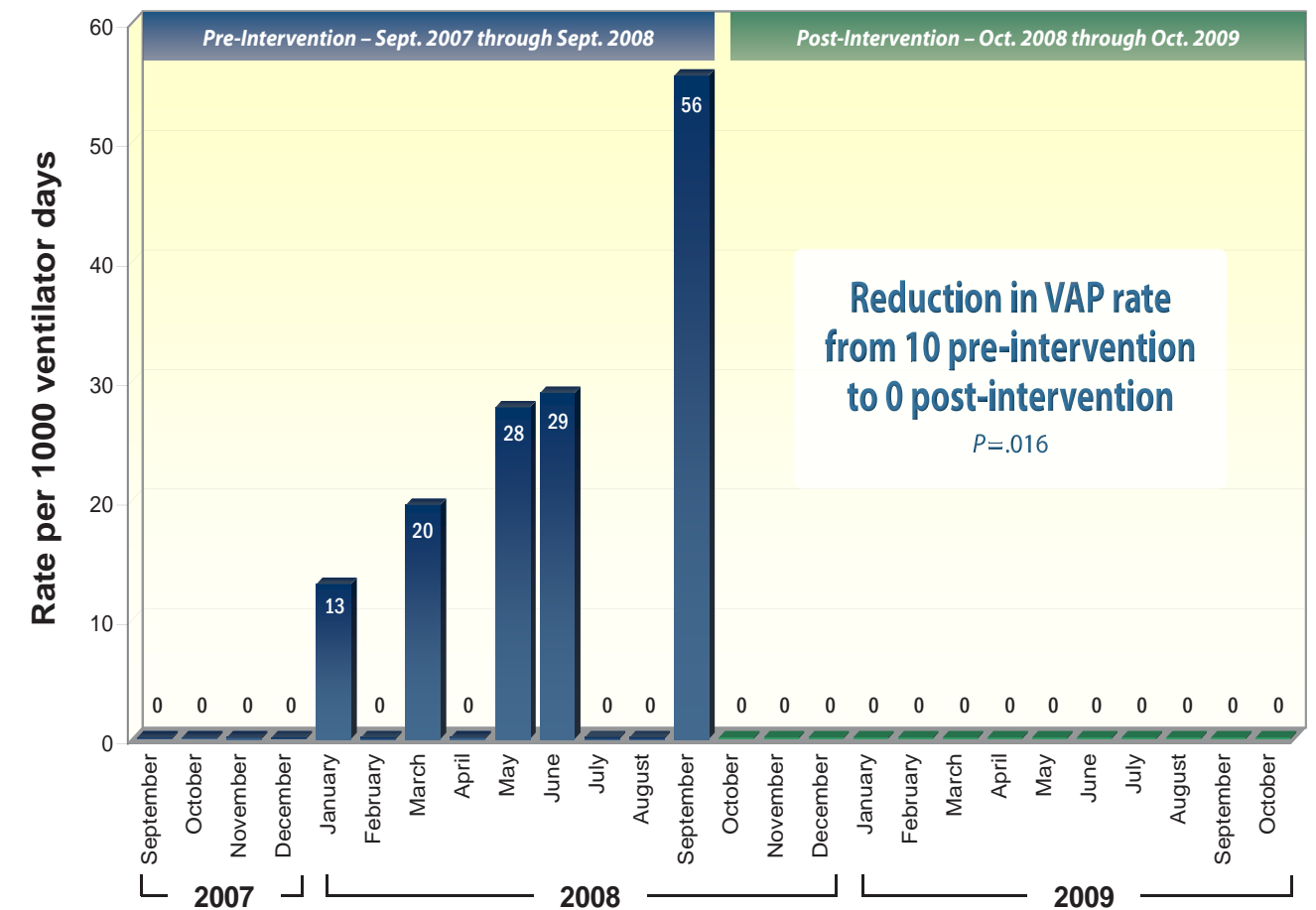
We recorded more than 1,200 observations during a time span of more than 2 years. Pre- and post-intervention durations were balanced at 13 months each, September 2007 to September 2008 and October 2008 to October 2009, respectively. The total number of cases of VAP for each time period were reported as a rate per 1000 ventilator-days. We achieved adequate statistical power to detect a difference of 10 in the VAP rate as statistically significant with an alpha level of 5% and a beta level of 20%. Fisher's exact test was used to assess the change in the VAP rate over time.

The data revealed a statistically significant reduction in the VAP rate from 10 (1,000 x [7/670]) to 0 (1,000 x [0/623]); (test statistic = 6.5, P = .016).

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Figure 2. VAP Rates Pre- and Post-Intervention



LESSONS LEARNED

- One of the most common and troubling healthcare-associated infections is pneumonia developing with long-term endotracheal intubation. Up to half of all patients with VAP die.
- Although we had an oral care program in place in our 8-bed ICU, our incidence of VAP was drastically reduced after the implementation of a more comprehensive oral care bundle[†] including regular (every 4 hours) suctioning and cleansing with CHG.[‡] Since October 2008, we have been VAP-free.
- The Keystone ICU program was critical to stimulating ongoing caregiver education. Our PDSA intervention ensured adherence to VAP prevention efforts and drastically reduced the incidence of pneumonia in our mechanically ventilated patients.

* This product name has been blurred for scientific and research purposes.
[†] Sage q4[®] Oral Cleansing and Suctioning System with Thumb Port Tools, Sage Products Inc., Cary, IL.