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**

Ventilator-associated pneumonia (VAP) is a serious hospital-acquired infection associated with increased patient length of stay, mortality, and morbidity, and expenditures. National health promotion initiatives are underway to prevent the development of VAPs and on the Keystone Intensive Care Unit (KICU) program. The Keystone ICU program has a model which assists facilities in implementing a “Plan, Do, Study, Act” (PDSA) quality improvement (QI) initiative to improve outcomes in mechanically ventilated patients.

Project: Our hospital is an ANCC Magnet facility with an 86-bed ICU. The ICU defines cost as a broad question of Wagner. The ICU desires to reduce ventilator-associated infections in our high-risk invasive patient. The ICU facility and care process to play by VAP-acclimated standards were reviewed. The facility implemented the recommendations of the Keystone ICU Program, which includes an A1 care policy and procedures that was instituted in 1999 1. The care policy consisted of the following procedures. I. Provide ventilator care with a minimum of 97% of ventilator days during the 1-year period (2006-2007) 1. The Keystone Intensive Care Unit (ICU) program, a Michigan-based initiative dedicated to improving patients' safety, has been implemented in more than 300 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 PDSA 2.

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

The overall purpose 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 2.

**ISSUES**

1. An estimated 1.7 million healthcare-associated infections occurred in US hospitals in 2002. One such infection is ventilator-associated pneumonia (VAP), an infection that develops in an estimated 9-27% of patients after prolonged mechanical ventilation. In addition to the extra $40,000 that VAPs add to hospital costs, it is associated with a mortality rate of 25-50%. Medical/surgical critical care units (non-ventilating hospitals) from 167 locations in the United States had a pooled mean VAP rate of 2.3 per 1,000 ventilator-days during a 1-year period (2006-2007) 1.

2. The Keystone Intensive Care Unit (ICU) program, a Michigan-based initiative dedicated to improving patients' safety, has been implemented in more than 300 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 PDSA 2.

3. The Keystone ICU developed a tool that assists facilities in implementing a “Plan, Do, Study, Act” (PDSA) cycle 2.

4. 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 5 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?
   - How do we keep what we learn in the future?
   - How do we sustain the change in the future?

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 environment. 3 We used a bedside oral care kit 1 to help initiate a program that included the following:
   - Teeth brushing
   - Application of CHG to all surfaces of the oral cavity
   - Use of antral rinse
   - Use of mouth rinse
   - Removal of secretions above the endotracheal tube

**Figure 1. PDSA Cycle**
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).

REFERENCES

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.