



## Best-practice protocols:

# VAP prevention

*Reduce complications from mechanical ventilation—such as ventilator-associated pneumonia (VAP)—by implementing a care bundle and daily patient goal assessment.*

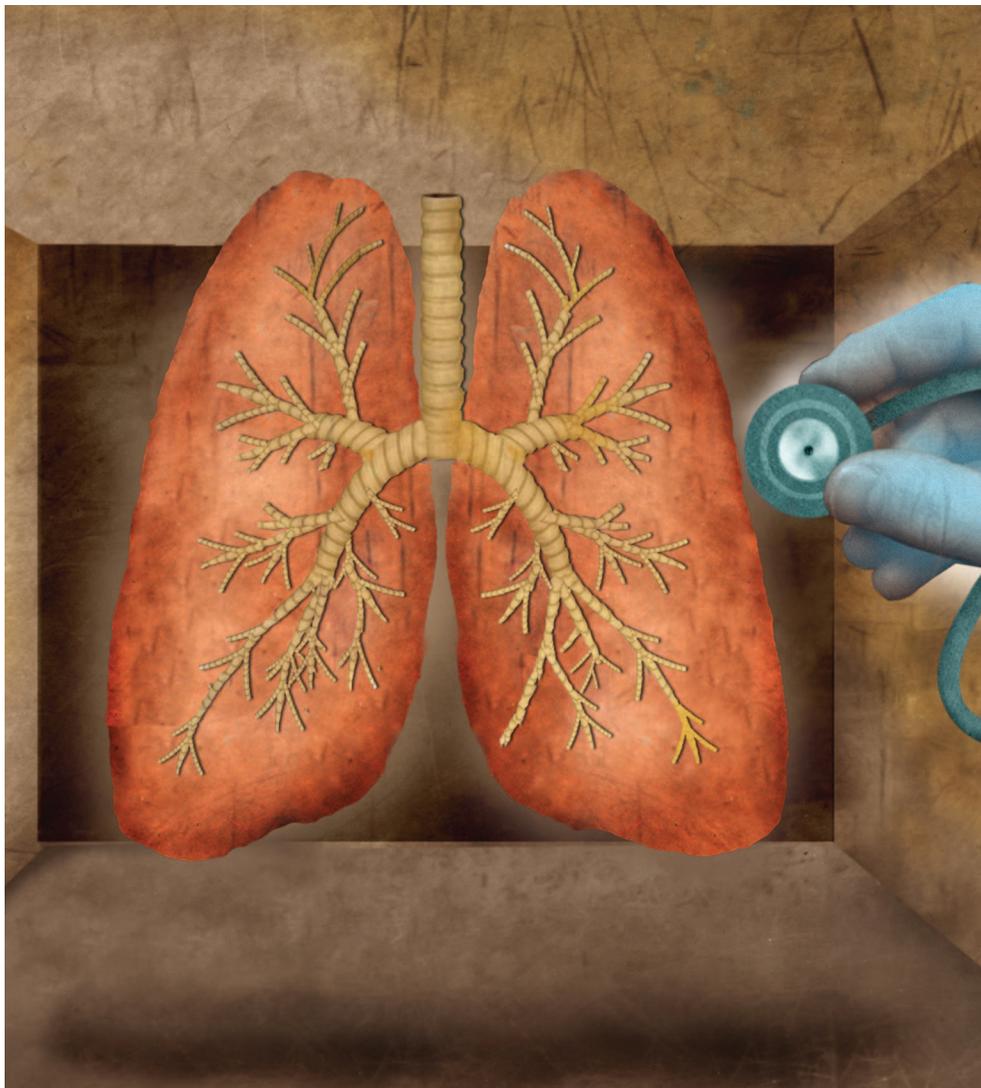
By **Barry Evans**, RN, MSN

**Abstract:** A standardized approach to care delivery helps intensive care units reduce VAP care complications. [Nurs Manage 2005;36(12):10-16]

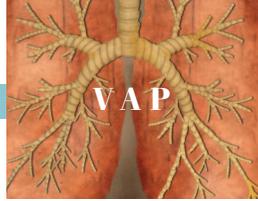
**V**entilator-associated pneumonia (VAP) is a common concern in critical care departments, where its incidence can run as high as 65%.<sup>1</sup> VAP can increase a patient's length of stay by 4.3 days; mortality rates range from 20% to 70%, with the total cost of care varying from \$5,800 to more than \$20,000 per incidence.<sup>2</sup>

VAP is diagnosed according to Centers for Disease Control and Prevention guidelines, which state that patients must be mechanically ventilated for greater than 48 hours and exhibit at least three out of the five following symptoms: fever, leukocytosis, change in sputum (color and/or amount), radiographic evidence of new or progressive infiltrates, and worsening oxygen requirements.<sup>3</sup>

Because of the high costs associated with VAP and its negative impact on patients, the Institute for Healthcare Improvement (IHI) created an initiative to reduce VAP







incidence in critical care. Within its 100,000 Lives Campaign, the IHI recommends safety interventions deployed at the patient care, health-care team, and leadership levels, thereby maximizing the potential for successful implementation of the patient safety initiative.<sup>4</sup>

Strong Memorial Hospital (SMH), a 700-bed tertiary care hospital in Rochester, N.Y., with trauma and transplant centers and a full range of specialized services, is participating in the campaign and has taken part in a number of IHI performance improvement initiatives. The medical intensive care unit (MICU) at SMH is a 17-bed intensive care unit that admits 1,100

groundwork for focused team care, enhancing the use of protocols and guidelines to bring about optimal patient outcomes.

Components of the ventilator bundle target head-of-the-bed (HOB) elevation, deep vein thrombosis prophylaxis, peptic ulcer disease prophylaxis, and daily “sedation vacations,” and daily assessments for readiness to extubate.<sup>5</sup> (See “Components of ventilator bundle.”)

A sedation vacation is implemented by stopping a continuous sedation infusion until a patient is able to follow commands or becomes fully awake. If continued sedation is required after the vacation period, clinicians administer a

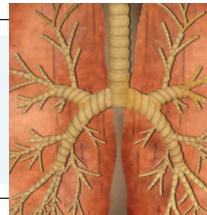
issues that are addressed at daily rounds by the nursing staff, nursing care coordinator, attending physician, and residents. The daily goal sheet targets immediate patient needs, facilitates progress trending, encourages rapid response to patient problems, and ensures that pertinent issues are addressed on a consistent basis.

◆ **Education:** Prior to implementing the standardized care delivery process, staff members were introduced to evidence-based information about VAP. They also were oriented to the ventilator bundle and daily goal sheet at staff meetings and in-services, and through poster presentations and one-to-one individual sessions. Ongoing education, reeducation, and reinforcement provided ample opportunity for staff to voice concerns, ask questions, and offer feedback about the initiative. The time from initial planning to actual implementation was approximately 7 weeks.

◆ **Day-to-day management:** The use of the daily goal sheets and the ventilator bundle were trialed on a small number of patients. Implementing small tests of change and using Plan Do Study Act (PDSA) cycles helped with the refinement of the goal sheet form. It took 3 months to test, modify, and reinforce the use of the daily goal sheets during the daily routine care provided by team members.

After extensive modification and the receipt of final approval from the healthcare team, the form was ready for use on a unit-wide basis. An RN care coordinator and quality data coordinator conducted weekly audits of daily goal sheet utilization, tracked staff progress with bundle compliance, and served as contacts for issues related to the initiative. The audits provided an important opportunity for staff reeducation, reinforcement, and overall support.

### ***Remember to designate responsibility for documentation of dose and incision time.***



patients a year, 70% of whom are mechanically ventilated. The MICU served as the hospital’s pilot unit to test changes to reduce VAP prevalence. The approach used to achieve this objective was the implementation of a standardized method of care delivery developed by the IHI, which was defined as a ventilator bundle.

#### **Bundle methodology**

IHI supports the use of bundle methodology, which combines care delivery interventions proven effective in optimizing patient outcomes. Bundles are groups of interventions related to a disease process based on evidence or best practice. When these interventions are implemented together, they produce better outcomes than would be achieved if implemented individually. The bundle focuses on a particular aspect of a patient’s treatment and lays the

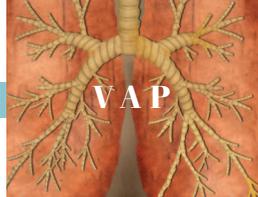
bolus sedation dose to the patient before restarting the sedative infusion at one-half of the previous rate.

#### **Implementation process**

Implementation of the ventilator bundle began with a plan for staff education, the development of audit tools, data collection, results tracking, outcome reporting, and the development of a team approach to drive and maintain the initiative’s momentum. At SMH, the medical director, critical care nursing director, nurse manager, and chief quality officer were key administrative champions, and their commitment and support sent a valuable message to the staff.

◆ **Daily goals:** The utilization of a patient daily goal sheet is instrumental to the introduction of the interventions in the ventilator bundle. The goal sheet contains a checklist of prioritized care delivery





### Components of ventilator bundle

- ◆ elevation of head of bed to between 30 and 45 degrees
- ◆ deep vein thrombosis prophylaxis
- ◆ peptic ulcer disease prophylaxis
- ◆ daily sedation vacation
- ◆ daily “sedation vacation” and daily assessment of readiness to extubate

Source: IHI, Cambridge, Mass.

◆ **Team meetings:** Weekly team meetings helped us plan, problem solve, and keep the performance improvement project moving forward. Meetings focused on accountability and included key multidisciplinary representatives from respiratory therapy, pharmacy, critical care leadership, and the day-to-day unit management team.

◆ **Structured oral care:** Evidence suggests that comprehensive oral care serves as a valuable deterrent to pneumonia in acute care settings, providing some level of oral secretion decontamination and reducing the risk factors associated with VAP development.<sup>6</sup> As a result, 1 year after the start of the VAP initiative, an additional intervention was introduced to promote good oral hygiene. A structured oral care protocol was implemented every 2 hours as a best-practice adjunctive therapy to the bundle.

#### Bundle barriers

Several obstacles to bundle implementation were noted in the MICU. Each of these is consistent with observations made by a team of investigators who examined the causes of noncompliance with interventions for the prevention of VAP. Findings of their study indicate nursing staff may be resistant to change when it perceives that the change compromises patient comfort and presents a risk for adverse events.<sup>7</sup> Barriers in the MICU included: lack of complete physician buy-in, noncompliance with the completion of daily goal forms, and inconsistent implementation of

ventilator bundle interventions.

Some staff members disagreed with the findings of the research concerning VAP prevention. Physician barriers centered on individual practice preferences and, in some instances, skepticism about evidence and research results. One physician stated that VAP was unavoidable regardless of any interventions provided. Both resident and nursing staff objected to the additional workload associated with filling out the daily goal sheets. Some nursing staff also suggested that the initiative was merely another PI project that would ultimately fall by the wayside.

The nursing staff voiced concerns that the sedation vacation process would pose a risk to patients and become a deterrent to patient safety. Greatest concern was expressed for nonsedated or lightly sedated patients who might prematurely pull out central access lines and endotracheal tubes. This concern was a serious one because sedation vacation is a vital component of the ventilator bundle and is essential to the achievement of desired outcomes. Moreover, evidence suggests that a nursing-implemented sedation protocol significantly reduces mechanical ventilation time.<sup>8</sup> To overcome this barrier, the medical director appealed to the nursing staff to form a task force to develop an evidence-based, nurse-driven sedation protocol. A collaborative effort between nursing staff and the critical care pharmacist produced an effective protocol containing both sedation vacation and weaning guidelines.

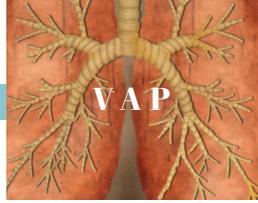
Another area that posed concern was the respiratory therapist-driven weaning protocol that was implemented to expedite the weaning process. The protocol empowered respiratory therapists to assess patients' physiologic and ventilator status and to implement a weaning procedure after collaboration with the bedside nurse. This new approach created boundary issues for nursing staff and required extensive in-services, one-on-one education, and reinforcement before the protocol's implementation could successfully be achieved.

#### Process and outcomes measurement

Compliance rate was used as an indicator of degree of bundle implementation. Compliance rate is calculated as the number of patients with all bundle components divided by the total number of mechanically ventilated patients on the unit. Although components of the bundle were built into the MICU mechanical ventilation guidelines, only baseline DVT and PUD compliance rates were at an acceptable level, which was set at greater than 90%. The 30-degree HOB elevation requirement was met only 11% of the time and daily sedation interruption compliance was 0%. These findings were evident even though readiness to wean was discussed during morning rounds. To achieve maximum results, all components of the ventilator bundle must be implemented. Consequently, our baseline data suggested we had considerable work to do to get to that level.

Intervention outcome measures included VAP frequency and the number of days between VAP incidence. The monthly VAP rate is calculated using the number of VAP cases as the numerator and the number of ventilator days as the denominator. Days between inci-





dences of VAP also were measured and reported along with the monthly rate. At baseline, the incidence rate for VAP was 6%.

Significant improvement in the VAP rate was noted within 4 months of implementation of the ventilator bundle. The MICU achieved an 88% reduction in VAP over 2.6 years, with only three confirmed cases of diagnosed VAP over 738 days. By tracking the data over time, we observed a continued and sustained reduction in VAP rate and a proportionate increase in days between episodes. Other notable improvements: a 1.4 day decrease in monthly average length of stay, a 3% reduction in mortality, and an overall 22% reduction in sedation days. A lesser reduction in mortality rate was seen, although this was likely the result of a 10% increase in the number of patients requiring mechanical ventilation each year since January 2003. In addition, a palliative care consultation team became actively involved in the care of patients in the MICU. Examination of data involving deaths in the MICU revealed that greater than 93% of deaths occurred after end-of-life issues were addressed.

### Recommendations for implementation

The implementation process can be launched successfully if the healthcare system is effectively designed, with champions from administration, leadership, and frontline staff to maintain the initiative's momentum. A suggested starting point for the process is the development and implementation of a population-specific daily goal sheet to incorporate components of the ventilator bundle into the daily patient care routine. Next, provide evidence-based educational sessions designed to help team members understand the changes being implemented.

Adequate time should be allowed for the change process, as this can be a lengthy one. Avoid setbacks during the implementation by starting with small trials of the change, using PDSA cycles to refine the process before spreading to a larger population.

Conduct weekly audits to collect data and track compliance with the use of the daily goal sheet and the bundle interventions, reeducating and reinforcing as necessary to address any noncompliance issues. Once data are available, analyze the findings and report the data graphically to visually reinforce the staff's efforts. In addition, maintain a weekly schedule for team meetings to allow for open communication, encourage participation, and gain buy-in from physicians, residents, and nurses. Lastly, use poster storyboards to keep the focus on goals, track progress throughout the initiative, and celebrate the staff's hard work and success.

The ventilator bundle is a simple, cost-effective program that has the potential to positively affect patients, staff, and hospital resources. Implementing a PI initiative to reduce VAP at one hospital resulted in a culture change that produced remarkable outcomes for patients of the MICU. The implementation of new protocols and a sense of shared ownership of the change process by all healthcare team members contributed to this success. The driving force of visionary leadership, the development and commitment of champions, the empowerment of staff to make decisions and set standards of practice, and the use of teams to plan and make decisions resulted in a patient-centered care initiative that has made impressive strides in patient care delivery at Strong Memorial Hospital. **NM**

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### ABOUT THE AUTHOR

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### About the IHI

Founded in 1991 and based in Cambridge, Mass., the Institute for Healthcare Improvement (IHI) is a not-for-profit organization, cultivating innovative concepts for improving patient care and implementing programs for putting these ideas into action. The 100,000 Lives Campaign is a nationwide initiative of the IHI to radically reduce morbidity and mortality in American healthcare. Building on the successful work of healthcare providers all over the world, the Institute introduced proven best practices across the country to extend or save as many as 100,000 lives. The IHI and its partners in this work believe it's possible to achieve this goal by June 2006. To learn more about this effort, contact the IHI at 1-866-787-0831 or <http://www.ihl.org>.

### About this series

This seven-part series, concluding this month, examines the IHI's suggested 100,000 Lives Campaign interventions from a managerial perspective. Parts one through six appeared in the June through November issues.

