

Project Submission:
2009 Delaware Valley Patient Safety Award

THOMAS JEFFERSON UNIVERSITY HOSPITAL

*“Ventilator Associated Pneumonia (VAP):
Focusing on the Elements of a
VAP Bundle is the Key to Successful Outcomes”*

**The Health Care Improvement Foundation
2009 Delaware Valley Patient Safety Award**

Abstract:

Ventilator-associated pneumonia (VAP) is a preventable secondary consequence of intubation on mechanical ventilation. It is the most common nosocomial infection in mechanically ventilated patients and is associated with a significant increase in length of stay, mortality and length of stay after discharge from ICU. VAP is the leading cause of death among hospital-acquired infections. (1) The incidence rate ranges from 4 to 15 per 1,000 device days. In 2006, Pennsylvania hospitals reported risk adjusted average mechanical ventilator days ranging from 4.1 to 16.1 days. The diagnosis of VAP adds an estimated cost of 40k to a typical hospital admission.

This institution was committed to taking a proactive approach with the goal of reducing our VAP rate to 0 and by doing so improve the quality of care hospital wide. In 2007, a committee was formed via medical and administrative leadership to pursue and achieve this goal.

This initiative demonstrates the effectiveness of the collaboration of a interdisciplinary team in implementing strategies to reduce the VAP rates and improve patient safety at an academic hospital. Our efforts involved the implementation of carefully selected interventions described as a ventilator bundle. The bundle included head of the bed elevation, sedation vacation, readiness to wean assessment, spontaneous breathing trial and oral hygiene. An effort at clarifying the definition of VAP and CDC criteria were carefully reviewed. An ongoing dialogue with bedside care team was initiated as well. We have also reviewed unique needs of patients in the individual units.

Title:

Ventilator Associated Pneumonia (VAP): Focusing on the Elements of a VAP Bundle is the key to Successful Outcomes

Goals:

The goal of this initiative was to reduce ventilator associated pneumonia (VAP) rates to zero. We created a prevention bundle of independent evidenced based interventions toward that goal. This process was designed and facilitated by an interdisciplinary group consisting of physicians, staff nurses, clinical nurse specialists, respiratory therapists, pharmacists, infection control officers and administrators representing all special care units.

Baseline Data:

Ventilator Associated Pneumonia is one of the many concerns in treating critical care patients on ventilators. The national rate of infection is 4 to 15 per 1,000 ventilator days. In 2007 when we started this project, Pennsylvania hospitals reported risk adjusted average mechanical duration between 4.1 to 16.1 days. Prior to implementation of our VAP initiative, VAP rates ranged from 6.77 to 10.57 (see figure 2).

Intervention:

A literature review completed by the VAP interdisciplinary working group resulted in:

A. An acceptable working definition of VAP

B. A prevention bundle whose elements are independently accepted as measures leading to significant decreases in the incidence of VAP.

1. Head of bed elevation >30 degrees.
2. Sedation vacation
3. Readiness to wean
4. Spontaneous breathing trial
5. Oral hygiene
6. Subglottic suction

(see figure 1)

A concise educational program was implemented for the practitioners responsible for performing each bundle element. All care team members were included.

Example-

Element 1 –head of bed (HOB) elevation: Respiratory Therapist (RT) rounds and documents HOB elevation. If HOB is not elevated, education ongoing with Intensive Care Unit(ICU) Team to assure future compliance

Element 2 – sedation vacation – RT, Registered Nurse (RN), and ICU physicians

Benefits to patient care discussed in critical care literature (2)

Our protocol is a 50% dose reduction with continuous monitoring until the patient shows signs of agitation; titrated to a ramsey sedation score of 2-3.

Element 3 - readiness to wean – performed during sedation vacation (see figure 3) if pts meet readiness to wean trial, proceed to element 4

Element 4 – spontaneous breathing trial (SBT) – defined as continuous positive airway pressure (CPAP) at 5 cm h₂o for 30 minutes (3). (see figure 4)

The RN and RT will evaluate tolerance of the SBT based on defined criteria (see figure 5). Along with the intensivist, liberation from the vent will be determined.

If patient is not a candidate for liberation, evaluation and correction of underlying factors performed (see figure 6) and the process is repeated the following morning.

Element 5 – oral health – shared RN and RT role; suction swab and oral debriding to teeth, gingiva, tongue and hard palate q 2 hours. Teeth brushed q12 hrs. This helps to eliminate the contribution of oral bacterial colonization to VAP.

Element 6 – Subglottic drainage endotracheal tube (ETT) - continous aspiration of subglottic secretions has been shown to significantly reduce VAP rates (4)

Results:

The implementation of the VAP bundle has dramatically decreased VAP rates throughout our institution (see figure 2). Since 1st quarter 2008 our VAP rates have dropped from 7.64 per 1,000 ventilator days to 2.87 per 1,000 ventilator days in 2nd quarter 2009. Monthly follow-up and reporting of data to the frontline caregivers has maintained consistent awareness of this initiative.

Evidenced-based interventions, hospital-wide education, and interdisciplinary collaboration among caregivers have made a positive impact in the VAP rates throughout all of the Intensive Care Units. The VAP working group has increased communication among caregivers and the electronic bundle flow sheet has generated conversation between respiratory therapists and nursing to collaborate the assessments for the patients at the bedside.

How this initiative may be replicated throughout the region:

The key to implementing a successful VAP bundle is answering the who, what, when, where, and how questions. This requires leadership, dedication, and teamwork from every discipline. Participants in the process from start to finish must understand the process from definitions to workflow. All groups must be represented regularly at the meetings to facilitate communication. The results of this initiative demonstrate that dedication, across disciplines, to a common goal results in a superior patient care delivery. Continued attention to detail allows a conference room concept to bloom into a reality that is readily reproducible.

Name: HADDENTEST, Flowchart **MRN:** 54008931 **Sex:** F
Account: **Room Bed:** 3218P
Date of Birth - Age: 19Aug1955=52 **ADMD LOS:** 22Jan08=58

Flowsheet Charting VENT PT. ASSESSMENT **Display through:** 19Mar2008 17:56 **Back Days:** 57

Flowsheet Charting History

VENT PT. ASSESSMENT	18Mar2008 17:51	17Mar2008 17:42	13Mar2008 14:22	13Mar2008 13:42	13Mar2008 12:36	13Mar2008 12:58
Summary Note						
▣ Daily Vent Assess						
-Vent Start Date	2-Mar2008	17Mar2008				
-Day on Ventilator	16	1	45	20	1245	10
-Vent End Date						
-Trach Start Date	9-Mar2008					
-HOB > 30 Degrees	NO		NO	YES	YES	NO
-Sedation Vacation	YES		YES	NO	NO	YES
-Readiness Assessment	NO		N/A	NO	N/A	N/A
-SBT/Readiness to Extubate	YES		N/A	N/A	NO	NO
-Vent Secretions	TENACIOUS					
-Vent Secretion AMT	LARGE					
-Pressure Support Vent Wean	NO		YES	YES	NO	YES
-Trach/Collar Wean	YES		YES	YES	NO	NO
-Reason for No Wean	Y		Y	Y	Y	Y

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Figure 1- Electronic Ventilator Assessment Flow sheet

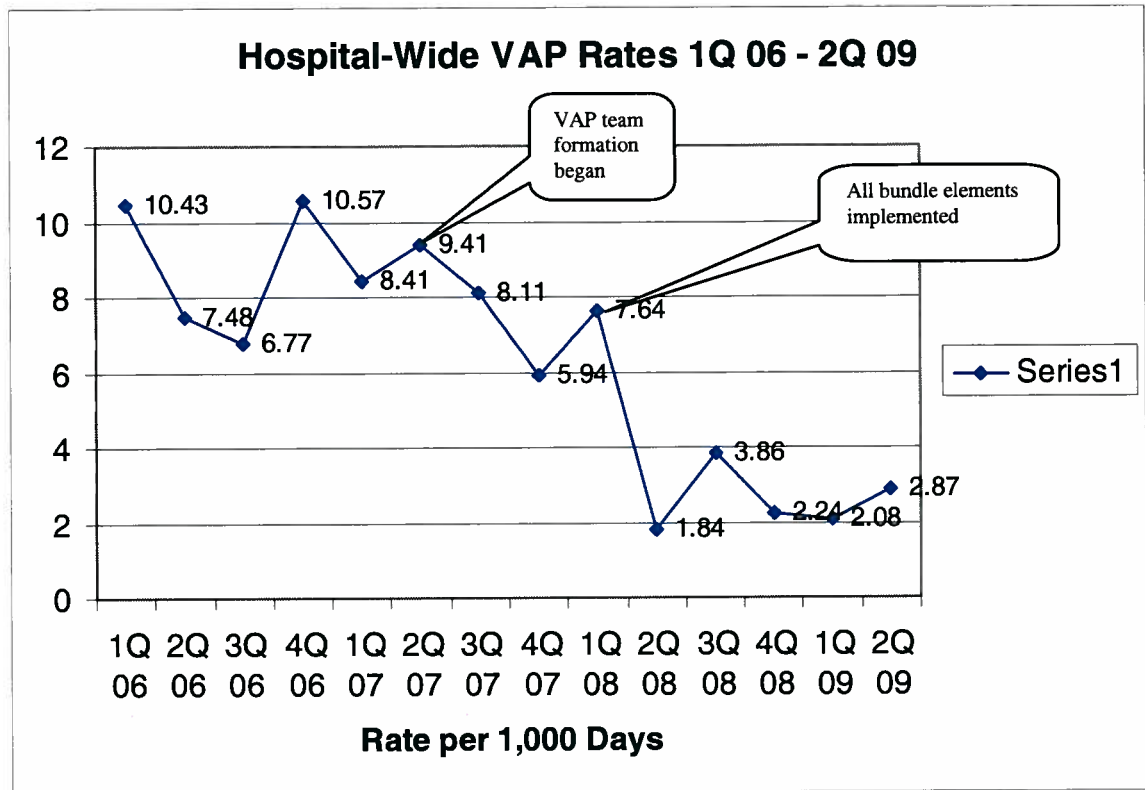


Figure 2- VAP results

SECTION #1: Daily Spontaneous Breathing Trial (SBT) Readiness Assessment (must be done between 6-8am, daily).
(All must be in range for patient to be a SBT or Progressive withdrawal candidate)
• SpO2 ≥ 90 on ≤ FI02 .4
• Hgb ≥ 8
• PEEP ≤ 5
• Capable of initiating a spontaneous breath
• Ve 6-12 l/m on ventilator
• pH ≥ 7.30 – 7.50
• No neuromuscular disease
• Modified Ramsay (sedation score) 1,2,3... 1: anxious/restless, 2: oriented/cooperative, 3: responds only to commands.
• <u>Hemodynamically stable</u> defined by
≤ 5 ug/kg/min dopamine or dobutamine
Absence of acute myocardial ischemia
Hr ≤ 120
Systolic BP ≤ 180 and ≥ 90.

Figure 3

SECTION #2 Spontaneous Breathing Trial (SBT) for Extubation (if Section 1 is met)
1. Place patient on CPAP of 5 cm h20 for up to 30 minutes if tolerated (see Section 3) between 6-8 am.
2. Obtain HP trends (RESP, HR and SpO2) at the end of the SBT.
3. If patient fails SBT (Section 3), place patient back on A/C settings with set rate 80% of actual rate to recover from muscle fatigue and perform another SBT in 24 hours. If patient fails SBT X ≥4 days, start endurance training (Progressive withdrawl) with PSV (SECTION #5).

Figure 4

Section #3 Daily SBT Criteria for tolerance for 30 minutes
Objective Criteria: <input type="text"/> HR < 120 or within 20% baseline
SpO2 >90 or PaO2>60 on FIO2 .40 Ph ≥ 7.30 – 7.50
RR < 35
Systolic BP >90 or less than 180 and within 20% of baseline
Subjective Criteria:
No signs of elevated Work Of Breathing
No signs of distress (ie;paradoxical breathing)

Figure 5

4. Address cause of SBT failure
• Low lung compliance (edema, infection, fibrosis, effusion, surgical dressing, position, atelectasis; etc)
• High airway resistance (bronchospasm, secretions, narrow or occluded ETTube; etc)
• Nutrition (excessive carbohydrates, over-under; etc)
• Electrolytes – muscle weakness (magnesium, phosphate; etc)
• Cardiovascular (CHF, hypotension, ischemia;etc)
Psychological (sleep, fear, stress; etc)

Figure 6

References

1. 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; 20(2)555-561.
2. Kress JP, Pohlman AS, O'Connor MF, Hall JB. Daily interruption of sedative infusions in critically ill patients undergoing mechanical ventilation. New England Journal of Medicine. May 18 2000;342(20):1471-1477.
3. Evidence Based Guidelines for Weaning and Discontinuing Ventilatory Support: A Collective Task Force Facilitated by the American College of Chest Physicians, the American Association for Respiratory Care, and the American College of Critical Care Medicine. Resp Care 2002;47(1):69-90
4. Craven DE, Hjalmarson K. Prophylaxis of Ventilator Associated Pneumonia: Changing Culture and Strategies to Trump Disease. CHEST: 2008:134(5):898-900