Creating and Implementing a Bundle to Reduce VAP in the NICU

Ventilator associated pneumonia (VAP) is an important nosocomial morbidity in the neonatal intensive care unit (NICU). VAP is defined as a hospital acquired pneumonia, with the diagnosis based on the worsening of the clinical status, positive tracheal aspirate, and radiographic changes which show new or increased infiltrates.¹

In 2002, this institution analyzed baseline data from a high risk neonatal population to determine the VAP rate along with possible contributing or associated clinical variables. The data supported the assumption that VAP leads to increased morbidity. Infants with VAP had more ventilator days, longer lengths of stay, as well as longer exposure to antibiotics than same birth weight peers that did not develop VAP.

The goal was established to decrease the ventilator-associated pneumonia (VAP) in the neonatal intensive care unit (NICU) to less than the 50th percentile (median) of the National Nosocomial Infections Surveillance System (NNIS²) for birth weight category. The challenge was to implement evidence based practice. Few neonatal articles in the literature at the time were available to support change.

A ventilator bundle was created based on a combination of evidence from the adult, pediatric and neonatal literature as well as best practice. The bundle was implemented in the fall of 2004. Components of ventilator bundle include: endotracheal tube care (ETT), oral care and emphasis on good hand washing, respiratory equipment care, and minimally invasive ventilatory support. Other components, such as a hand washing campaign were added to augment the effects of the bundle on outcomes.

Data was collected on all patients. Measures for VAP (VAP incidence/1000 ventilator days) as well as accidental extubations (number of accidental extubations/100 ventilator days) were collected. The VAP rate was calculated based on weight category.

After implementation of the neonatal ventilator bundle in the fall of 2004, the VAP rate in the NICU decreased by greater than 50%. The goal of having over 300 consecutive days without a VAP was achieved in 2006, we had 404 VAP free days in the NICU. In early 2011, we surpassed the 450 day mark without a VAP. There were no VAP for any birth weight category in 2010. This demonstrates that practice change based on this “bundles of care” is successful in achieving the desired goal.

²American Journal of Infection Control 31(8):481-98, 2003 December
Steps to Reduce Ventilator Acquired Pneumonia in the NICU

ETT Care
- Suction tubing remains continuously attached to in-line suction catheter.
  - The Ballard “Y” suction tubing does this effectively. The system allows for the suction to remain continuously attached and has stopcock on adjoining end allowing for adequate oral suction and provides simple and cost effective oral care.
- Reduce the number of inadvertent extubations with the use of consistent effective securing methodology.
  - We used an ETT clamp created from drilled umbilical clamp.
- ETT clamps are cleaned and individually packaged though not sterilized.
- Actively discourage the removal of the ET in infants in distress as evidence clearly shows that the more an infant is reintubated, the greater the chance of infection. Assessment and manual ventilation utilized rather than defaulting to removing an ETT. Sterilely suction utilized if indicated.
- Reduce number of ventilator days with alternative ventilatory support.
  - We utilized bubble CPAP extensively with great success markedly reducing ventilator days.

Oral Care
- Mandatory in-services to all NICU RN’s and RT’s (100% compliance) and included the following:
  - No bulb syringes used on ventilated patients.
  - All oral care products (catheters and oral suction devices) are disposable one-time use for ventilated infants. Utilize catheters provided with Ballard suction systems.
  - Use sterile water, colostrum or Biotene to moisten VAP Guard swab to wipe lips and gums (clamp itself can also be wiped). These are single use items.
  - Oral care done every 3-4 hours with RN check—no exceptions. This is done with or without the need for ETT suction. Special attention given to ventilated, sedated infants.
  - Practice of good hand cleansing technique and beginning patient assessment with ETT care, oral care, then remainder of assessment.
  - Practice suctioning mouth, then nose.
  - When bulb syringes are utilized on non intubated infants, they are cleaned, rinsed and allowed to air dry between uses (we have Hibiclens® at our sinks).

Equipment Care
- Ventilator circuits are changed as needed when mechanically malfunctioning or visibly soiled.
- Ventilators were not allowed to remain on stand-by after a patient was extubated.
- CPAP systems are allowed to remain on stand-by for 12 hours with flow and heater on.
- Oxygen therapy equipment is changed as needed when mechanically malfunctioning or visibly soiled. This equipment may be cleaned, rinsed, and allowed to air dry.
- Resuscitation bags are never to be placed on the bed. They are hung outside of the isolette or above the warming bed. Resuscitation bags are replaced once per week.

Environment of Care-Hand Hygiene
- Wear gloves when in contact with secretions

• Wash hands pre- and post patient contact
• Sterile water used for skin care and bathing for infants < 1500 gms.
• Unique signs made
• Audits performed

**Use of single use ultra sound get packets.** Multi-use bottles were found to be contaminated with pseudomonas

**Monitoring**
Participated in iNICQ series sponsored by the Vermont Oxford Network which began in the Spring of ‘05
• Unit infection audits instituted
• Handwashing campaign instituted winter of ’05 in response to audit results; had staff & patients (included the Pediatric areas) develop handwashing signs to post in the unit.
• Monitor handwashing monthly

Respiratory Performance Improvement Monitor developed and on-going measurement collected. Respiratory Therapist and RN’s involved in collecting the data. This helps to reinforce good practice.

Tracking days between VAP

Celebrate success!

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**Data**
Days between VAP incidences significantly improved since implementation of the VAP bundle in 2005; $F(1,23)=8.427, p<.029$. As of March 31, 2011 days between VAP exceeded 500.

For all but the most vulnerable infants (BW <750 gms) the VAP rate has been zero since the bundle was implemented. In 2010, there were zero VAP.