Prevention of VAP

Most initiatives for reducing VAP can be readily incorporated into standard care for ventilated patients without incurring significant expenditure of resources.

• Wash hands — Washing hands or the use of alcohol-based antiseptic solutions has been shown to reduce nosocomial infections. Clean hands between patients, after glove removal, before clean and after dirty tasks.

• Wear gloves and gowns as appropriate — Change gloves between patients and between contaminated and clean procedures on the same patient. Use sterile gloves when appropriate to protect the patient (e.g., suctioning). Gloves and gowns have been shown to be effective in preventing the spread of Vancomycin-Resistant Enterococci (VRE) and MRSA.

• Make patient oral hygiene standard practice — Routine oral decontamination is an effective method for reducing VAP by decreasing the microbial load in the oropharyngeal cavity. It has been found that the incorporation of routine oral hygiene into standard practice reduced VAP by 57.8%. Oral hygiene programs should consist of frequent tooth brushing, oral suctioning and swabbing of the mouth with antiseptic agents.

• Implement Common Suction Protocol — Standardized endotracheal suction protocols, in which everyone suctioning effectively in the same way, have been shown to reduce colonization and the incidence of VAP. Subglottic suction prior to extubation should be included.

• Use Closed Suction System (CSS) — CSS provides a barrier to separate the contaminated catheter from the caregiver and other patients as well as reduce the environmental exposure of the patient being suctioned. Closed suctioning also permits continuous ventilation reducing respiratory stress and vulnerability. CSS is recommended by the American Association for Respiratory Care (AARC) as part of an infection control program.

Prevention of VAP [continued]

• Avoid the use of antacids and histamine type-2 antagonists — Patients on mechanical ventilation are subject to gastrointestinal hemorrhage (stress ulcers). Antacids and histamine type-2 antagonists are often used protectively. Unfortunately, they also alter the acidic environment allowing bacteria to colonize the area while increasing gastric volume and distension. Regurgitation and subsequent aspiration can cause VAP. Alternatively, sucralfate has been advocated as it neither decreases acidity nor increases gastric volume. However, more recent studies have had variable results as to the reduction of VAP.

• Use of post-pyloric rather than gastric feeding has benefits — A gastric feeding tube violates the gastroesophageal (cardiac) sphincter. This can permit gastric reflux which can travel up the esophageal tract to the subglottic space then subsequently aspirated around the cuff. The percutaneous delivery of nutrients into the small bowel (post-pyloric) prevents gastroesophageal delivery-related gastric reflux, gastric over-distension, and peptic acid alteration, reducing VAP risk. The overall optimal approach for feeding the ventilated patient is undefined; however, post-pyloric feeding is associated with an overall reduction in pneumonia.

• Utilize methods for early diagnosis of VAP — Early recognition of VAP and identification of the causative pathogen(s) insures early use of the appropriate antibiotic regimen reducing outcome severity. Methods of rapid accurate sampling include bronchial alveolar lavage (BAL) or mini-BAL performed by the respiratory therapist or other trained caregivers or specimen retrieved by brush, biopsy, swab or lavage bronchoscopy conducted by a pulmonologist.

• Write policies, educate staff and monitor compliance — Although positioned last in this list, institutionalization of the above recommendations can only be accomplished by integrating them into facility policies, routinely educating staff and monitoring for compliance — absolutely necessary for reduction of VAP.

This brochure was originally developed for Infection Control Week 2004, sponsored by Kimberly-Clark.
Background

Nosocomial pneumonia is the most deadly form of hospital-acquired infection. Patients receiving mechanical ventilation are especially at risk. Intubated patients are approximately 20 times more likely to develop pneumonia than non-intubated patients. The endotracheal tube interferes with normal patient defenses by blocking mucusociliary ladder, interfering with gag and cough reflexes and allowing pathogens direct access to the lung. Ventilator-associated pneumonia (VAP) continues to occur in 8 to 28% of this vulnerable population. VAP accounts for 60% of all deaths due to hospital-acquired infections.

Cost

Increased hospital charges attributed to nosocomial pneumonia are approximately $40,000.

Mortality

The mortality rate ranges from 24 to 50% and can reach 76% when high risk pathogens are involved. As the number of days intubated increases, so does the mortality rate.

Epidemiology

VAP is a bacterial pneumonia. Infections which occur within 48 to 72 hours after intubation are referred to as “early-onset” and are usually antimicrobial sensitive. Those occurring after 72 hours, referred to as “late-onset”, are often multi-drug resistant. The causative pathogens usually associated with these time periods are:

- **Early-onset (EOP)**
  - Staphylococcus aureus
  - Haemophilus influenza
  - Streptococcus pneumoniae
- **Late-onset (LOP)**
  - Pseudomonas aeruginosa
  - Methicillin Resistant Staphylococcus aureus (MRSA)
  - Acinetobacter or Enterobacter

Prevention of VAP (continued from outside flap)

- **Minimize Saline Lavage** — Research does not support the routine use of saline lavage. Some studies have shown that the practice may be detrimental to the patient as bacteria may be dislodged from the catheter and endotracheal tube into the lung while simultaneously causing oxygen desaturation. However, some textbooks do recommend the use of saline sparingly for thick secretions. It is important to note that this does not exclude thorough and complete rinsing of CSS after suctioning which is necessary to prevent colonization (follow manufacturers directions).

- **Prevent patient contamination by circuit condensate** — Warm expired air condenses in ventilator tubing. Microbial growth occurs rapidly in the pooled condensate. Disconnection of the circuit and manipulation to drain the tubing can cause the contaminated condensate to dump directly into the lungs. Condensation traps permit drainage without opening the circuit, preventing both microbial dump and contamination from the external environment. Opening the circuit for other procedures should be avoided. Accumulation of condensate can also be reduced by the use of a heated wire in the expiratory phase tubing or a heat-moisture exchanger (HME). However, care must be taken not to allow patient secretions to dry, which can cause endotracheal and tracheostomy tube blockage.

- **Perform subglottic suctioning when necessary**

The endotracheal tube prevents closure of the epiglottis. Oropharyngeal secretions accumulate above the endotracheal tube cuff below the glottis. Microorganisms can grow in this protected environment. Suction removal of these fluids can reduce the risk of aspiration. Suctioning prior to repositioning or extubation should be standard protocol.

- **Incline patient’s head whenever possible** (Reverse Trendelenberg’s position) — The supine position increases the accumulation of secretions in the subglottic area. Elevating the head 30 to 45° reduces this pooling and thus the microbial load.

- **Avoid nasotracheal intubation whenever possible** — Nasotracheal intubation has been associated with nosocomial sinusitis and high incidence of VAP. The oropharyngeal route is recommended.

Prevention of VAP (continued)

- **Maintain optimal pressure in endotracheal cuff if patient is intubated** — A cuff that is under-inflated forms creases that can readily allow contaminated secretions to migrate past the cuff and aspirate into the lungs. The optimal pressure for all situations has not been conclusively established but is generally held to be 20 mmHg. Cuff pressure should be monitored and recorded routinely. Avoid excessive inflation as too much pressure can prevent adequate perfusion of the tracheal mucosa and damage tissue.

- **Avoid unnecessary manipulation of the endotracheal tube** — Manipulation of the tube creates creases and gaps in the cuff which can allow contaminated secretions to slip through and drop into the lungs.

- **Remove tube as early as possible, but avoid re-intubation** — Early tube removal has been shown to reduce VAP. However, if the patient is not ready and must be re-intubated, the process will increase VAP risk. Noninvasive ventilation may be more appropriate rather than re-intubation.

- **Prevent cross-contamination with reusable devices** — Use single use devices whenever possible. Reusable items such as resuscitation bags, temperature probes, spirometers, humidification apparatus and endoscopes must be subjected to sterilization or high level disinfection to prevent cross-contamination. Residual disinfectants should be rinsed off with sterile water, or when this is not possible, rinsed with tap or 0.2 micron filtered water followed by alcohol rinse with forced air drying.

- **Selective decontamination of the digestive tract is controversial** — The use of an antibiotic paste for the mouth and stomach is gaining favor in Europe, but has not been widely used in the US. This practice has been associated with the emergence of antibiotic-resistant bacterial strains.

- **Vaccinate staff** — Seasonal influenza vaccinations are recommended, as well as the 23-valent vaccine against invasive pneumococcal disease (if indicated), to protect staff and reduce nosocomial outbreaks.

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