Preventing Ventilator-associated pneumonia:
The VAP Bundle
What Is VAP?

Healthcare-associated pneumonia is the leading cause of death from hospital related infections.

VAP (ventilator-associated pneumonia) refers to pneumonia developing in a mechanically ventilated patient more than 48 hours after intubation.
Incidence and Risk

Prospective single-center study over 22 months of 888 patients on mechanical ventilation:

VAP occurs in up to 15% of patients receiving mechanical ventilation.
Risk factors include tracheostomy, multiple central line insertions, re-intubation, etc.

**Mortality:** Hospital mortality for patients who develop VAP is 46%, compared to 32% for patients who do not develop VAP.

VAP Prolongs Care

Large retrospective matched cohort study of risk factors and consequences of VAP:

- Prolonged mechanical ventilation
- Prolonged ICU stay
- Prolonged post-ICU hospital stay
- Marked increase in cost of admission

Opportunity Knocks

What if a series of interventions could markedly reduce the risk of VAP?

What if those interventions were already readily available in hospitals?

What if all of those interventions were done all of the time on each patient?
Possible Benefits of Eliminating VAP

Better patient outcomes

Reduced mortality

Improved satisfaction…
  Nursing
  Physician
  Patients and families

Financial benefits
The Ventilator Bundle

...is a package of evidence-based interventions that, when implemented together for all patients on mechanical ventilation, has resulted in dramatic reductions in the incidence of ventilator-associated pneumonia.
Ventilator Bundle Elements

- Elevation of the head of the bed to between 30 and 45 degrees
- Daily “Sedation Vacation” and daily assessment of readiness to extubate
- Peptic ulcer disease (PUD) prophylaxis
- Deep vein thrombosis (DVT) prophylaxis (unless contraindicated)
Do Bundles Work?

Our Lady of Lourdes, Binghampton, NY
VAP rate 1/31/2004 through 2/28/2005

The VAP rate on the Y axis is per 1000 ventilator days
Our Lady of Lourdes, Binghamton, NY

Began working in March 2004;
Head of the Bed 30-45°

Why?

- Reduces potential for aspiration
- Potential to improve ventilation

Identified Issues and Concerns

- Is it comfortable for the patient?
- Causes the patient to slide down in bed
- Potential for skin-shearing

Anecdotal Experience

- Patients do not complain of discomfort
- No significant documented increase in skin breakdown
Sedation Vacation

Why?

• Has been demonstrated to reduce overall patient sedation
• Promotes early weaning

Identified Issues and Concerns

• Increases potential for self-extubation
• Increases potential for patient pain and anxiety
• Increases episodes of desaturation

Anecdotal Experience

• Promotes early extubation
• No significant increase in patient self-extubation
Sedation Vacation

128 adults on mechanical ventilation randomized to daily interruption of sedation until the patient was awake or interruption at the clinician’s discretion

Duration of ventilation:
4.9 days vs. 7.3 days (p=0.004)

Why?

- Reduces acid production in stomach and the consequent risk of bleeding from gastric erosions and peptic ulcers

Identified Issues and Concerns

- Some studies have shown increased rates of ventilator associated pneumonia in patients on prophylactic treatments, e.g. sucralfate

Anecdotal Experience

- None significant
DVT Prophylaxis

Why?

• Reduces potential for clot formation
• Reduces potential for pulmonary emboli

Identified Issues and Concerns

• May increase the risk of bleeding
VAP Measure #1

*Calculate the Ventilator-Associated Pneumonia Rate per 1000 ventilator days:*

**Numerator:** Number of ventilator-associated pneumonia cases x 1000

**Denominator:** Total ventilator days