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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**



Rello J. *Chest*. 2002;122:2115-2121.

# 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

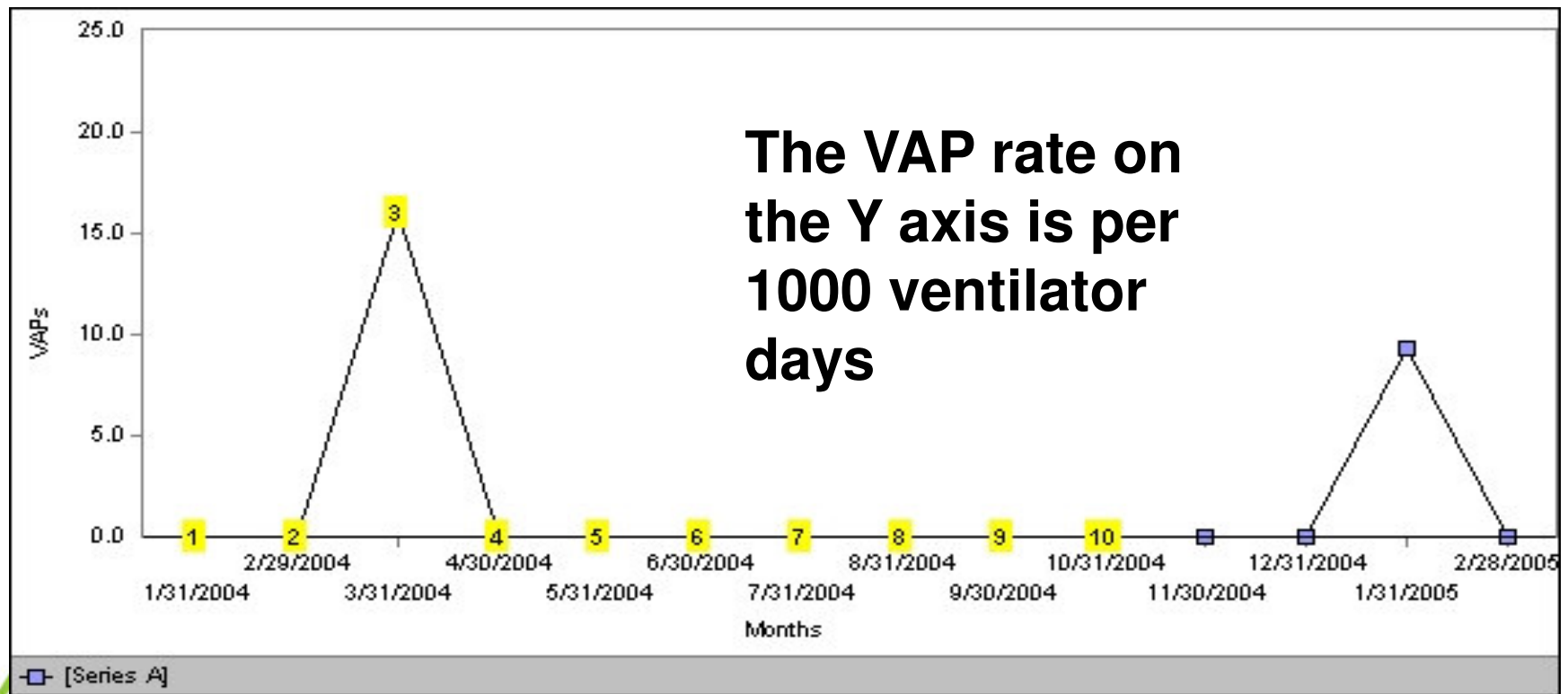
Peptic ulcer disease (PUD) prophylaxis

Deep vein thrombosis (DVT) prophylaxis (unless contraindicated)



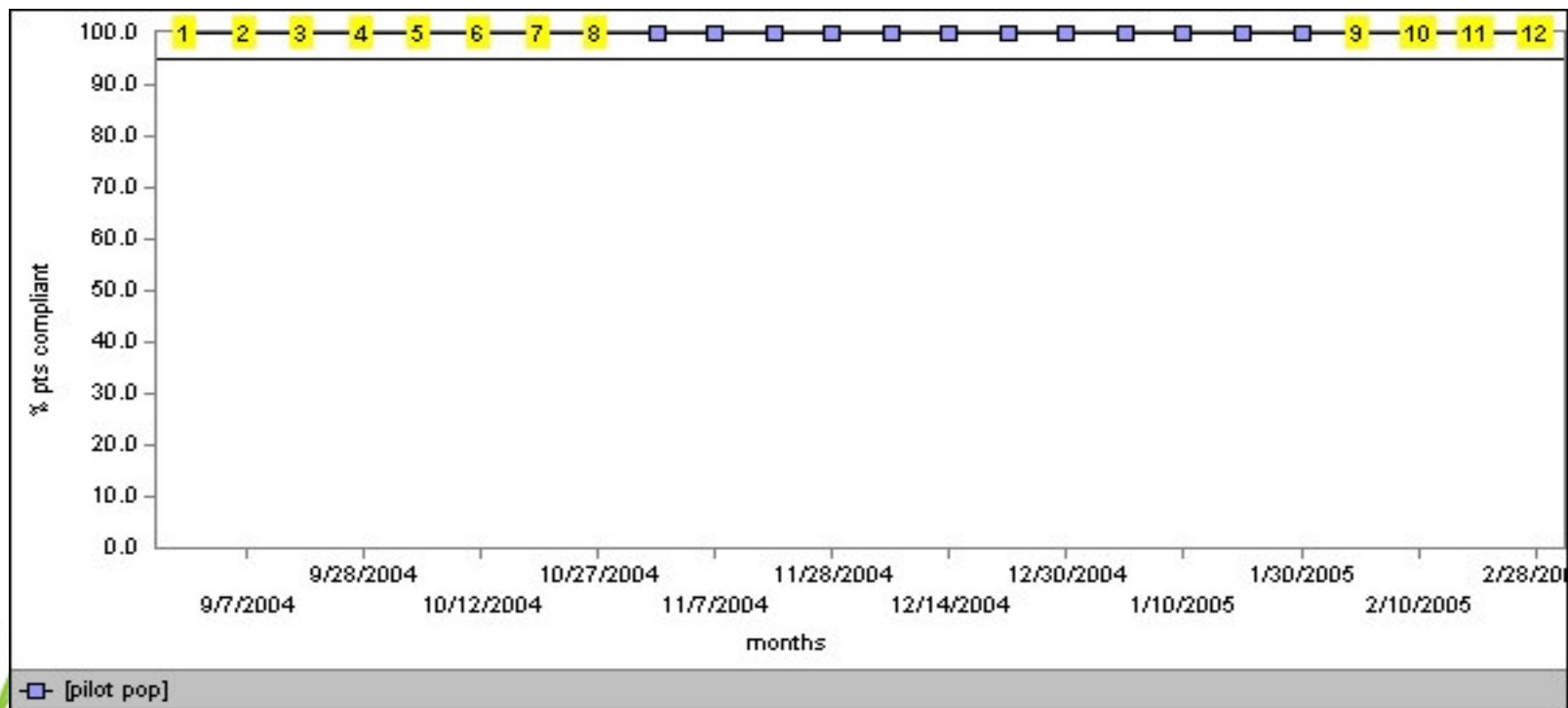
# Do Bundles Work?

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



# Our Lady of Lourdes, Binghamton, NY

Began working in March 2004;  
Ventilator Bundle Compliance 9/1/2004 - 2/28/2005



*Always.*

# 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 ( $p=0.004$ )



# PUD Prophylaxis

## 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