



# Do No Harm: Mitigating Risk Factors Vent and Non-Ventilator Pneumonia

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**Kathleen Vollman**  
ADVANCING NURSING THROUGH KNOWLEDGE & INNOVATION



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# Disclosures

- ▲ Consultant-Michigan Hospital Association Keystone Center
- ▲ Subject matter expert on CAUTI, CLABSI, HAPI, Sepsis, Safety culture for HRET/AHA
- ▲ Consultant and speaker bureau
  - △ Stryker's Sage business
  - △ LaJolla Pharmaceutical
  - △ Potrero Medical
- ▲ Baxter Advisory Board



## Session Objectives

- Define key fundamental evidence-based nursing care practices that reduce vent and non-vent HAP
- Discuss strategies to overcome barriers



## Notes on Hospitals: 1859

“It may seem a strange principle to enunciate as the very first requirement in a Hospital that it should do the sick no harm.”

- Florence Nightingale

**Advocacy = Safety**



The Why



# VAP

- 8.3% of ICU patient in Europe develop an HAI<sup>1</sup>
- 6% is pneumonia with 97% associated with mechanical ventilation (9.5 VAP per 1000 intubation days)<sup>1</sup>
- Most frequent organism pseudomonas aeruginosa<sup>1</sup>
- VAP is associated with ↑ MV days and ↑ ICU & hospital LOS<sup>2</sup>
- Attributable mortality estimated to be 4.0–13.5%<sup>2</sup>
- Financial cost of a VAP episode has been estimated as approximately 15,000 to 40,000 US<sup>2</sup>



1. European Centre for Disease Prevention and Control. HAIs in the ICU. In ECDC. Annual epidemiological report for 2017. Stockholm: ECDC; 2019
2. Torres A, et al. Eur Respir J 2017;50(3):1700582

## Building Blocks to Best Practice in Caring for Mechanically Ventilated Patients

**Ventilator Bundle:** HOB 30, Deep Vein Thrombosis (DVT) prophylaxis, Peptic Ulcer Disease (PUD) prophylaxis, Sedation interruption, Spontaneous breathing trial, daily care with chlorhexidine



**VAP Bundle:** HOB 30, Sedation interruption, Spontaneous breathing trial, oral care 6x per day, CHG rinse 2x per day, subglottic secretions drainage if expected to be ventilated > 72hrs

# Risk Factor Categories for Hospital Acquired Pneumonia

- Factors that increase bacterial burden or colonization
- Factors that increase risk of aspiration

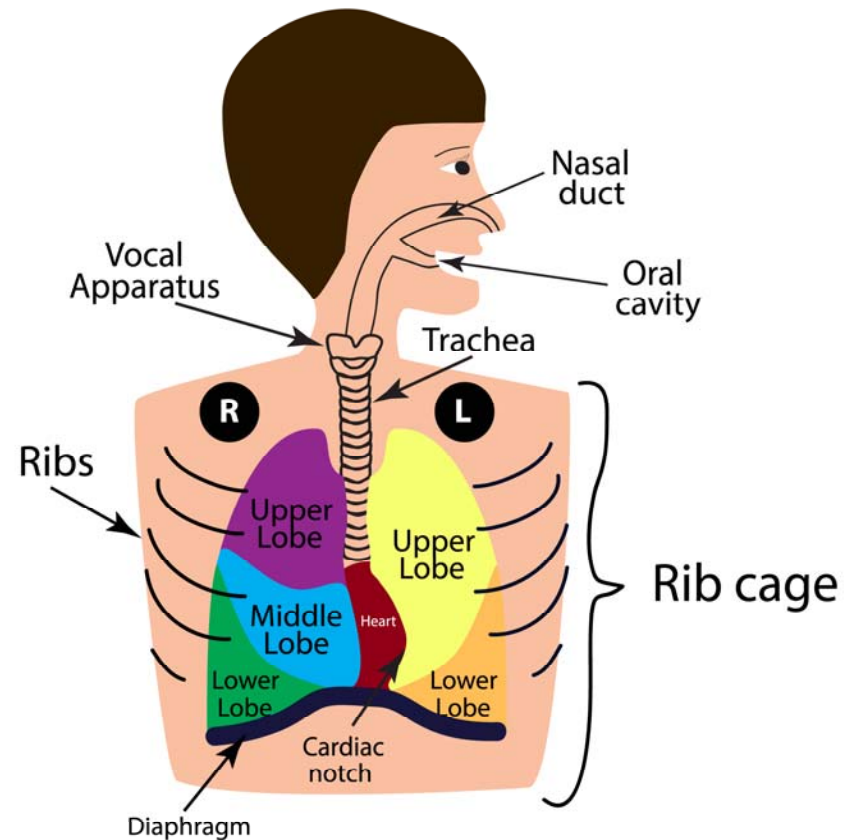




## Single Ecosystem

- Entire respiratory tract is one ecosystem<sup>1</sup>
  - Upper-nasal and oral cavities
  - Lower-alveoli
- Not sterile environment<sup>1</sup>
- Oral flora changes in hospitalized patients<sup>2</sup>
- Relationship between dental plaque and pulmonary lavage fluid<sup>3</sup>

1. Huffnagle GB, et al. Mucosal Immunol. 2017 Mar;10(2):299-306
2. Johanson WG, et al. N Engl J Med. 1969 Nov 20;281(21):1137-40
3. Heo SM, et al. Clin Infect Dis. 2008 Dec 15;47(12):1562-70.



# Where does Pneumonia Start: Oral Bacteria during Hospitalization & Illness

## Oral cavity<sup>1</sup>

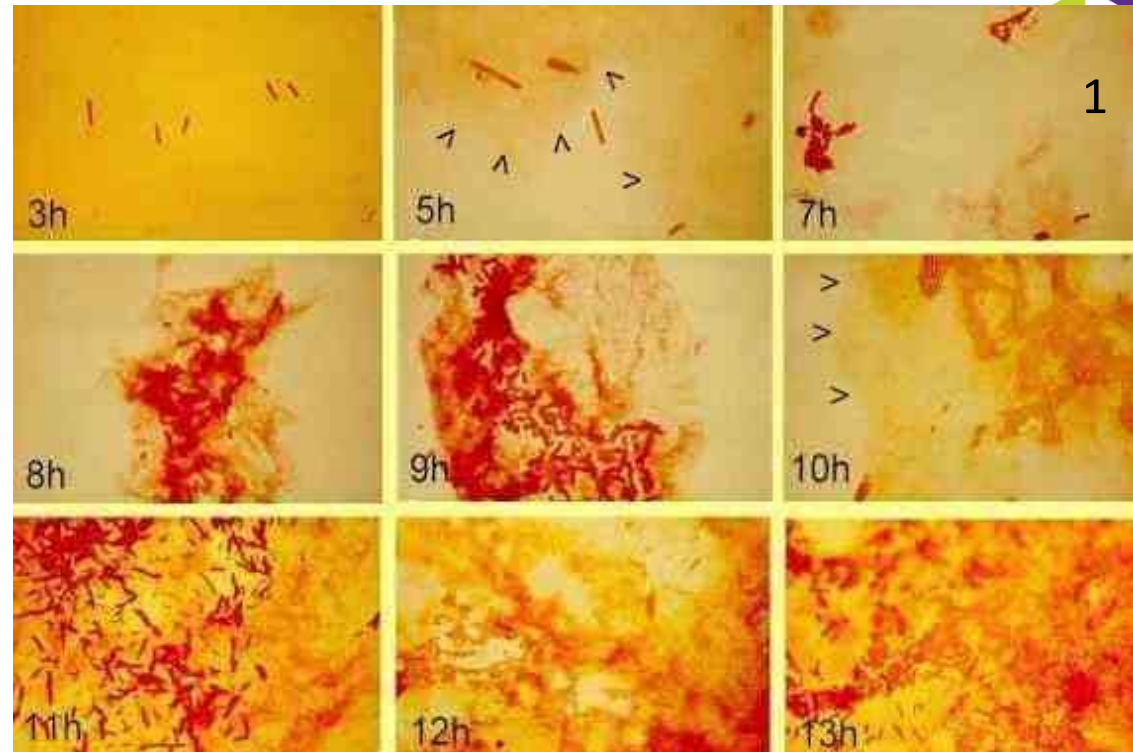
- △ > 1 billion oral microbes
- △ 700-1000 species
- △ Replicate's 5 x in 24hr period

## Disruption of Microbiome<sup>2</sup>

- △ Plaque, gingivitis, tooth decay
- △ Reduced salivary flow/change in pH

## 24-48 hours for HAP pathogens in mouth<sup>3</sup>

## If aspirated =100,000,000 bacteria/ml saliva into lungs<sup>4</sup>



1. <http://helios.bto.ed.ac.uk/bto/microbes/biofilm.htm>
2. Loesche, W. 2012
3. Scannapieco FA, Stewart EM, Mylotte JM.. *Crit Care Med.* 1992;20:740-745.
4. Langmore, S. et.al. (1998) *Dysphagia.* 13, 69-81

# Oral Cavity & VAP

- 89 critically ill patients
- Examined microbial colonization of the oropharynx through out ICU stay
- Used pulse field gel electrophoresis to compare chromosomal DNA
- Results:
  - △ Diagnosed 31 VAPs
  - △ 28 of 31 VAPs the causative organism was identical via DNA analysis

- 49 elderly nursing home residents admitted to the hospital
- Examined baseline dental plaque scores & microorganism within dental plaque
- Used pulse field gel electrophoresis to compare chromosomal DNA
- Results
  - △ 14/49 adults developed pneumonia
  - △ 10 of 14 pneumonias, the causative organism was identical via DNA analysis



# Risk Factor Categories for Hospital Acquired Pneumonia

- ▲ Factors that increase bacterial burden or colonization
- ▲ Factors that increase risk of aspiration



# Micro Aspiration during Sleep in Healthy Subjects

🔗 Prospective duplicate full-night studies

🔗 10 normal male's 22-55 years of age

🔗 Methods:

- Radioactive 99 mTc tracer inserted into the nasopharynx
- Lung scans following final awakening
- No difference in sleep efficacy between 2 study nights

🔗 Results:

# 50%

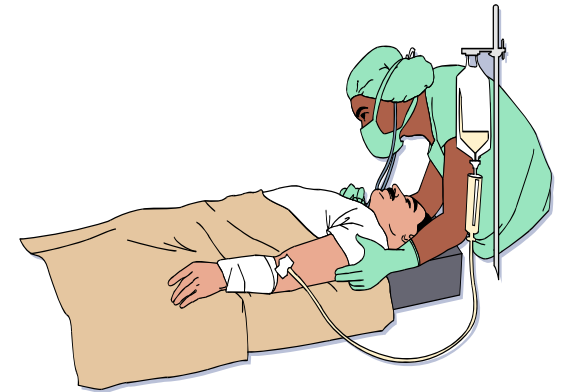
In the lung parenchyma



# Body Position: Supine versus Semi-recumbent (30-45 degrees)

## Methodology

- 19 mechanically ventilated patients
- 2 period crossover trial
- Study supine and semirecumbent positions over 2 days
- Labeled gastric contents (Tc 99m sulphur colloid)
- Measured q 30 min content of gastric secretions in endobronchial tree in each position
- Sampled ET secretions, gastric juice & pharyngeal contents for bacteria



# Body Position: Supine versus Semi-recumbent

## Results:

Radioactive contents higher in endobronchial secretions in supine patients

Time dependent:

- Supine: 298cpm/30min vs. 2592cpm/300min
- HOB: 103cpm/30min vs. 216cpm/300min



Same microbes cultured in all 3 areas

- HOB: 32%
- Supine: 68%



# Oral Hygeine





## Polling Question

What is your current oral care regime at your facility?

- △ CHG alone
- △ Toothbrushing
- △ Toothbrushing with CHG
- △ Toothbrushing, CHG, cleansing swabs(Comprehensive kit)
- △ Nothing



# What Does the Evidence Tell Us?

Brush  
CHG rinse alone  
CHG rinse in Combination  
Swab/Clean/Moisturize  
Suction

**All of the above**

Comprehensive Oral Care Program



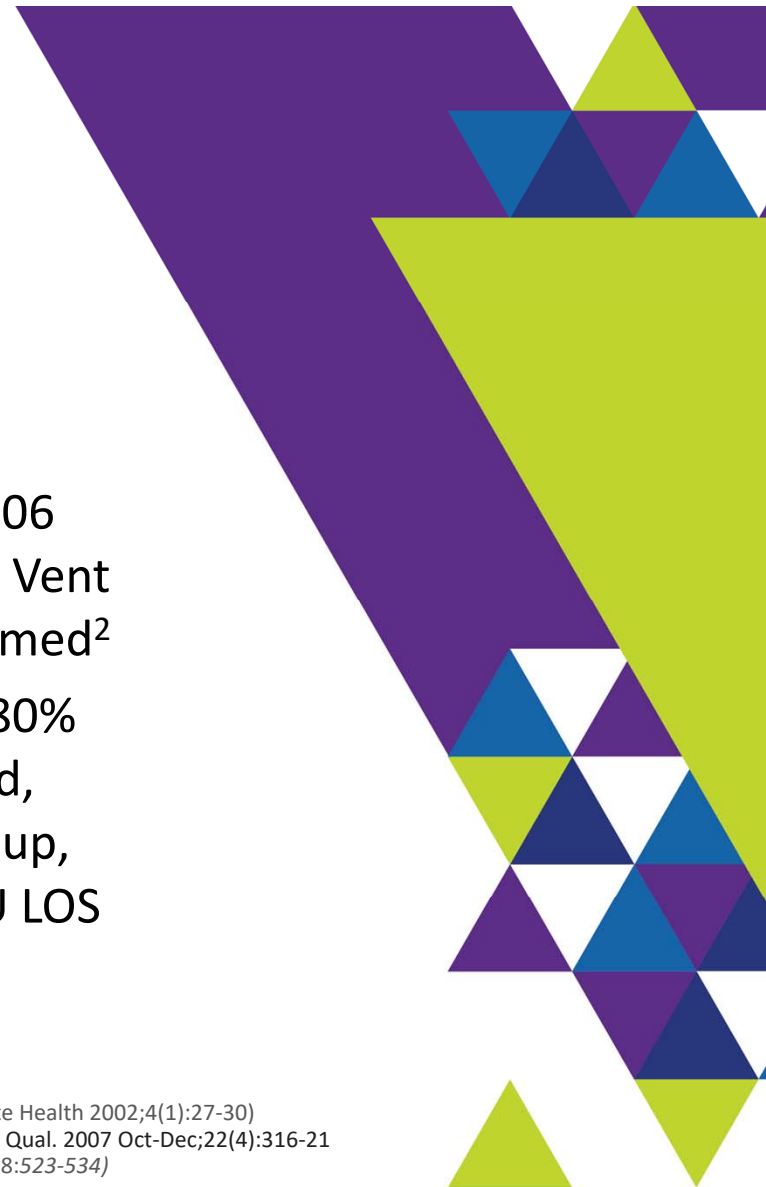
# Literature Review: Oral Care

## Impact of VAP

### Comprehensive Oral Care:

- Reduction in VAP from 5.6 to 2.2<sup>1</sup>
- Reduction in VAP from 4.10 (2005) to (2.15) in 2006 with addition of CPC & comprehensive oral care. Vent bundle & rotational therapy already being performed<sup>2</sup>
- Reduction in VAP from 12.0 to 8.0 (p=.060) with 80% compliance, vent bundle already being preformed, 1538 patients randomized to control or study group, Additional outcomes; ↓ vent days (p=.05), ↓ ICU LOS (p=.05) ↓ time to VAP (p= <.001) & reduction in mortality (p=.05)<sup>3</sup>

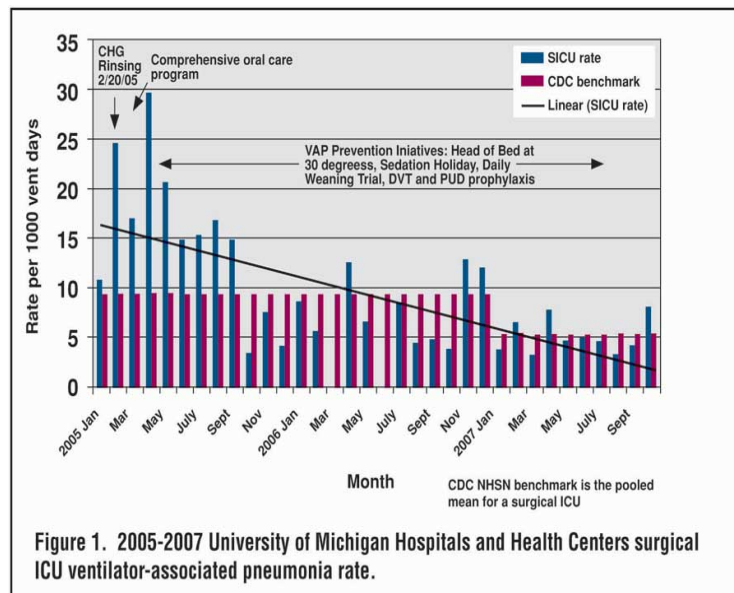
1. Schleder B. et al. J Advocate Health 2002;4(1):27-30
2. Powers J, et al. J Nurs Care Qual. 2007 Oct-Dec;22(4):316-21
3. Garcia R et al AJCC, 2009;18:523-534)



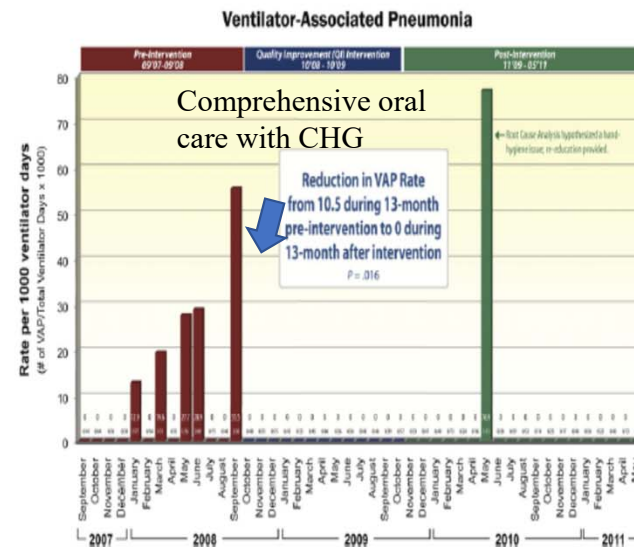
# Literature Review: Oral Care Impact of VAP

## Comprehensive Oral Care & CHG:

- Reduction in VAP to zero for 2 years, vent bundle, mobility, oral care & CHG with comprehensive education preformed (Murray TM et al. AACN Advanced Critical Care. 2007;18(2):190-199)



Dickinson S et al. SCCM Critical Connections, 02/2008



Heck K, et al. American Journal of Infection Control 40 (2012) 877-9




# Does CHG Oral Care Impact VAP and Mortality



## Klompas Study- Retrospective review

- △ Single center
- △ Impact of vent bundle (5536 patients)
- △ Connection of CHG with increase mortality on patients vented > 3 days

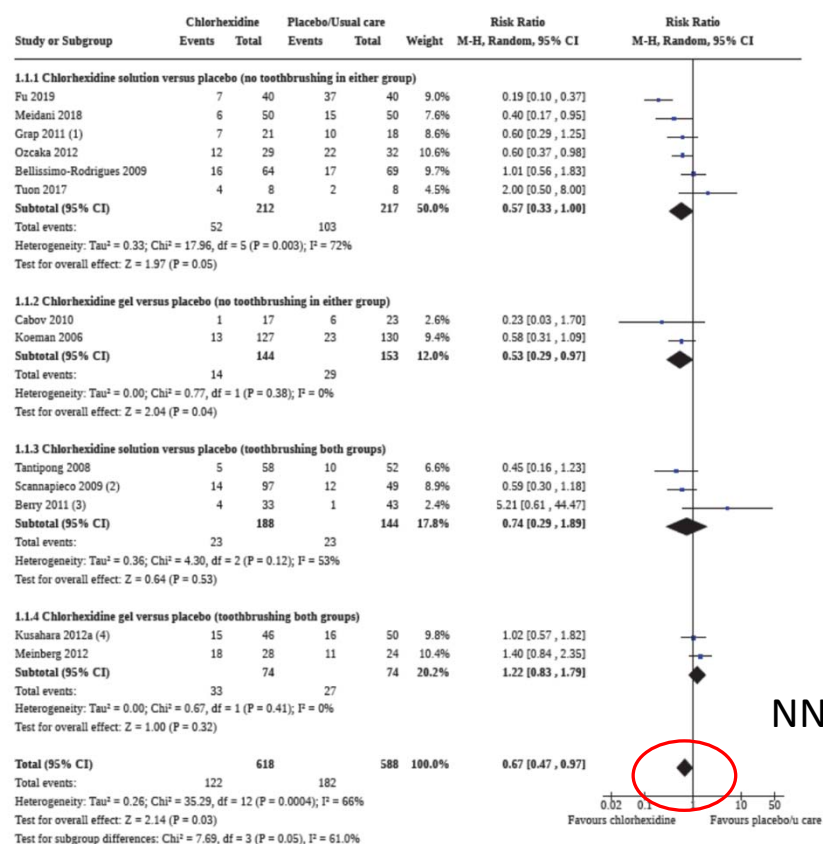
## Deschepper study: Retrospective Review

- △ Hospital wide retrospective cohort (82,274 patients)
- △ 11,133 patients received CHG oral care
- △ Divided into low exposure-cumulative dose < 300 mg (8080 pts)
- △ High exposure > 300 mg (3053 pts)
- △ 300 mg CHG is equivalent to 1 bottle of 250ml of oral care soln at .12%-covers 5-6 days at 3 times a day)
-  In the sickest group CHG low or high exposure was not a risk for increased mortality
-  Showed improvement on mortality in ICU patients ventilated < 96hrs and not harm if vented > 96 hrs
-  Greatest risk for mortality increase is use in non-ICU patients.

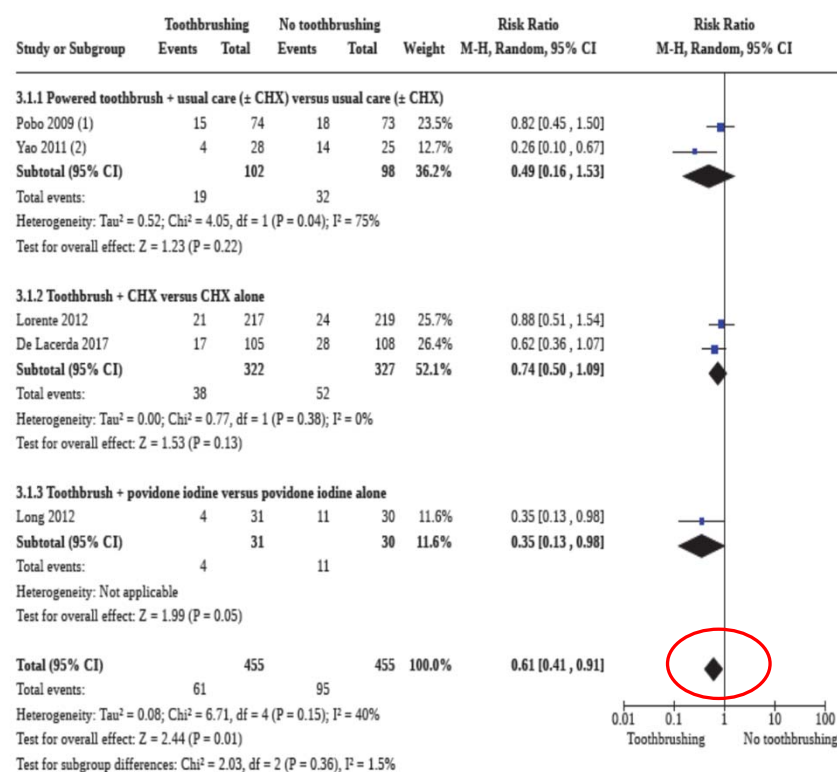


# Cochrane Meta-Analysis 2020 of RCT's

Analysis 1.1. Comparison 1: Chlorhexidine versus placebo/usual care, Outcome 1: Incidence of VAP

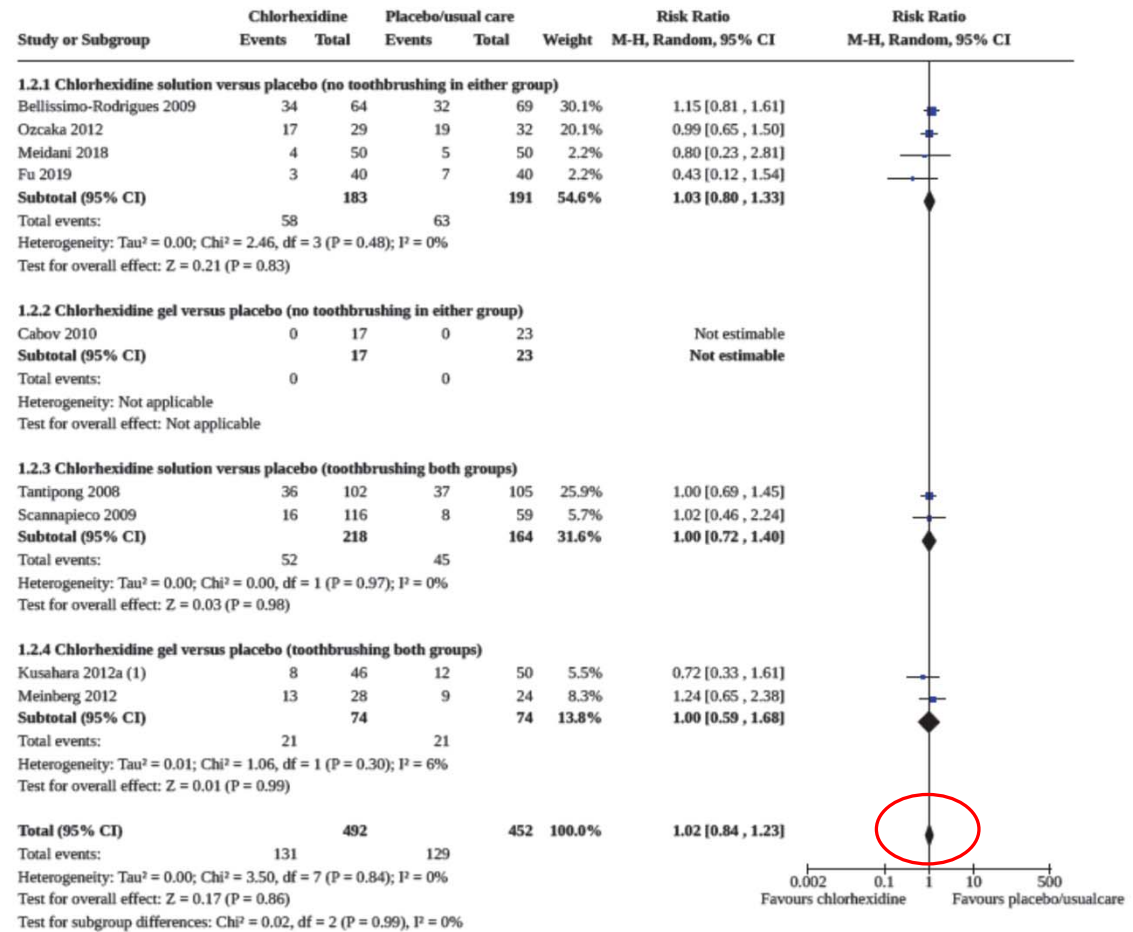


Analysis 3.1. Comparison 3: Toothbrushing versus no toothbrushing, Outcome 1: Incidence of VAP



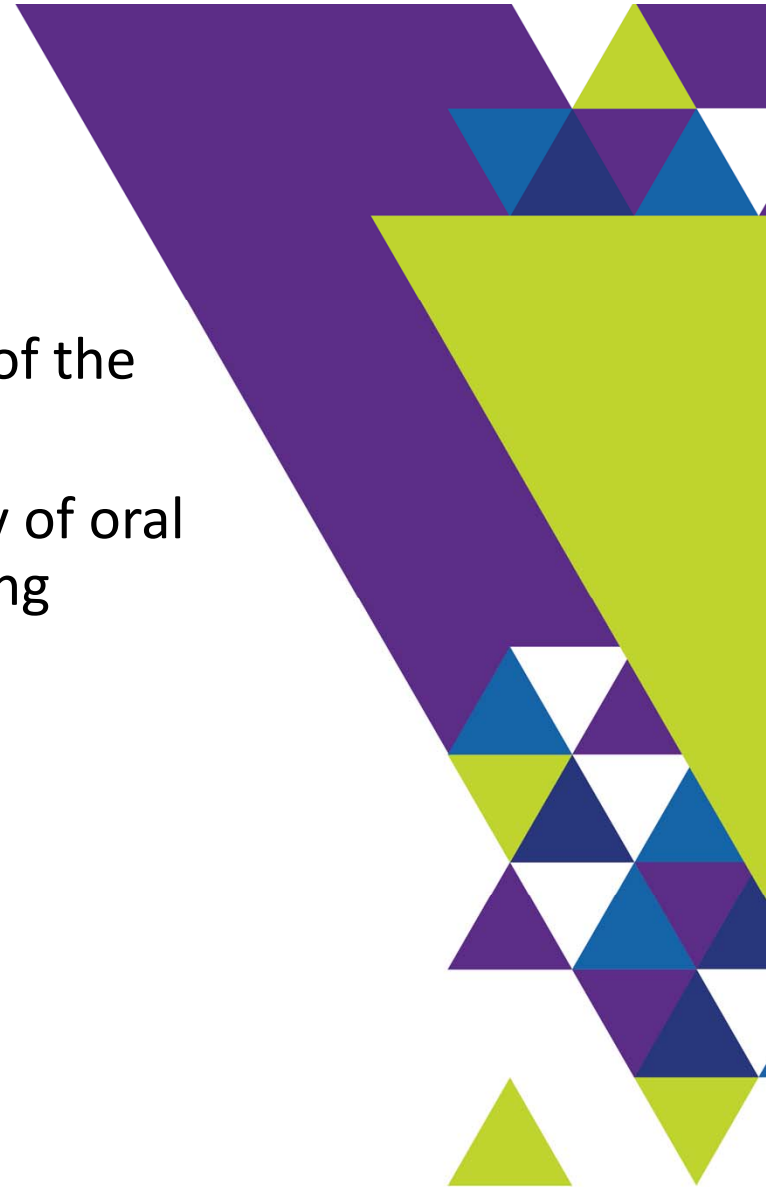
# Impact on Mortality

## Analysis 1.2. Comparison 1: Chlorhexidine versus placebo/usual care, Outcome 2: Mortality



## It is More than CHG

- 🔗 .12% CHG application 2x daily is a small part of the oral care equation
- 🔗 It is the comprehensive and frequent delivery of oral hygiene, including toothbrushing and cleansing







# BACCN Oral Care for Adults in Critical Care

## Ventilated Patients

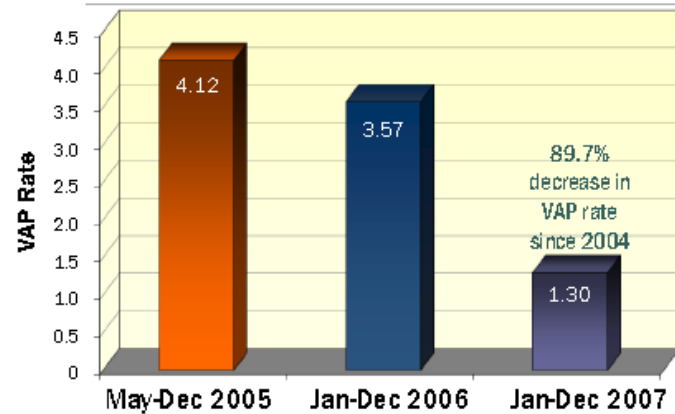
- △ Assessment completed within 6hrs of admission & then q 12hrs
- △ Standardized oral assessment tool
- △ Toothbrushing should occur X2 daily additionally oral cleansing with swabs, suctioning and moisturization of the mouth q 2-4hrs
- △ Tools to use
  - Pediatric toothbrush followed by suctioning or Suction toothbrush (consider using a single use)
  - Swab for cleaning and moisturizing/suction swab if available to suction debris with cleaning
  - Consider using oral care tools & supplies that can be kept at the bedside
- △ Oral care cleansing solutions
  - Use of an oral antiseptic rinse like CHG or CPC after brushing or in combination with comprehensive oral care
  - Advise caution with routine use of CHG/consult team
  - With swab cleaning use CPC, 1.5% H2O2 or sterile water



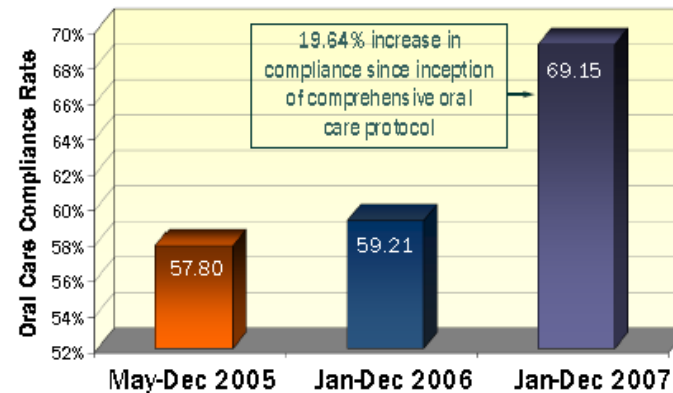
# Does Compliance Make A Difference?

Oral care compliance  
& use of the  
ventilator bundle  
resulted in a 89.7%  
reduction in VAP

**VAP rates for the years of the study**

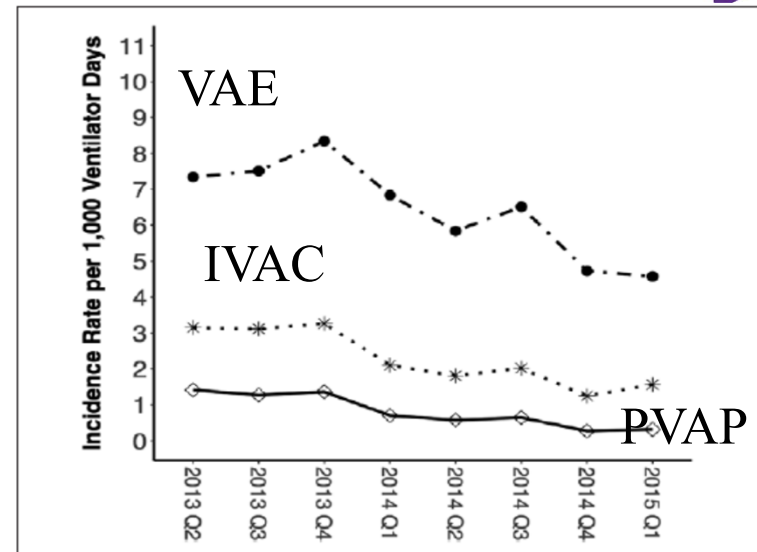


**Compliance rates for the years of the study**



# Impact of a New Bundle/2 State Collaborative

- 38 hospitals, 56 ICU's in 2 states from October 2012 to March 2015
- Evidence based interventions, teamwork & safety culture
- Head-of-bed elevation, use of subglottic secretion drainage endotracheal tubes, oral care, chlorhexidine mouth care, and daily spontaneous awakening and breathing trials.



- VAE: 7.34 to 4.58 cases per 1,000 ventilator-days ( $p = 0.007$ )
- IVAC 3.15 to 1.56 per 1,000 ventilator days ( $p = 0.018$ )
- PVAP 1.41 to 0.31 cases per 1,000 ventilator-days ( $p = 0.012$ )

# Building Blocks to Best Practice in Caring for Mechanically Ventilated Patients

**Ventilator Bundle:** HOB 30, Deep Vein Thrombosis (DVT) prophylaxis, Peptic Ulcer Disease (PUD) prophylaxis, Sedation interruption, Spontaneous breathing trial, daily care with chlorhexidine<sup>1</sup>



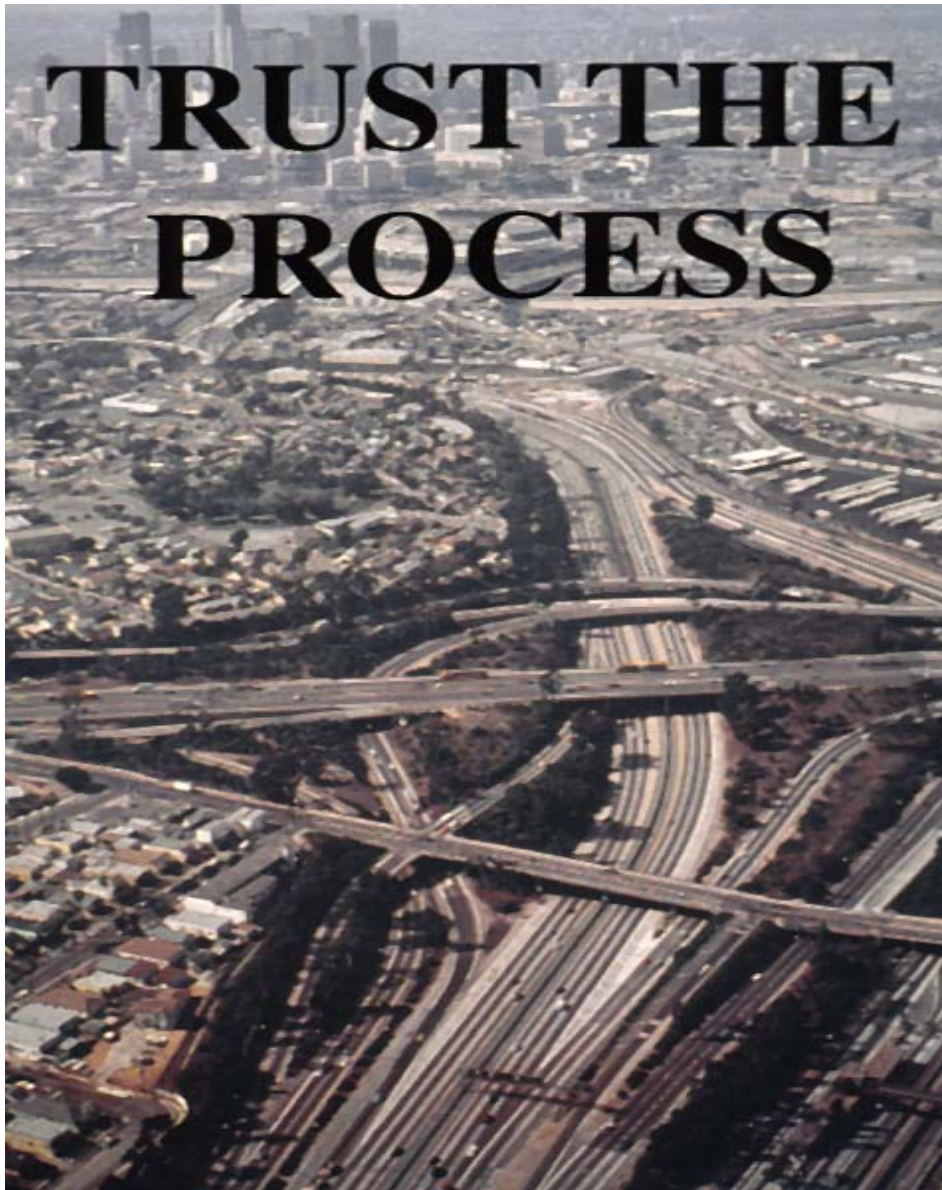
**VAP Bundle:** HOB 30, Sedation interruption, Spontaneous breathing trial, oral care 6x per day, CHG rinse 2x per day, subglottic secretions drainage if expected to be ventilated > 72hrs<sup>2</sup>



**ABCDE Bundle:** Assess & manage pain, Both Spontaneous awakening trial (SAT) & spontaneous Breathing trial(SBT), Choice of Sedation, Delirium Assessment and management, Early Mobility, Family and Patient Engagement<sup>3</sup>

1. <http://www.ihl.org/resources/Pages/Tools/HowtoGuidePreventVAP.aspx>
2. Rawat N, et al. Crit Care Med, 2017;45:1208-1215
3. [www.ICUliberation.org](http://www.ICUliberation.org)





# Non-Vent Pneumonia: Addressing Risk Factors



# Build the Will: NV-HAP Causes Harm

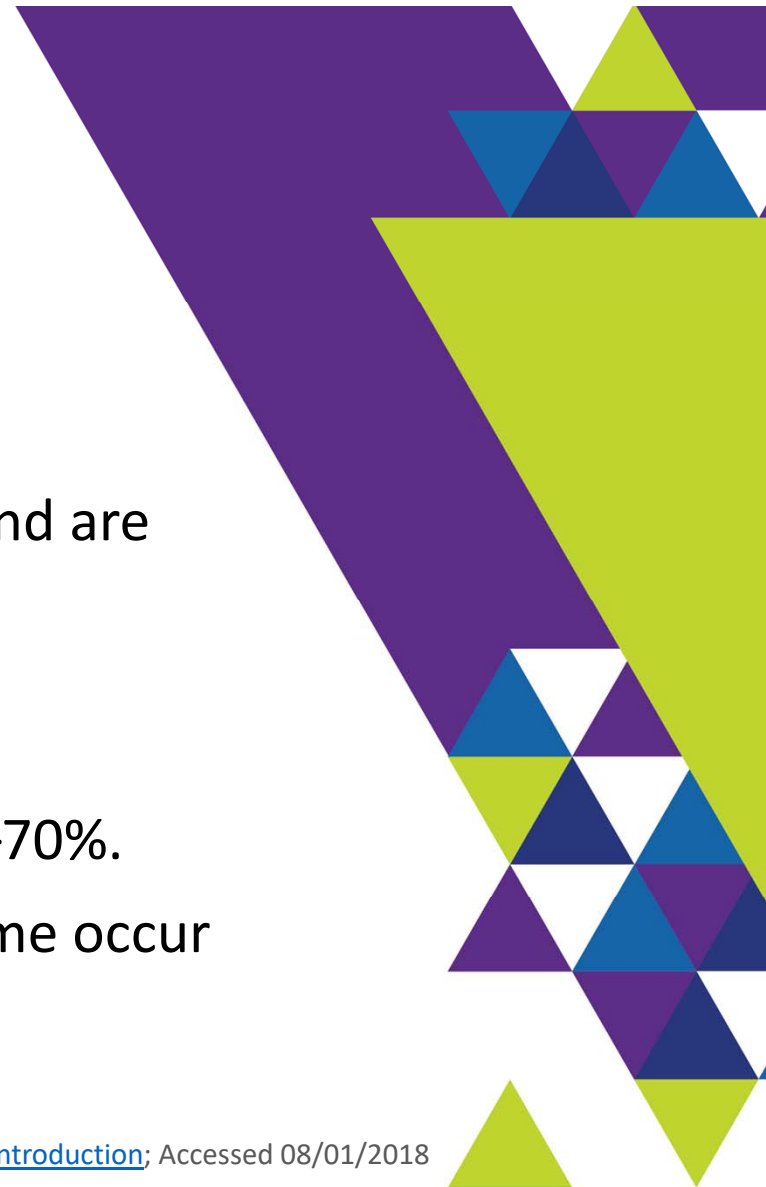
- ▲ HAP 1st most common HAI in U.S.<sup>1,2</sup>
- ▲ 1 in every 4 hospital infections are pneumonia<sup>1</sup>
  - △ 60% non-ventilator
- ▲ Increased mortality → 15.5%-30.9%<sup>3</sup>
  - △ 8 ½ x more likely to die than equally sick patients who did not get non-vent HAP<sup>4</sup>
- ▲ Increased morbidity → 50% are not discharged home<sup>5,6,7</sup>
  - △ Extended LOS → 7-9 days<sup>5,6,7</sup>
  - △ Increased Cost → \$36K to \$54K per case<sup>6</sup>
  - △ 2x likely for readmission <30 day<sup>5,6</sup>
  - △ 46% ↑ ICU utilization<sup>5,6</sup>
  - △ Increase antibiotic utilization<sup>8</sup>

1. Magill SS, et al. NEJM 2018;379:1732-1744
2. Strassle PD, et al. Infect Control Hosp Epidemiol. 2020 Jan;41(1):73-79.
3. Giuliano K, et al. Am J of Infect Control. 2018;46:322-327
4. Micek ST, et al. Chest. 2016 Nov;150(5):1008-1014.
5. Baker D, Quinn B et al. J Nurs Care Qual, 2019 1-7
6. Giuliano K, et al. Am J of Infect Control. 2018;46:322-327
7. Davis J et al. Pa Patient Safety Advisory, 2018;15(3)
8. Lacerna CC, et al. Infec control & Hosp Epidemiology 2020;41, 547-552



## United Kingdom- Non-Ventilator HAP

- 1.5% of hospital inpatients in England have a hospital-acquired respiratory infection
- Over half are hospital-acquired pneumonia and are not associated with intubation.
- Hospital-acquired pneumonia is estimated to increase hospital stay by about 8 days
- Reported mortality rate that ranges from 30–70%.
- Variations in clinical management and outcome occur across the UK.





# Hospital-Acquired Pneumonia:

## Non-Ventilated versus Ventilated Patients in Pennsylvania

### **Purpose:**

- 🔗 Compare VAP and NV-HAP incidence, outcomes

### **Methods:**

- 🔗 Pennsylvania Database queried
- 🔗 All nosocomial pneumonia data sets (2009-2016)



# Results:

**Table 1. Pennsylvania Nosocomial Pneumonia Incidence and Number of Patients with NV-HAP or VAP Who Died**

| Year         | Number of NV-HAP Patients | Number of NV-HAP Patients Who Died | Percentage of Patients with NV-HAP Who Died (Confidence Interval) | Number of VAP Patients | Number of VAP Patients Who Died | Percentage of Patients with VAP Who Died (Confidence Limit) |
|--------------|---------------------------|------------------------------------|---|------------------------|---------------------------------|---|
| 2009         | 1,977                     | 364                                | 18.41 (16.52–20.3)  | 922                    | 163                             | 17.68 (14.96–20.39)   |
| 2010         | 1,848                     | 366                                | 19.81 (17.78–21.83)   | 737                    | 144                             | 19.54 (16.35–22.73)   |
| 2011         | 1,780                     | 318                                | 17.87 (15.9–19.83)  | 643                    | 127                             | 19.75 (16.32–23.19)   |
| 2012         | 1,620                     | 307                                | 18.95 (16.83–21.07)   | 571                    | 112                             | 19.61 (15.98–23.25)   |
| 2013         | 1,528                     | 285                                | 18.65 (16.49–20.82)   | 767                    | 160                             | 20.86 (17.63–24.09)   |
| 2014         | 1,419                     | 256                                | 18.04 (15.83–20.25)   | 901                    | 199                             | 22.09 (19.02–25.16)   |
| 2015         | 1,427                     | 277                                | 19.41 (17.13–21.7)  | 912                    | 218                             | 23.90 (20.73–27.08)   |
| 2016         | 1,380                     | 280                                | 20.29 (17.91–22.67)   | 980                    | 221                             | 22.55 (19.58–25.52)   |
| <b>Total</b> | <b>12,979</b>             | <b>2453</b>                        | <b>18.89%</b>   | <b>6433</b>            | <b>1344</b>                     | <b>20.89%</b>   |

- Mortality
- Incidence
- Total deaths
- Total cost
- Wide-spread



## NV-HAP SMCS Research Findings: 2010

### Incidence:

- ▲ 115 adults
- ▲ 62% non-ICU
- ▲ 50% surgical
- ▲ Average age 66
- ▲ Common comorbidities:
  - CAD, COPD, DM, GERD
- ▲ Common Risk Factors:
  - Dependent for ADLs (80%)
  - CNS depressant meds (79%)

**24,482 patients and 94,247 pt days**

### Cost:

- ▲ \$4.6 million
- ▲ 23 deaths
- ▲ Mean Extended LOS 9 days
- ▲ 1,035 extra days



# HAPPI-2 Incidence of Non-Ventilator Hospital-Acquired Pneumonia

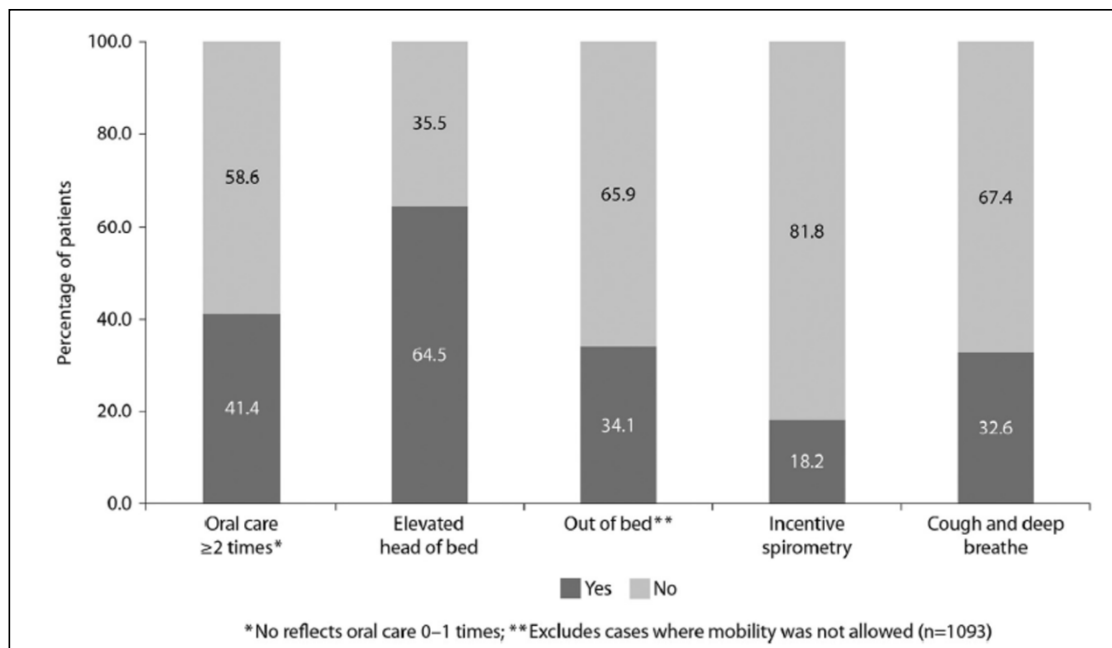


- ▲ Multicenter retrospective chart review
- ▲ Extracted NV-HAP cases per the 2014 ICD-9-CM codes for pneumonia not POA and the 2013 CDC case definition
- ▲ 21 hospitals completed data collection
- ▲ Measured nursing care missed 24hrs before diagnosis
- ▲ Non-vent HAP occurred on every unit



# HAPPI-2 Incidence of Non-Ventilator Hospital-Acquired Pneumonia

Missed nursing care 24 hours prior to Non-Vent HAP dx.



# HAPPI-2 Incidence of Non-Vent Hospital-Acquired Pneumonia

## Results:

🌈 1,300 NV-HAP (0.12-2.28 per 1,000 pt days)

- △ 15.8% mortality
- △ 50% < 66 yrs old
- △ 63% non-surgical
- △ 70.8% outside the ICU
- △ 27.3 % in ICU
- △ 18.8% transferred to ICU
- △ 37.3% LOS >20 days
- △ 57.7% LOS > 15 days
- △ 40.6% admitted from home were discharged back to home
- △ 19.3% readmitted within 30 days
- △ \$36.4 -\$52.56 million in extra costs

- Med-Surg (43.1%; n = 560)
- Telemetry (8.5%; n = 111)
- Progressive (7.2%; n = 93)
- Oncology (4.9%; n = 64)
- Orthopedic (2.8%; n = 37)
- Neurology (1.5%; n = 19)
- Obstetric (0.2%; n = 3)

# Is Pneumonia Part of the Sepsis Picture?

30-50% of sepsis cases may initiate with pneumonia<sup>1</sup>

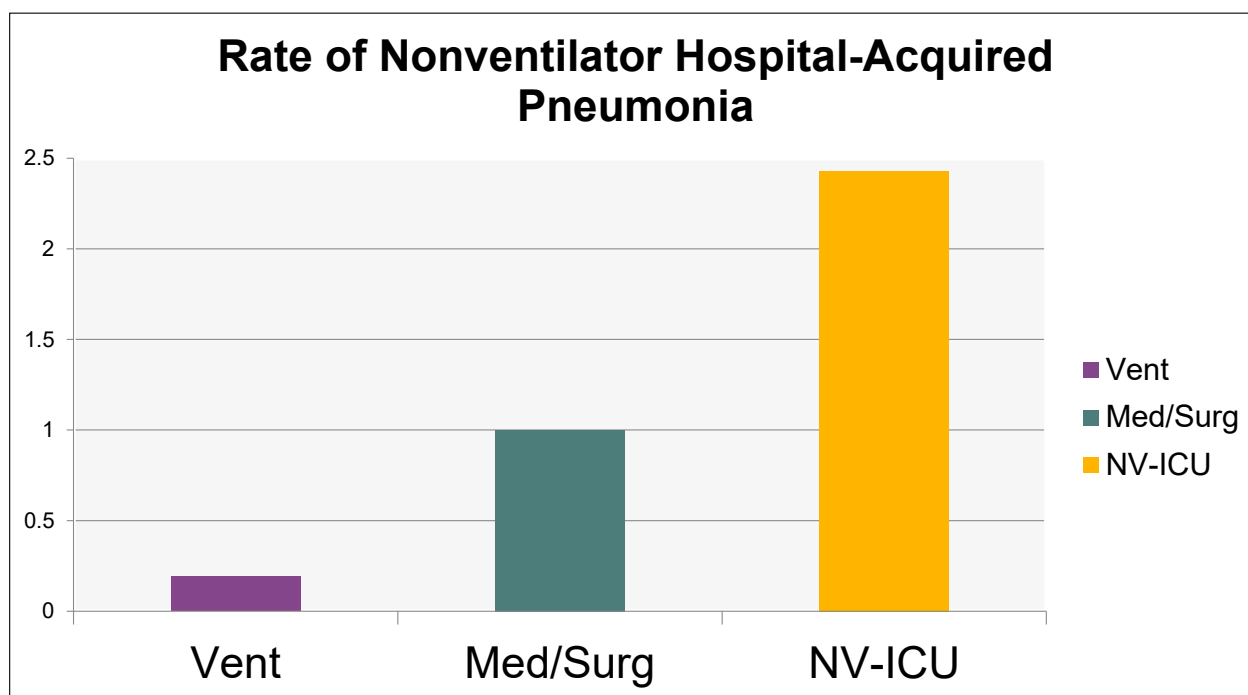
| Site of infection      | Frequency % |        | Mortality % |        |
|------------------------|-------------|--------|-------------|--------|
|                        | Male        | Female | Male        | Female |
| Respiratory            | 41.8        | 35.8   | 22.0        | 22.0   |
| Bacteremia             | 21.0        | 20.0   | 33.5        | 34.9   |
| Genitourinary          | 10.3        | 18.0   | 8.6         | 7.8    |
| Abdominal              | 8.6         | 8.1    | 9.8         | 10.6   |
| Device related         | 1.2         | 1.0    | 9.5         | 9.5    |
| Wound/ soft tissue     | 9.0         | 7.5    | 9.4         | 11.7   |
| Central nervous system | 0.7         | 0.5    | 17.3        | 17.5   |
| Endocarditis           | 0.9         | 0.5    | 23.8        | 28.1   |
| Other/ unspecified     | 6.7         | 8.6    | 7.6         | 6.5    |

Risk of developing sepsis 28x greater with NVHAP than with pneumonia on admission<sup>2</sup>

1. Angus DC, et al. N Engl J Med. 2013 Aug 29;369(9):840-51.
2. Giuliano K, et al. Am J of Infect Control. 2018;46:322-327



## Where is the Highest Risk for NV-HAP?



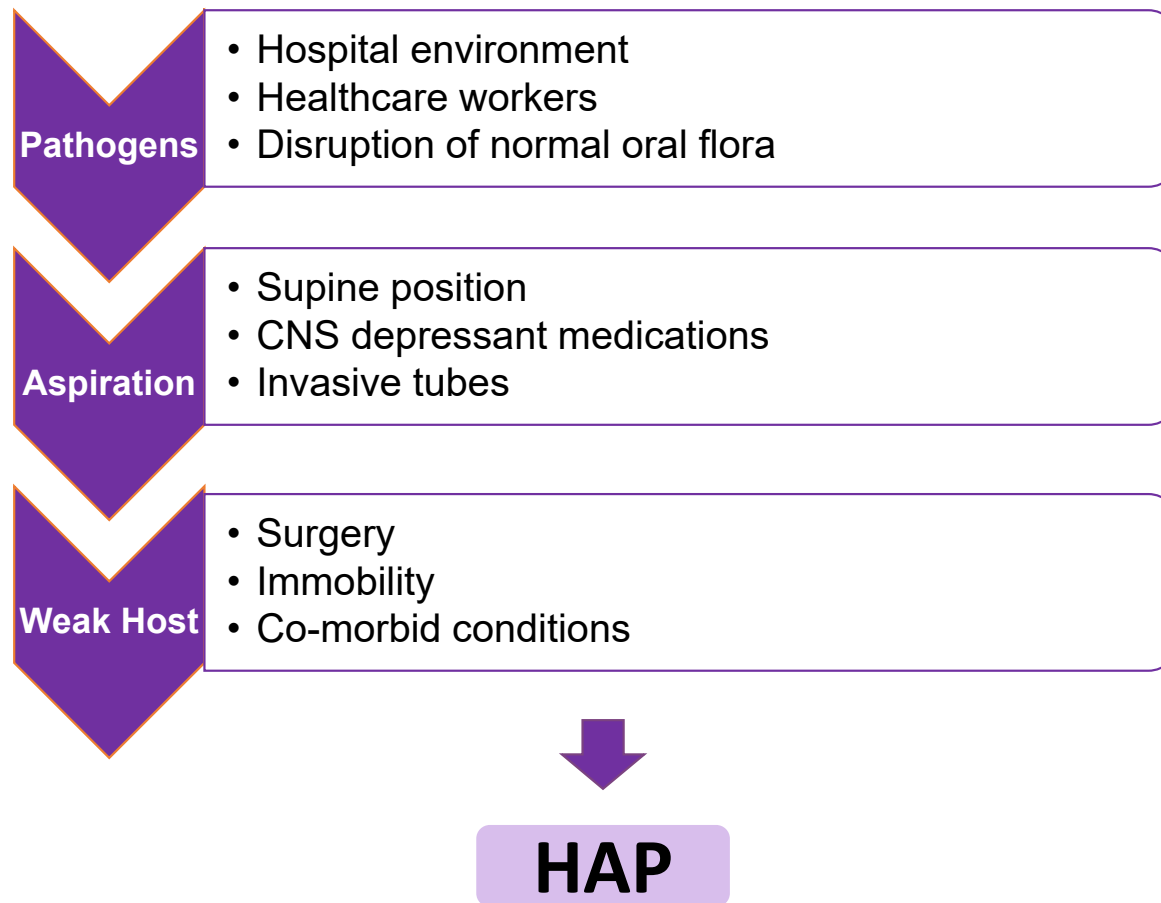
**NV-HAP per 1000 patient days**



Addressing the risk-factors  
associated with NV-HAP  
through evidence based  
fundamental nursing care  
strategies



# Risk Factors for Pneumonia



## Weak Host: Who is at Highest Risk?

- Male
- Elderly
- Surgical
- ICU
- Chronic disease
  - DM, CHF, CKD, COPD, alcoholism

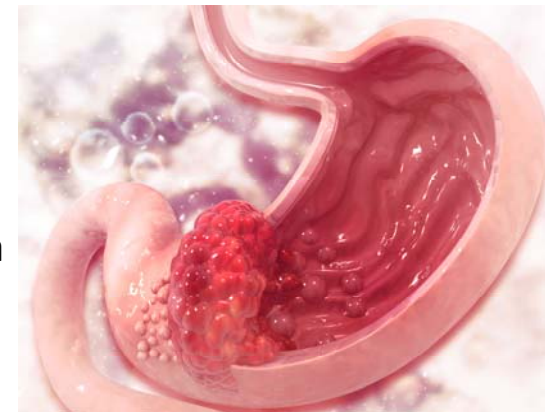
- Immunocompromised
- More than 6 medications
- Low albumin
- On antibiotics
- Dependent for ADLs
- Smokers



# Stewardship of Stress Ulcer Prophylaxis (SUP)



- 🔗 The most common complication of SUP is pneumonia<sup>1</sup>
- 🔗 ICU enteral fed patients<sup>1</sup>
  - △ no benefit & may increase risk for pneumonia Avoid unnecessary use
- 🔗 Acute Stroke patients (Systematic Review & Meta-Analysis)<sup>2,3</sup>
  - △ Acid suppressive medications are an important contributor to pneumonia development, especially PPIs
- 🔗 May lead to loss of protective bacteriostatic effect of gastric acid<sup>1,3</sup>
- 🔗 Higher risk of Clostridium difficile infection when combined with antibiotics<sup>1</sup>



1. Huang et. al (2018). Critical Care 22(20), 1-9.
2. Marchina et al (2019). J of the Neurological Sciences, 400;122-128.
3. Herzig SJ. et. Al (2014) Ann Neurol. 76(5): 712-178.



# Systematic Review of Inpatient Mobilization

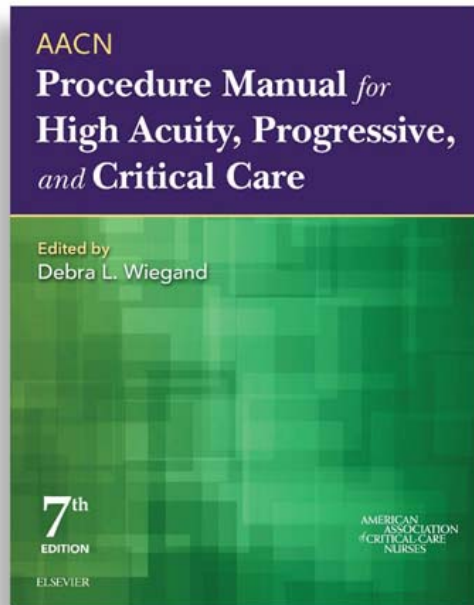


- 🔍 Literature review of research studies that provides evidence to the consequences of mobilizing or not mobilizing hospitalized adult patients
- 🔍 36 studies were included
- 🔍 Findings in four theme areas:
  - △ Physical outcomes include pain relief, reduced deep vein thrombosis, less fatigue, less delirium, less pneumonia, improved physical function (no relationship to falls)
  - △ Psychological outcomes include less anxiety, ↓ depressive mood, ↓ distress symptoms, ↑ comfort and ↑ satisfaction
  - △ Social outcomes include ↑ quality of life and more independence
  - △ Organizational outcomes include ↓ length of stay, ↓ mortality and ↓ cost





# AACN Procedural Manual-7th Ed



## Procedure 4: Endotracheal Tube Care and Oral Care

### Authors:

Kathleen M Vollman

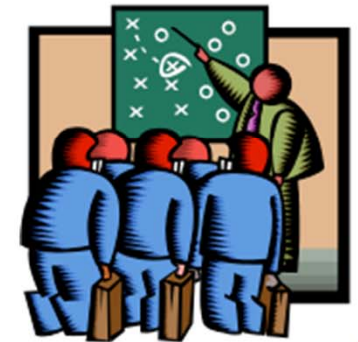
Mary Lou Sole

Barbara Quinn

# SMCS HAP Prevention Plan

## Phase 1: Oral Care

- Formation of new quality team: Hospital-Acquired Pneumonia Prevention Initiative (HAPPI)
- New oral care protocol to include non-ventilated patients
- New oral care products and equipment for all patients
- Staff education and in-services on products
  - Monthly audits





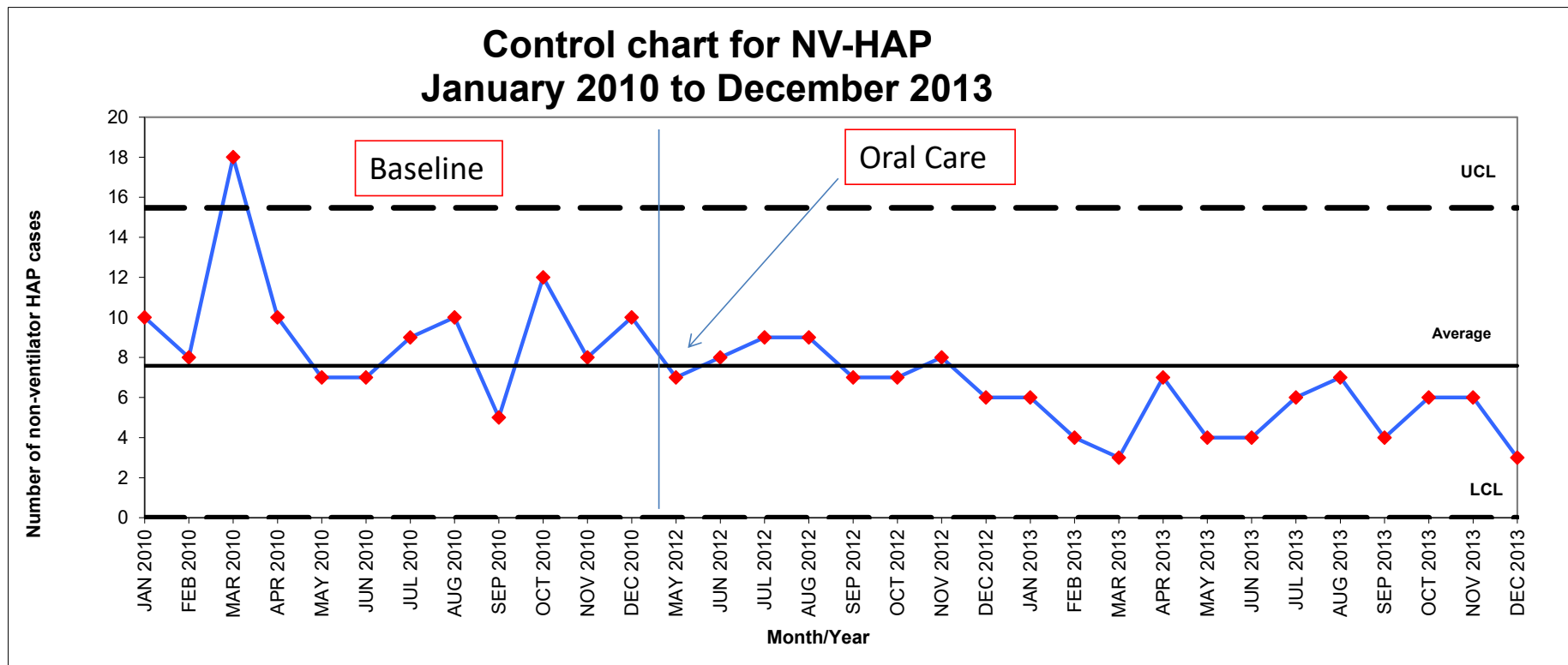
# Protocol – Plain & Simple



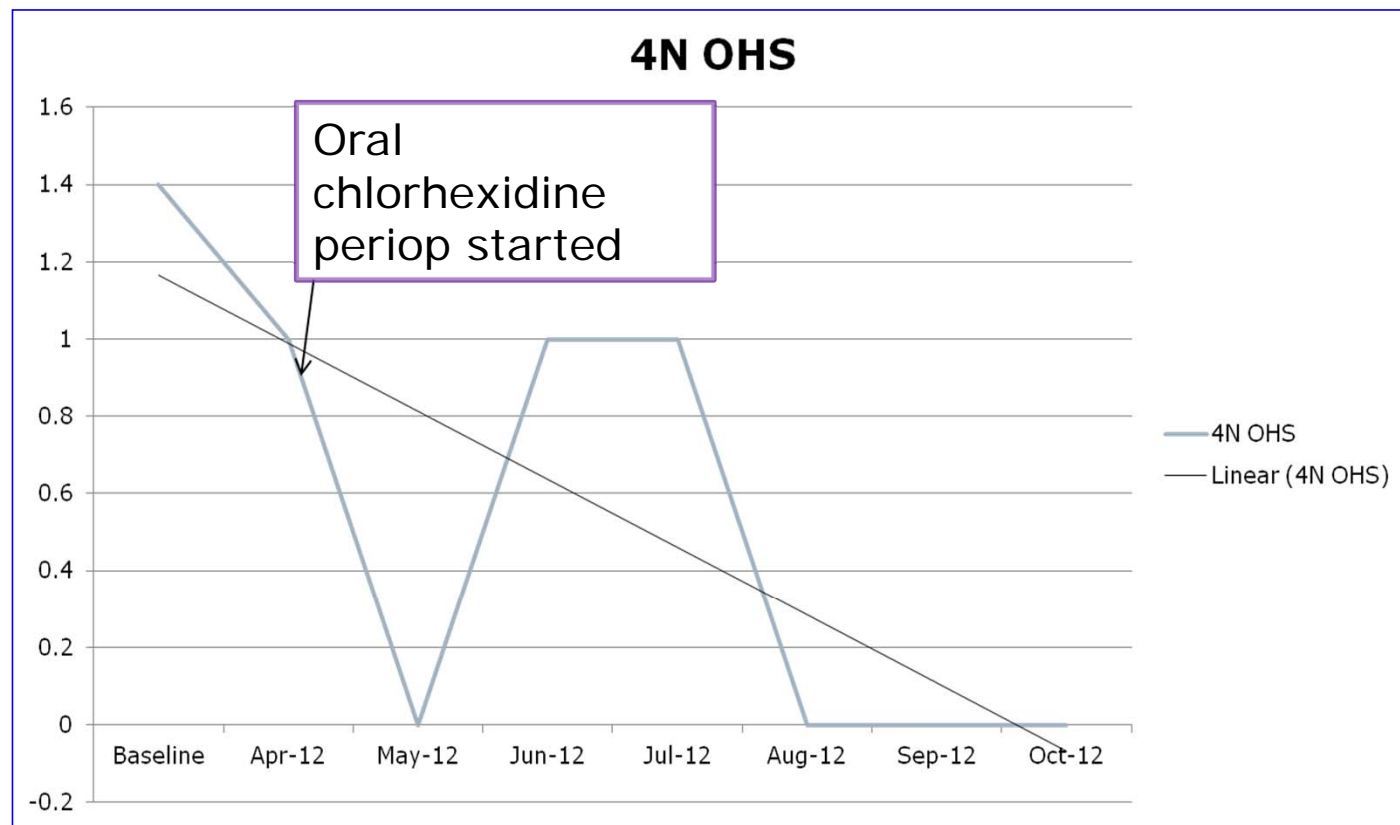
| Patient Type                | Tools  | Procedure  | Frequency |
|-----------------------------|--|--|-----------|
| Self Care / Assist          | Brush, paste, rinse, moisturizer <ul style="list-style-type: none"> <li>• Soft-bristled toothbrush</li> <li>• Toothpaste with dentifrice</li> <li>• Antiseptic mouth rinse (alcohol-free)</li> <li>• Moisturizer (Petroleum-free)</li> </ul> | Provide tools<br>Brush 1-2 minutes<br>Rinse          | 4X / day  |
| Dependent / Aspiration Risk | Suction toothbrush kit (4)   | Package instructions                                 | 4X / day  |
| Dependent / Vent            | ICU Suction toothbrush kit (6) <ul style="list-style-type: none"> <li>• CHG for vent &amp; cardiac surgery patients</li> </ul>   | Package instructions                                 | 6X / day  |
| Dentures                    | Denture cup, brush<br>Cleanser<br>Adhesive   | Remove dentures & soak<br>Brush gums, mouth<br>Rinse | 4X / day  |

# NV-HAP Incidence

## 50 % Decrease from Baseline



# Open Heart Surgery Patients: NV-HAP Reduced 75%



Quinn, B. et al. Journal of Nursing Scholarship, 2014. 46(1):11-19



## Return on Investment

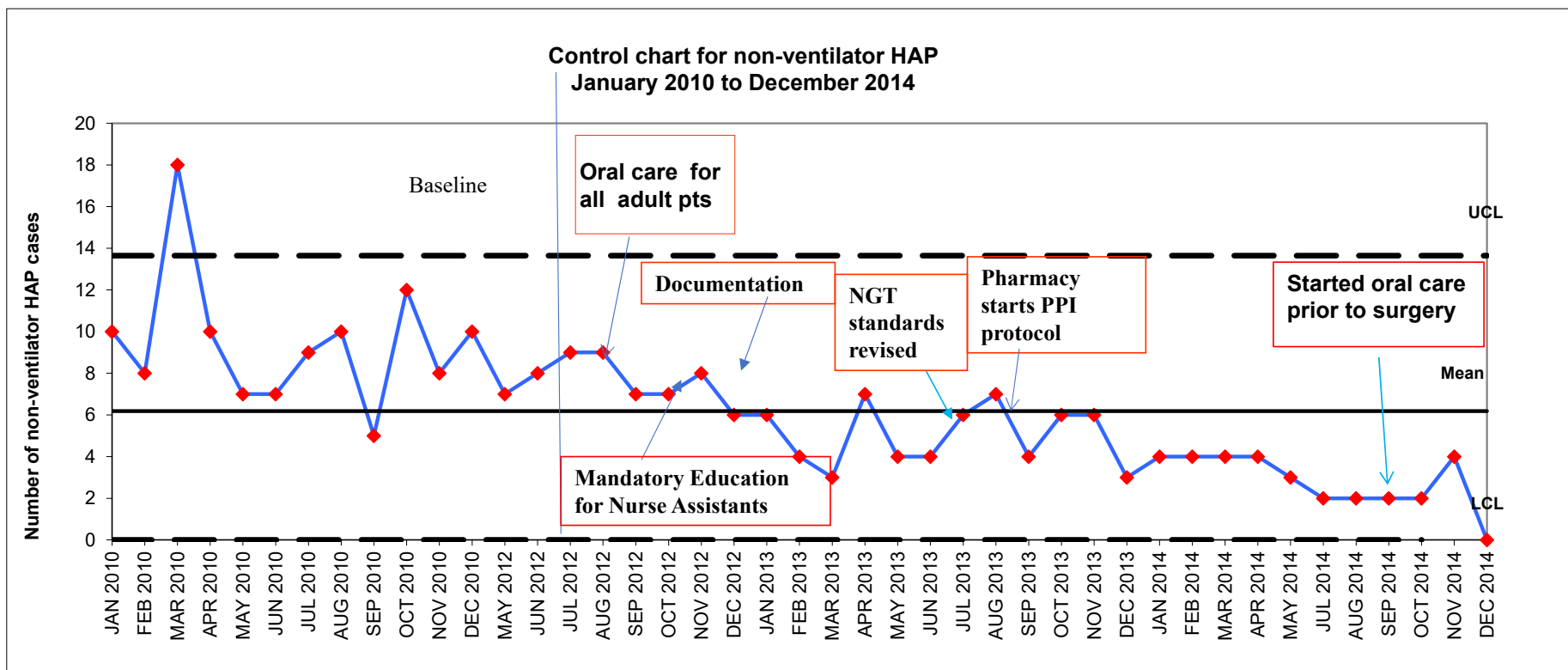
- 60 NV-HAP avoided Jan 1 – Dec. 31 2013
- \$2,400,000 cost avoided
- 117,600 cost increase for supplies
- \$2,282,400 return on investment

**8 lives saved**

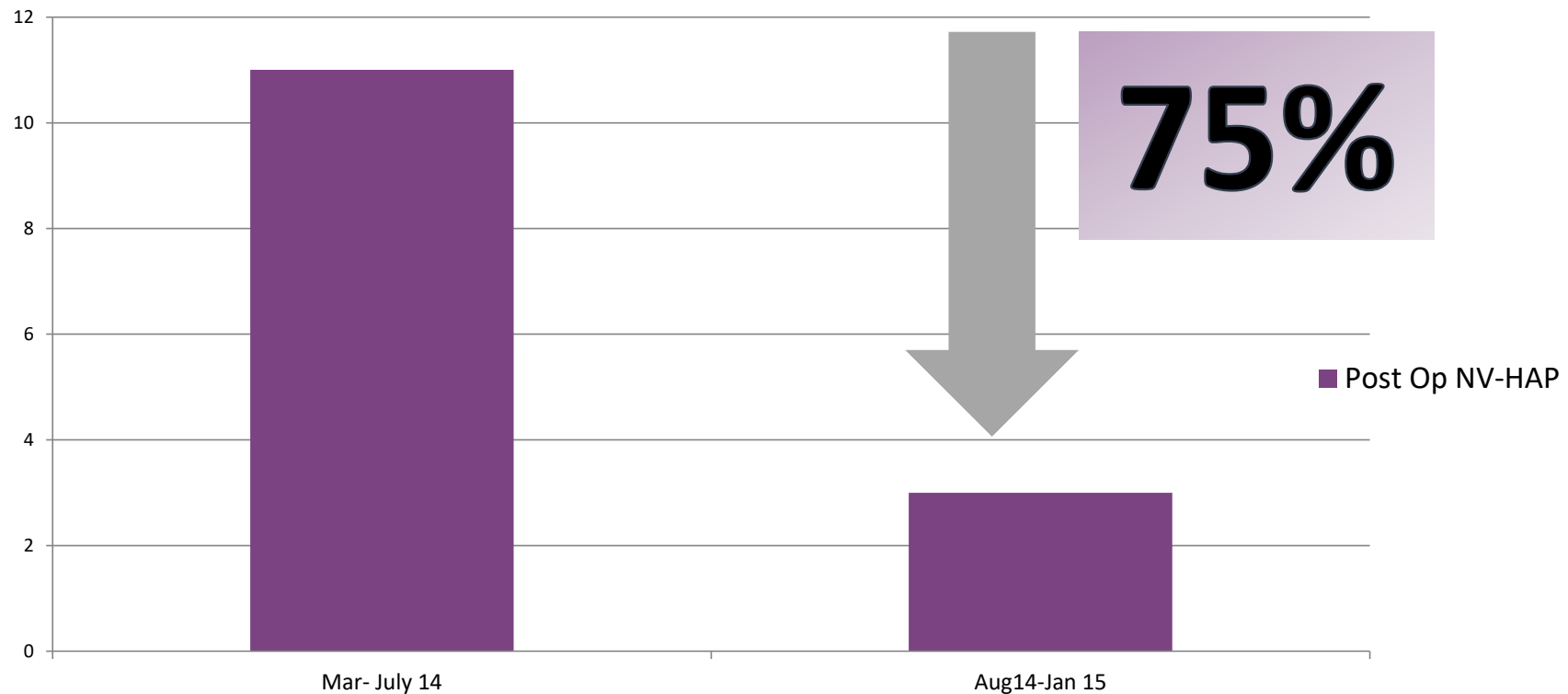
**PRICELESS**



# NV-HAP ↓ 70% from baseline!



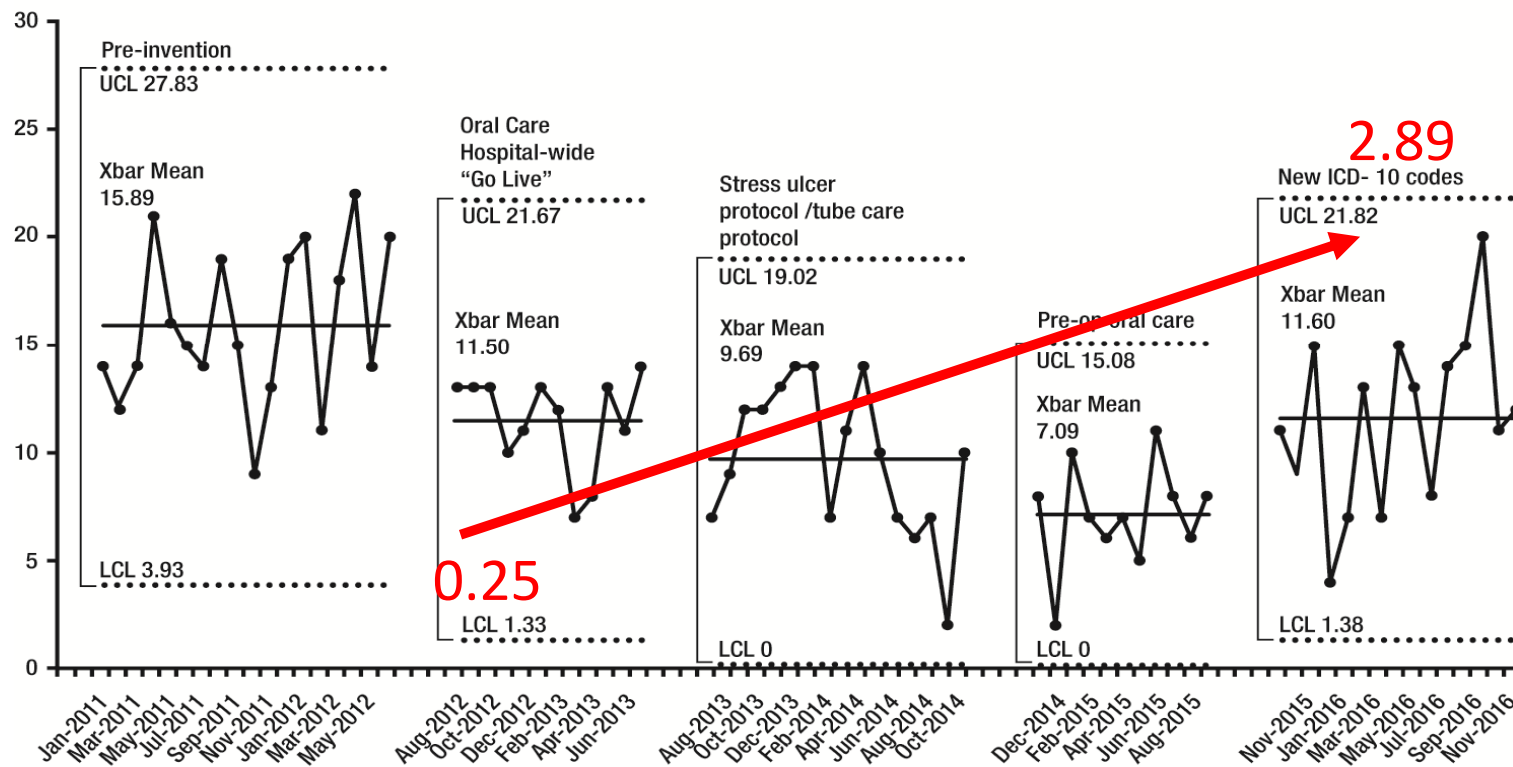
## Post-Operative NV-HAP (all adult inpatient surgery) Incidence 6 months Pre-Oral Care vs. 6 Months After



Quinn B, Presented at AACN NTI, Houston, Tx, 2017

# Sustainability Hospital Wide Oral Care from .25 to 2.89 (almost 3x a day)

Figure 1: Statistical process control R and X-bar-charts:  
International Statistical Classification of Diseases and Related Health Problems (ICD) codes (3 standard deviations)



# Outcomes:

## From the Beginning to 2014

🌀 Between May 2012 and December 2014

🌀 Sutter Medical Center avoided 164 cases of NV-HAP:

△ **\$5.9 million**

△ **31 lives**

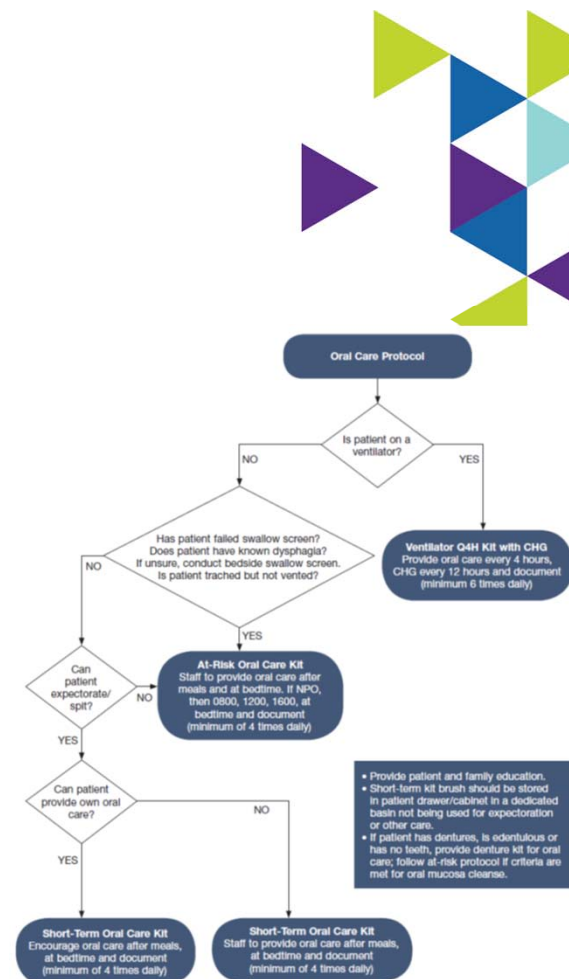
△ **656-1476 extra days in the hospital**





# Nurse Driven Oral Care Protocol to Improve NV-HAP

- QI project, 650 bed level 1 trauma center
- Data measure retrospectively/prospectively using ICD 9 & 10 codes not POA for NV-HAP and VAP
- 7 months baseline, 7 months intervention
- Method:
  - △ Evaluated current practice, the literature and oral care supplies
  - △ Pilot program with new oral care protocols/supplies for self care, assisted oral care and ventilator oral care
  - △ Expanded to whole hospital post pilot area



# Results

Staff adherence to protocol 76% (36%-100%)

NV-HAP

△ Baseline: 202 charts/52 NV-HAP's-20 deaths

△ Post: 215 charts/26 NV-HAP's (p< 0.0001)-4 deaths

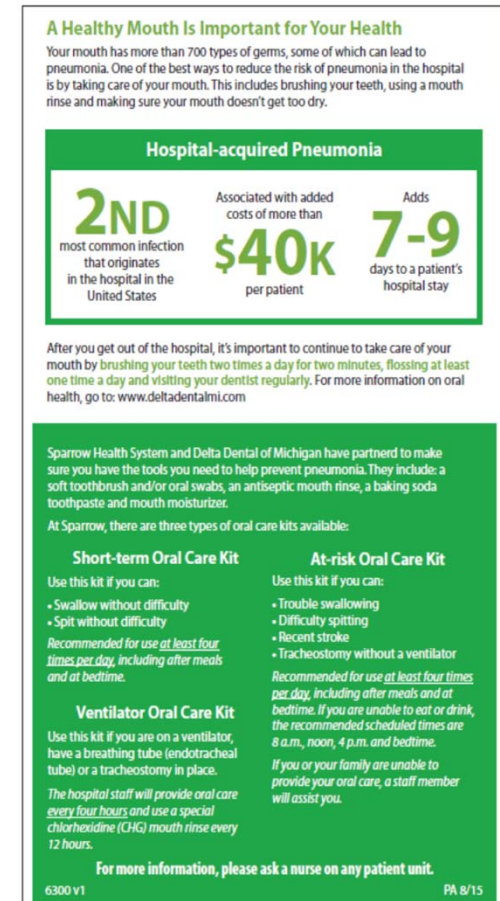
VAP

△ Baseline: 56 VAE's/ 12 VAP's (2.87 per 1000 vent days)

△ Post: 49 VAE's/3 VAP's (1.26 per 1000 vent days)

50% reduction in NV-HAP, avoided 16 deaths  
& 1.4 million dollars

Figure 2. Patient Education Information Sheet



**A Healthy Mouth Is Important for Your Health**

Your mouth has more than 700 types of germs, some of which can lead to pneumonia. One of the best ways to reduce the risk of pneumonia in the hospital is by taking care of your mouth. This includes brushing your teeth, using a mouth rinse and making sure your mouth doesn't get too dry.

**Hospital-acquired Pneumonia**

|   |  |  |
|---|--|--|
| <b>2ND</b><br>most common infection<br>that originates<br>in the hospital in the<br>United States | Associated with added<br>costs of more than<br><b>\$40k</b><br>per patient | Adds<br><b>7-9</b><br>days to a patient's<br>hospital stay |
|---|--|--|

After you get out of the hospital, it's important to continue to take care of your mouth by brushing your teeth two times a day for two minutes, flossing at least one time a day and visiting your dentist regularly. For more information on oral health, go to: [www.deltadentalmi.com](http://www.deltadentalmi.com)

Sparrow Health System and Delta Dental of Michigan have partnered to make sure you have the tools you need to help prevent pneumonia. They include: a soft toothbrush and/or oral swabs, an antiseptic mouth rinse, a baking soda toothpaste and mouth moisturizer.

At Sparrow, there are three types of oral care kits available:

| Short-term Oral Care Kit   | At-risk Oral Care Kit   |
|--|---|
| Use this kit if you can: <ul style="list-style-type: none"><li>• Swallow without difficulty</li><li>• Spit without difficulty</li></ul> Recommended for use <u>at least four times per day</u> , including after meals and at bedtime. | Use this kit if you can: <ul style="list-style-type: none"><li>• Trouble swallowing</li><li>• Difficulty spitting</li><li>• Recent stroke</li><li>• Tracheostomy without a ventilator</li></ul> Recommended for use <u>at least four times per day</u> , including after meals and at bedtime. If you are unable to eat or drink, the recommended scheduled times are 8 a.m., noon, 4 p.m. and bedtime. If you or your family are unable to provide your oral care, a staff member will assist you. |

**Ventilator Oral Care Kit**

Use this kit if you are on a ventilator, have a breathing tube (endotracheal tube) or a tracheostomy in place.

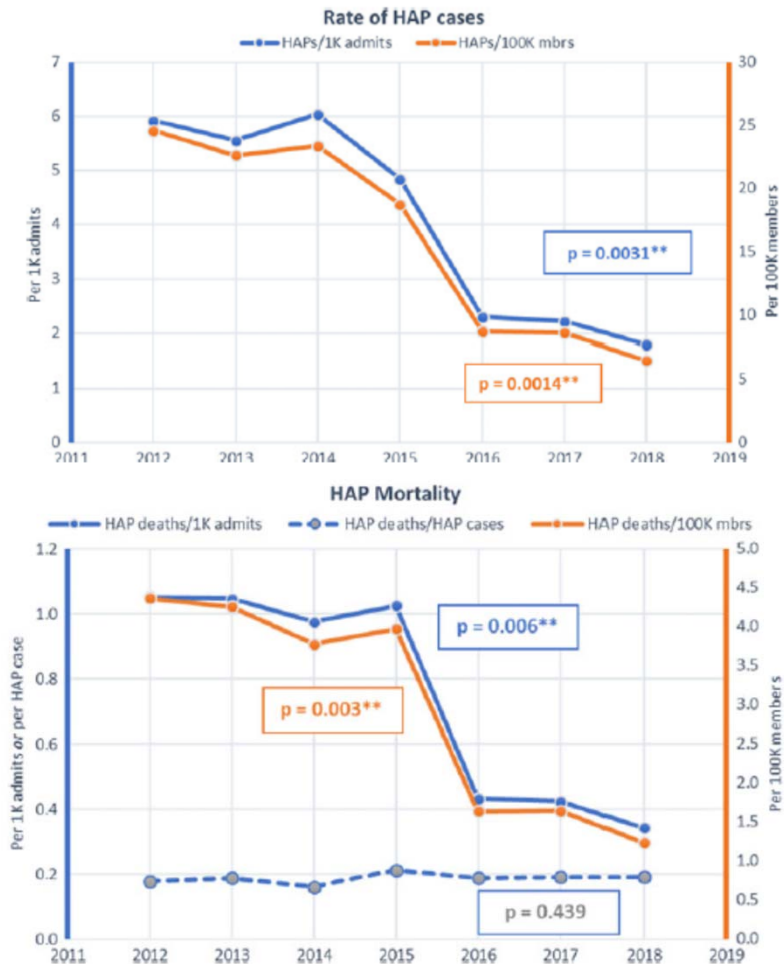
The hospital staff will provide oral care every four hours and use a special chlorhexidine (CHG) mouth rinse every 12 hours.

For more information, please ask a nurse on any patient unit.

6300 v1 PA 8/15

# A Successful Program to ↓ NVHAP in a Large Hospital System

- 21 hospital system
- Longitudinal observational design
- Intervention
  - △ Upright for meals, mobilization, swallow evaluation, sedation restrictions, rigorous oral care, feeding tube care (ROUTE)
- Additional results
  - △ Reduction in antibiotic days
    - Carbapenem, quinolone, aminoglycoside & vancomycin
  - △ ↓ Benzodiazepine use





# BACCN Oral Care for Adults in Critical Care

## Non-Vent Patients

- △ Provided for patients who are unable to manage their own care or secretions safely
- △ Assessment completed within 6hrs of admission
- △ Standardized oral assessment tool
- △ Toothbrushing should occur X2 daily additionally oral cleansing with swabs, suctioning and moisturization of the mouth q 2-4hrs (schedule adjusted to accommodate patient condition/sleep)
- △ Tools to use
  - Pediatric toothbrush followed by suctioning or Suction toothbrush (consider using a single use)
  - Swab for cleaning and moisturizing/suction swab if available to suction debris with cleaning
  - Consider using oral care tools & supplies that can be kept at the bedside
  - No recommendation on toothpaste for bacteria control
- △ Oral care cleansing solutions
  - With swab cleaning use CPC, 1.5% H2O2 or sterile water





# WHEN WOULD NOW BE A GOOD TIME TO DO THIS?

It is not enough to do your best; you must know what to do, and THEN do your best.

*~ W. Edwards Deming*

**Forbid yourself to be deterred by  
poor odds just because your  
mind has calculated that the  
opposition is too great. If it were  
easy, everyone would do it.**





HAI prevention courses by Kathleen Vollman

<https://www.medbridgeeducation.com/advancing-nursing>



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