

The Next Big Adventure: Prevention of Non-Ventilator Hospital Acquired Pneumonia



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Disclosures

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

Session Objectives

- ▶ Create the link of patient advocacy to the basic nursing care
- ▶ Define key fundamental evidence-based nursing care practices that reduce 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



Protect The Patient From Bad Things Happening on Your Watch



Implement Interventional Patient Hygiene

Interventional Patient Hygiene

- Hygiene...the science and practice of the establishment and maintenance of health
- Interventional Patient Hygiene....nursing action plan directly focused on fortifying the patients host defense through proactive use of evidence-based hygiene care strategies

Hand Hygiene

Comprehensive
Oral Care Plan

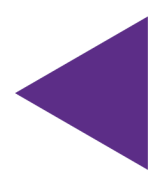
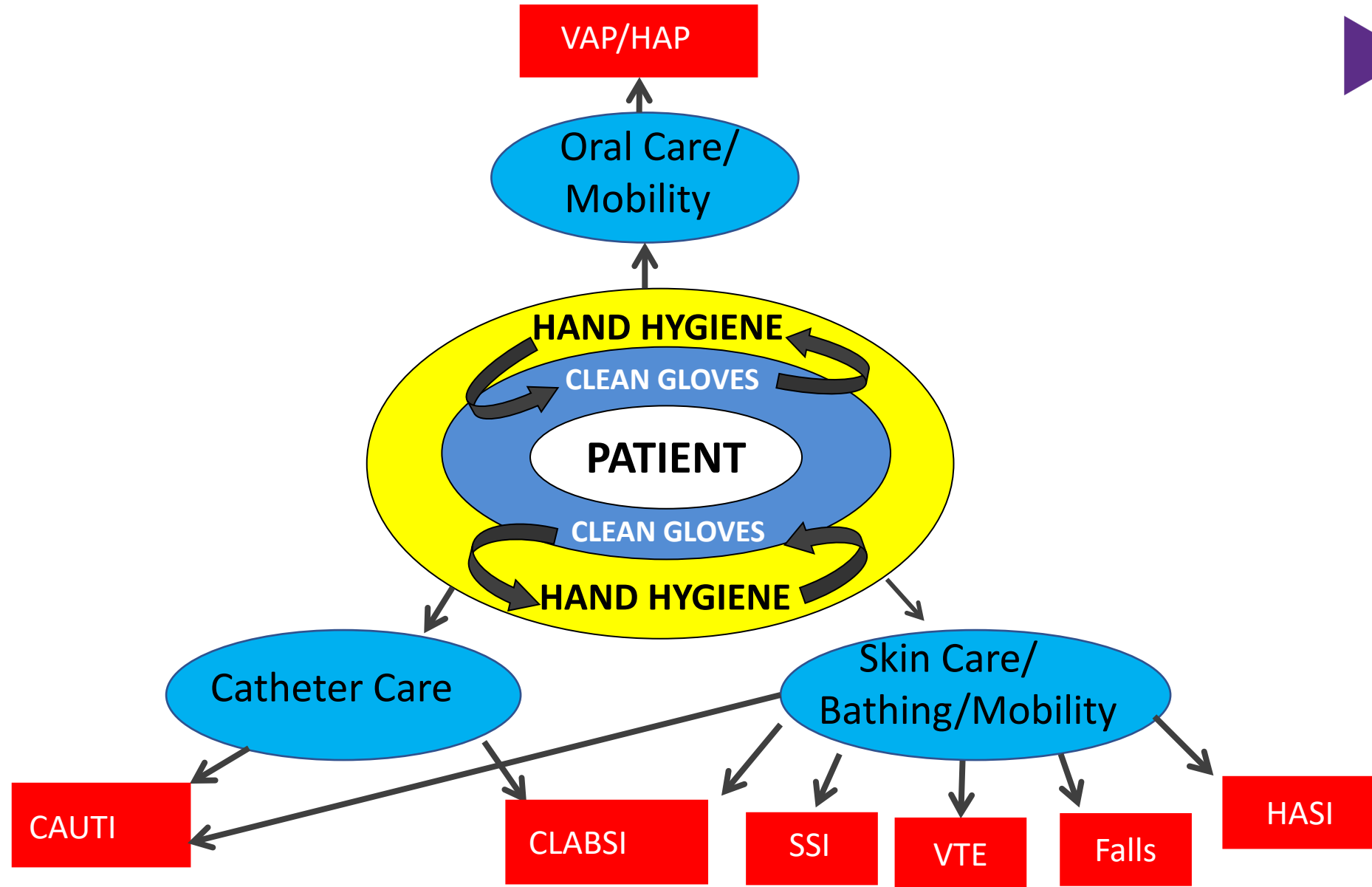
Incontinence Associated
Dermatitis Prevention Program

Bathing &
Assessment
Pressure
Ulcer
Prevention

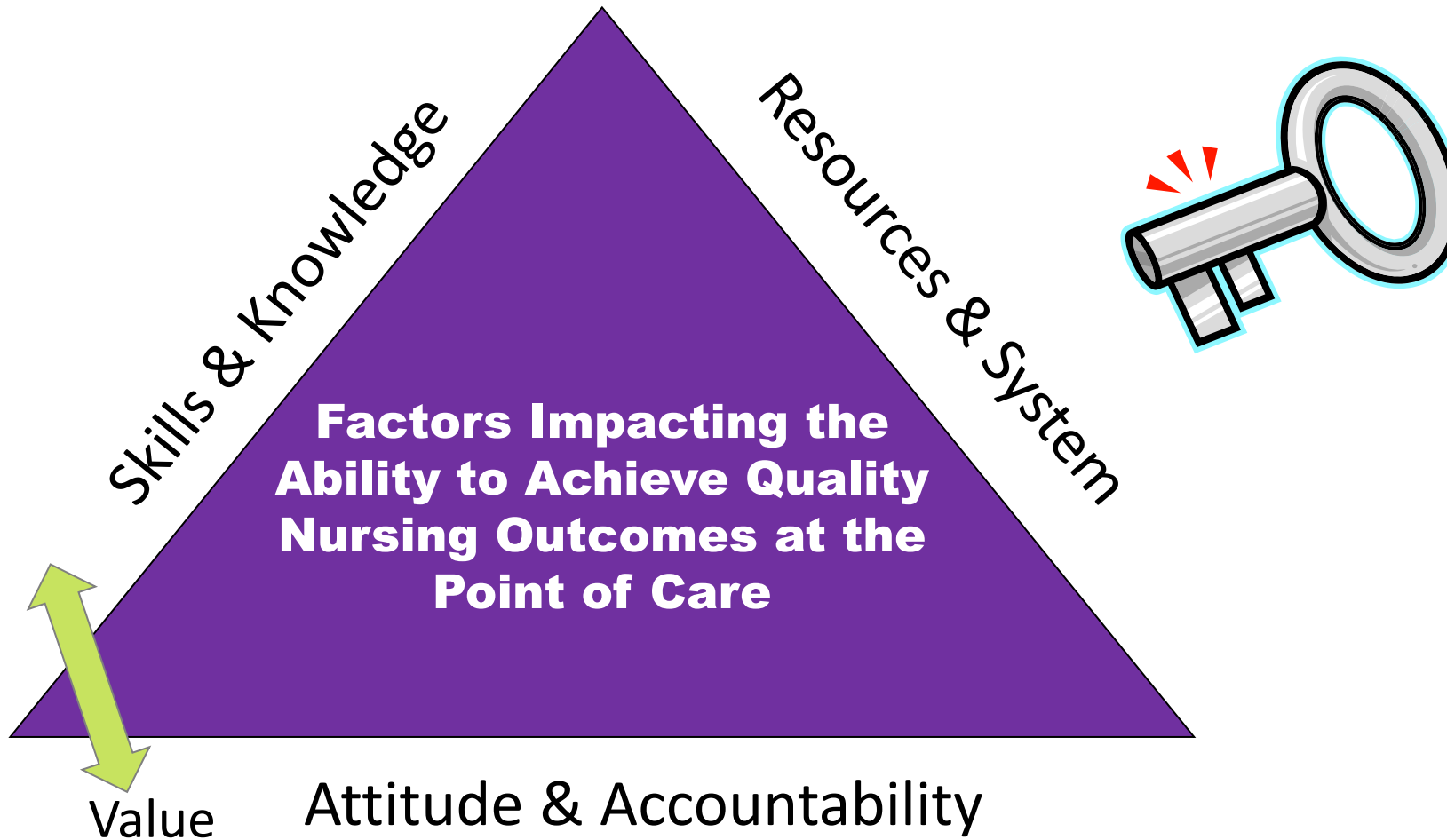
Catheter
Care



INTERVENTIONAL PATIENT HYGIENE(IPH)



Achieving the Use of the Evidence



Missed Nursing Care

- “Any aspect of required patient care that is omitted (either in part or whole) or significantly delayed.”
- A predictor of patient outcomes
- Measures the process of nursing care



Hospital Variation in Missed Nursing Care

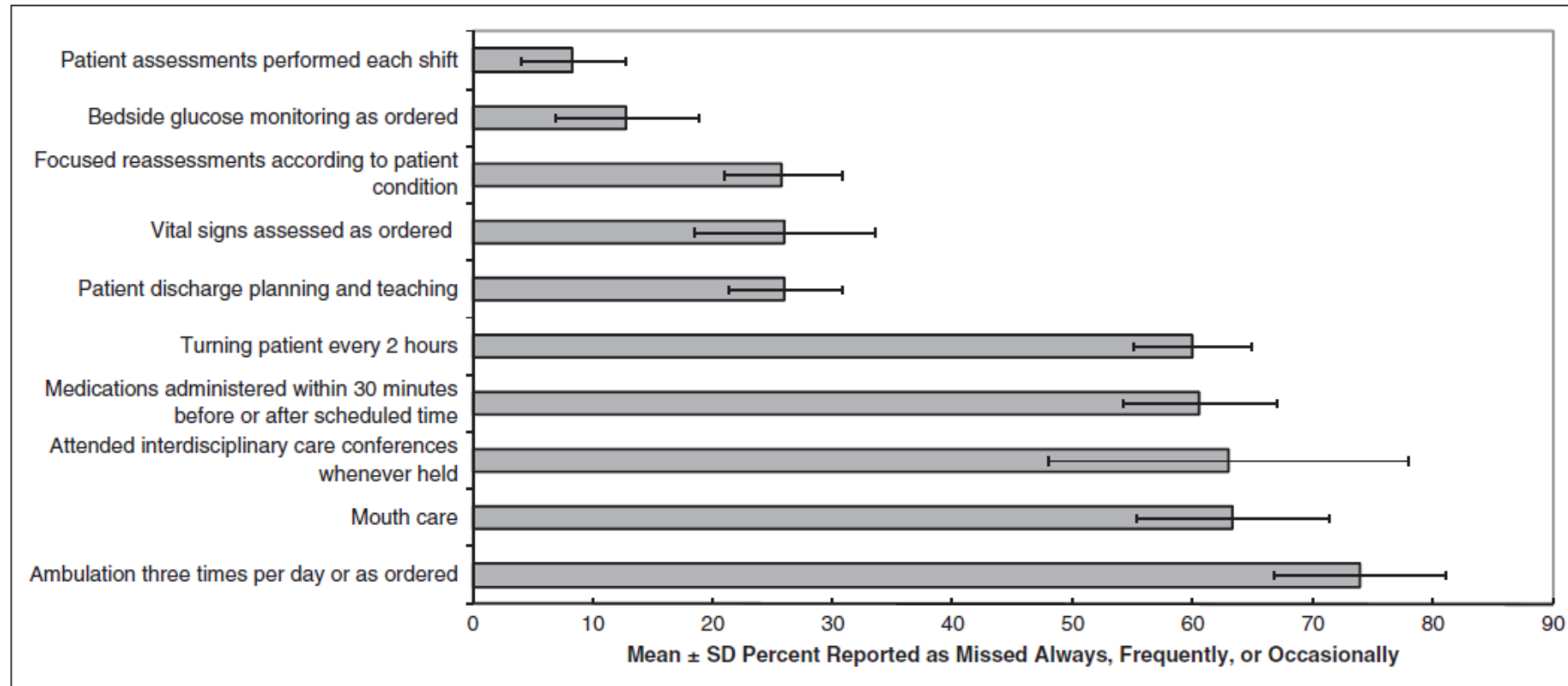


Figure 2. Elements of care most and least frequently missed. The solid bars represent the means across all 10 hospitals, and the range lines indicate the standard deviations.

Patient Perceptions of Missed Nursing Care

Table 2. Elements of Nursing Care by Ability of Patient to Report and Extent Missed*

	Fully Reportable	Partially Reportable	Not Reportable
			■ Patient assessment ■ Surveillance ■ IV site care
Frequently Missed	■ Mouth care ■ Listening ■ Being kept informed	■ Ambulation ■ Discharge planning ■ Patient education	
Sometimes Missed	■ Response to call lights ■ Response to alarms ■ Meal assistance ■ Pain medication and follow-up	■ Medication administration ■ Repositioning	
Rarely Missed	■ Bathing	■ Vital signs ■ Hand washing	

* IV, intravenous.

Non-Vent Pneumonia: Addressing Risk Factors



Build the Will: NV-HAP Causes Harm

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

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

Table 3 Prevalence of healthcare-associated infections identified during the 2009 point prevalence survey (N = 1173)

Type of HAI	All HAI Patients n = 1173		HAI Adults n = 1053 (90 %)		HAI Children n = 66 (6 %)		HAI Infants n = 52 (4 %)	
	No.	%	No.	%	No.	%	No.	%
Urinary Tract	428	34.8	414	39.0	5	0.4	8	0.7
Pneumonia Total	268	21.8	248	20.2	16	1.3	4	0.3
VAP	82	6.7	71	5.8	8	0.7	3	0.2
Non VAP	175	14.2	167	13.6	7	0.6	1	0.1
Surgical Site Total	214	17.4	200	16.3	10	0.8	4	0.3
PI related	63	5.1	58	4.7	5	0.4	0	0
Non PI related	133	11	124	10.1	5	0.4	4	0.3
Blood Stream Total	169	13.8	131	10.6	15	1.2	23	1.9
Primary, non CVC-BSI	73	5.9	48	3.9	11	0.9	14	1.1
Primary, CVC-BSI	29	2.4	19	1.5	2	0.2	8	0.7
Secondary	63	5.1	60	4.9	2	0.2	1	0.1
CDI	115	9.3	110	8.9	4	0.3	0	0
Visc Respiratory Illness	17	1.4	5	0.4	9	0.7	3	0.2
Visc Gastroenterocolitis	17	1.4	0	0	10	0.8	7	0.6
NEC	3	0.2	0	0	0	0	3	0.2
Total *	1231	100	1108	90.0	69	5.6	52	4.2

Abbreviations: VAP ventilator-associated pneumonia; PI prosthetic implant; CVC-BSI central venous catheter associated blood stream infection; CDI *Clostridium difficile* infection; NEC Necrotizing enterocolitis

Taylor, G., Gravel, D., Matlow, A. *et al.* Assessing the magnitude and trends in hospital acquired infections in Canadian hospitals through sequential point prevalence surveys. *Antimicrob Resist Infect Control* **5**, 19 (2016).

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)
Total	12,979	2453	18.89%	6433	1344	20.89%

- ▲ 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

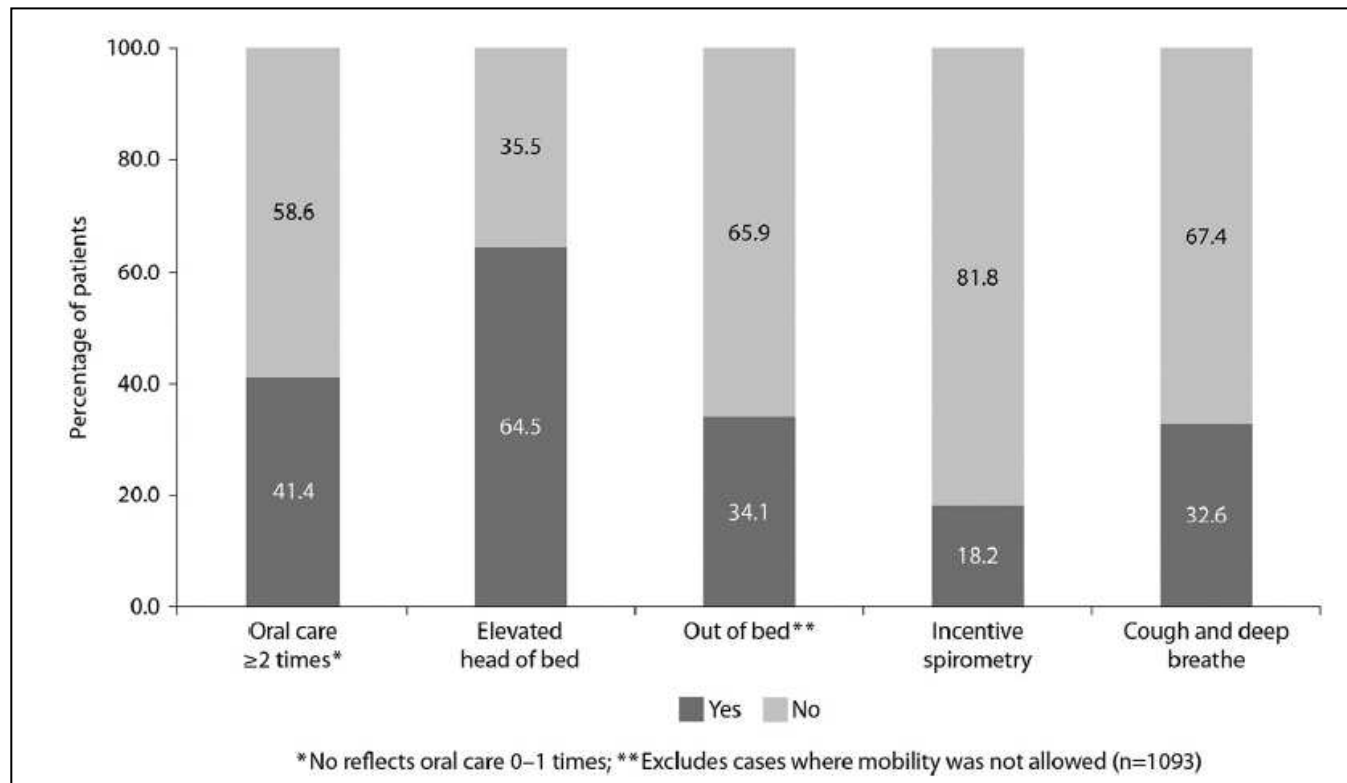


- ▲ Multicenter retrospective chart review
- ▲ Extracted NV-HAP cases per the 2014 ICD-9-CM codes for pneumonia not POA and the 2013 CDC case definition
- ▲ 21 hospitals completed data collection
- ▲ Measured nursing care missed 24hrs before diagnosis
- ▲ Non-vent HAP occurred on every unit



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)

Epidemiology of Non-Ventilator Hospital Acquired Pneumonia in US

▲ The 2012 US national inpatient sample dataset was used to compare an NV-HAP group to 4 additional group cohorts:

- Pneumonia on admission
- General hospital admissions
- Matched on mortality & disease severity
- Ventilator-associated pneumonia (VAP)

▲ Secondary outcome: compare HLOS, total hospital charges, and mortality between the NV-HAP group and the 4 I group cohorts

Epidemiology of Non-Ventilator Hospital Acquired Pneumonia in US



- ▲ Incidence of NV-HAP was 1.6%, (3.63 per 1,000 pt days)
- ▲ NV-HAP was associated with:
 - △ Increased total hospital charges
 - △ Longer hospital length of stay
 - △ Greater likelihood of death



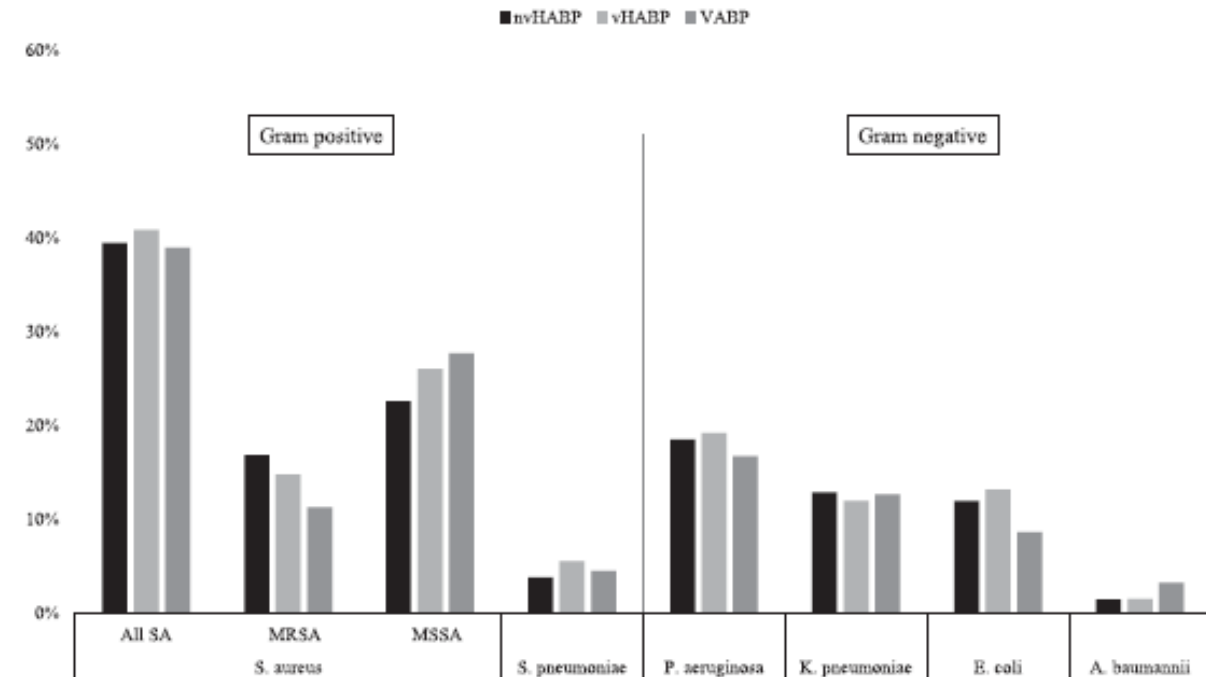
Compared to all groups except patients with VAP



Epidemiology & Outcome of nvHABP, vHABP, VABP

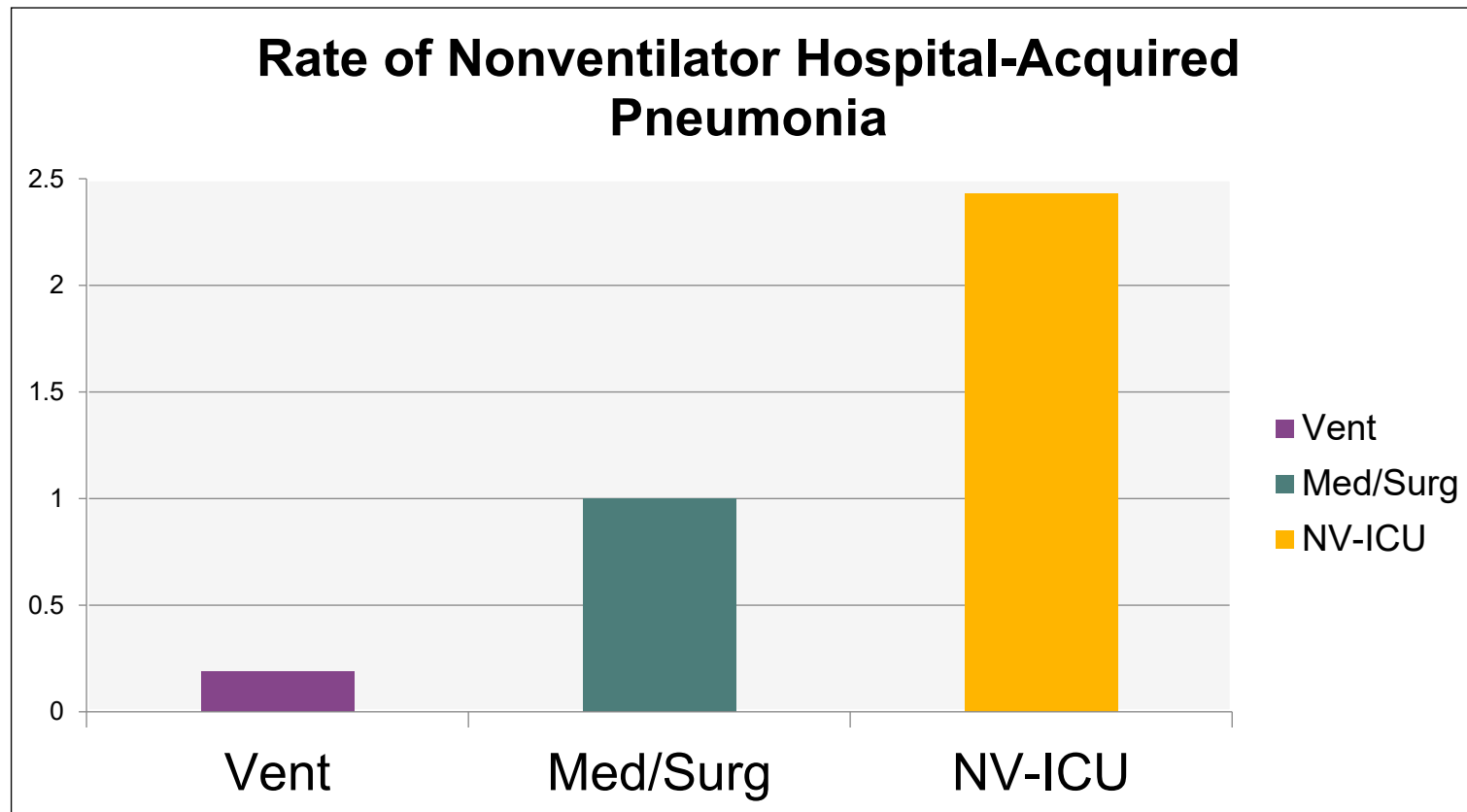
- 253 Acute care hospital
- Premier database 2012-2019
- Retrospective cohort
- 17,819 pts met enrollment

Type	Incidence	Mortality	Cost
nvHABP	26.5%	11.7%	39,991
vHABP	25.6%	29.2%	\$62,464
VABP	47.9%	21.3%	\$77,657





Where is the Highest Risk for NV-HAP?



NV-HAP per 1000 patient days



National Initiative (Sponsored by VA)

🔗 National organization to prevent hospital acquired pneumonia

🔗 Develop a Call to Action

△ Research focus

- Economic impact
- Pathogenesis
- By NVHAP survey methods
- Pathways for prevention and implementation science

🔗 APIC Position Paper

- △ Hospital to design programs to address NVHAP
- △ Surveillance & reporting requirements

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



Oral Health in Canada

- 3 out of every 4 Canadians visit a dental professional yearly
- 84% Canadians report good oral health
- Canadians rank favorably with oral health indicators;
 - △ decayed or missing teeth, filled teeth
 - △ Severe chronic gum dx
 - △ Instances of oral & lip cancer
- Specific groups have challenges
 - △ Seniors,
 - △ Low income
 - △ People with special needs
 - △ Children
 - △ indigenous

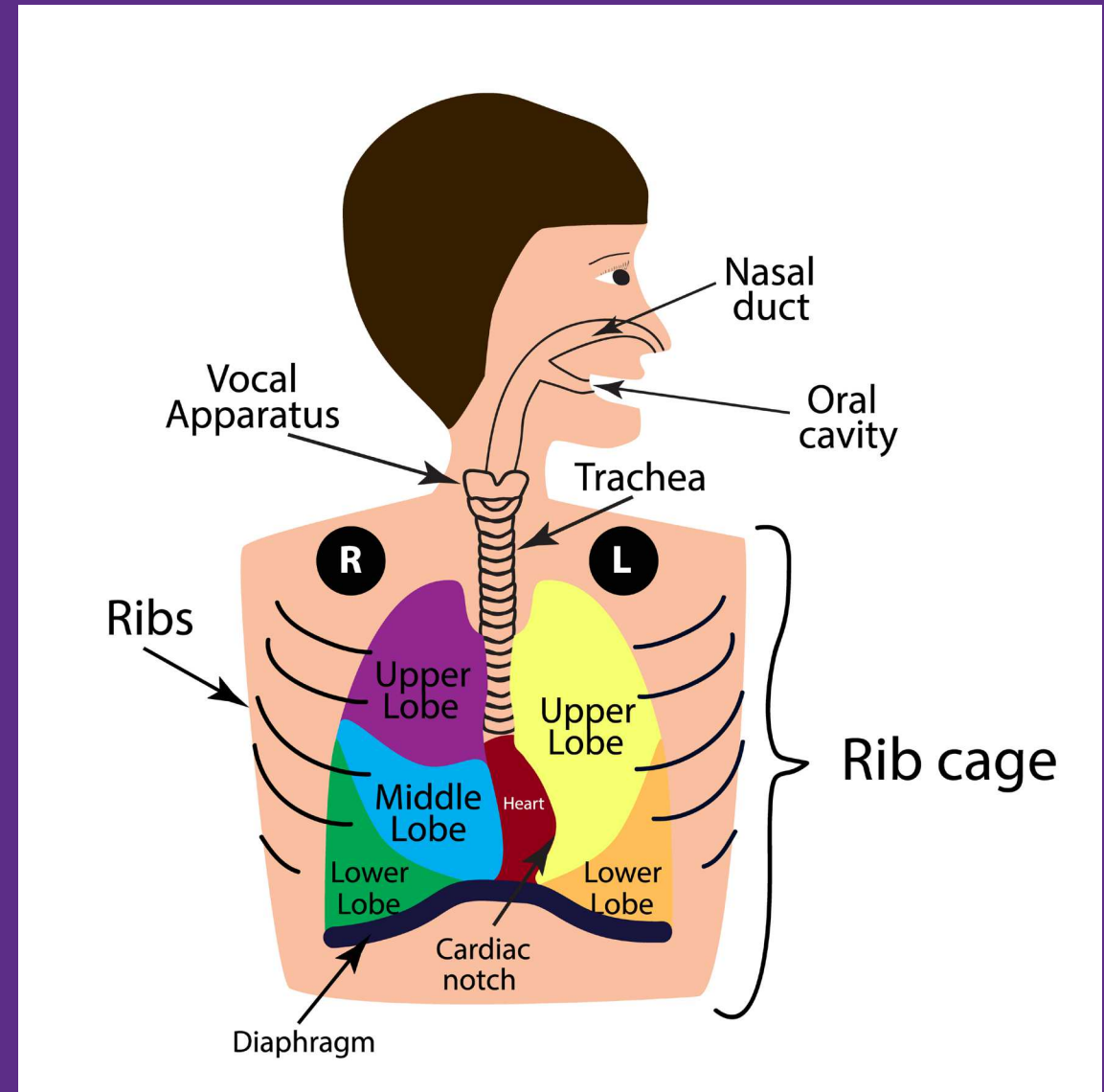
cda-adc.ca

The State of Oral
Health in Canada

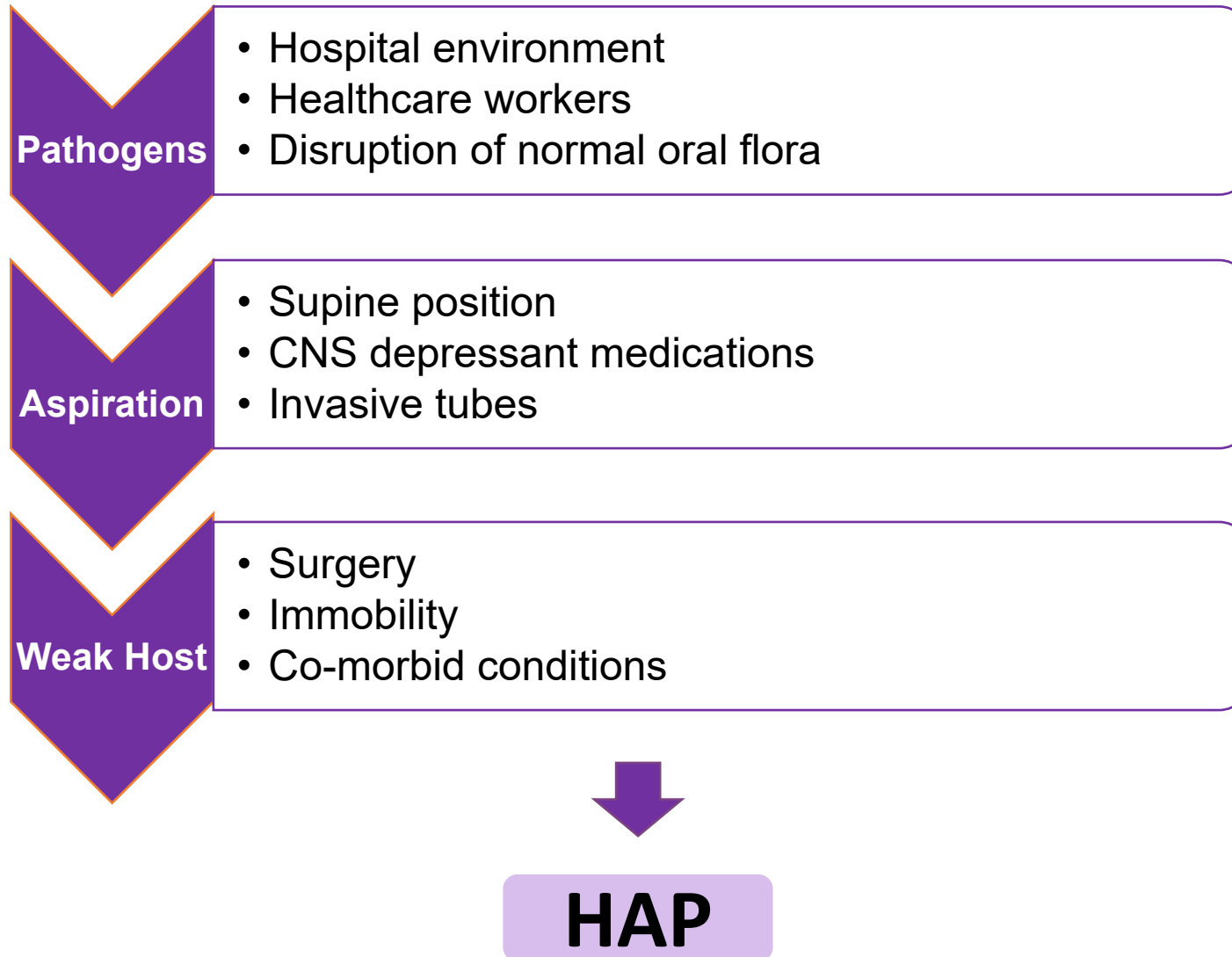


Single Ecosystem

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



Risk Factors for Pneumonia In Hospital



Where does Pneumonia Start: Oral Bacteria during Hospitalization & Illness

🔬 Oral cavity

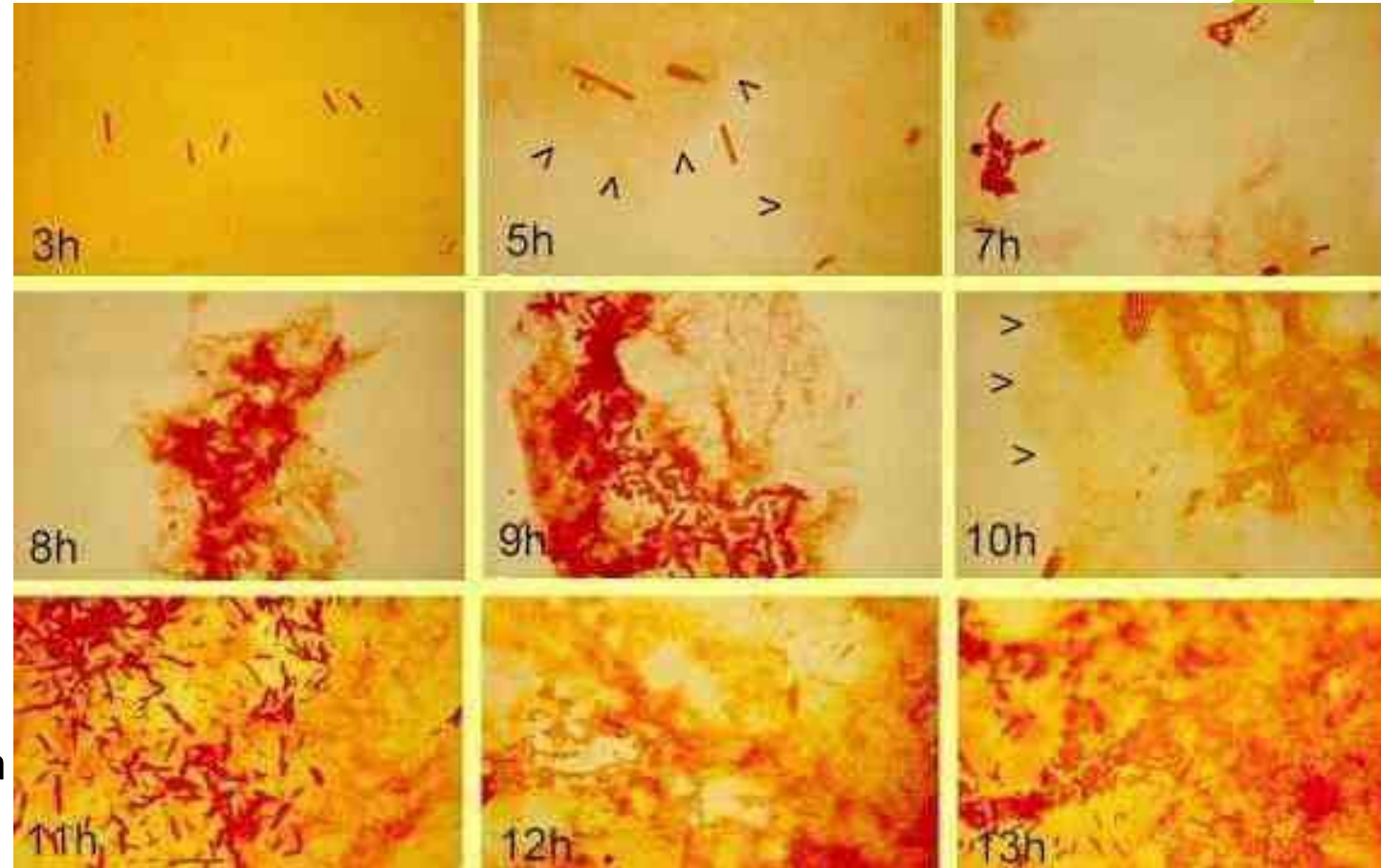
- △ > 1 billion oral microbes
- △ 700-1000 species
- △ Replicate's 5 x in 24hr period

🔬 Disruption of Microbiome

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

🔬 24-48 hours for HAP pathogens in mouth

🔬 If aspirated =100,000,000 bacteria/ml saliva into lungs



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

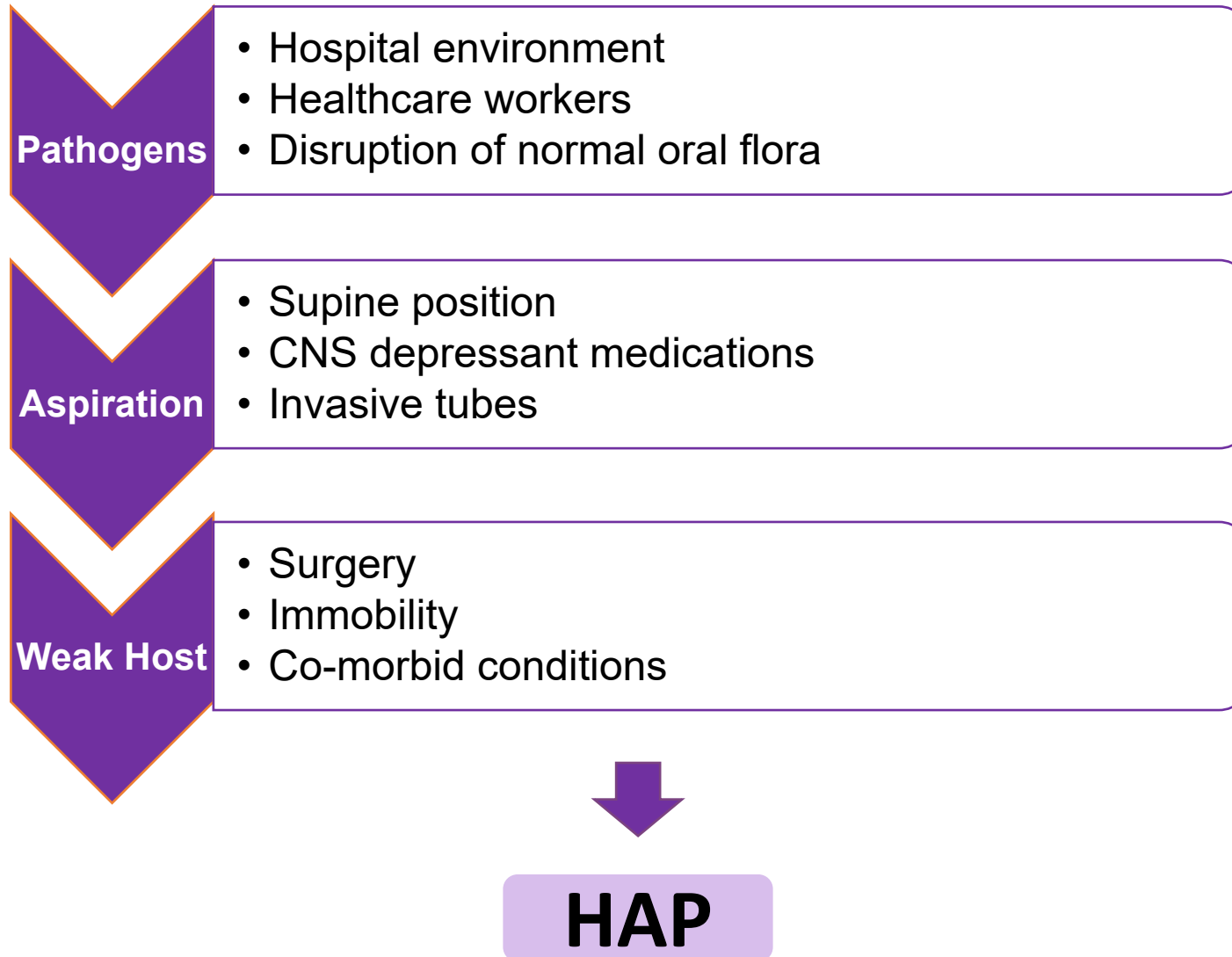
- 49 elderly nursing home residents admitted to the hospital
- Examined baseline dental plaque scores & microorganism within dental plaque
- Used pulse field gel electrophoresis to compare chromosomal DNA
- Results
 - △ 14/49 adults developed pneumonia
 - △ 10 of 14 pneumonias, the causative organism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

Role of Salivary Flow

- ▲ Provides mechanical removal of plaque and microorganisms
- ▲ Innate & specific immune components (IgA, cortisol, lactoferrin)
- ▲ Patients receiving mechanical ventilation have dry mouth which in turn contributes to accumulation of plaque & reduced distribution of salivary immune factors



Risk Factors for Pneumonia



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%

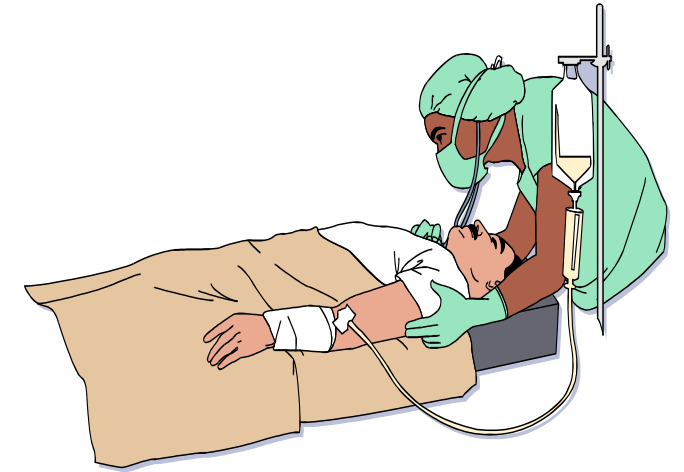
In the lung parenchyma



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%

Risk Factors for Pneumonia

Pathogens

- Hospital environment
- Healthcare workers
- Disruption of normal oral flora

Aspiration

- Supine position
- CNS depressant medications
- Invasive tubes

Weak Host

- Surgery
- Immobility
- Co-morbid conditions

HAP

Weak Host: Who is at Highest Risk?

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

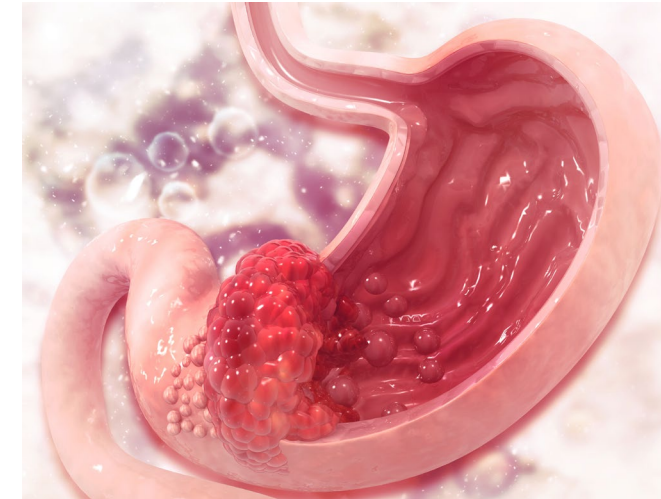
- Immunocompromised
- More than 6 medications
- Low albumin
- On antibiotics
- Dependent for ADLs
- Smokers



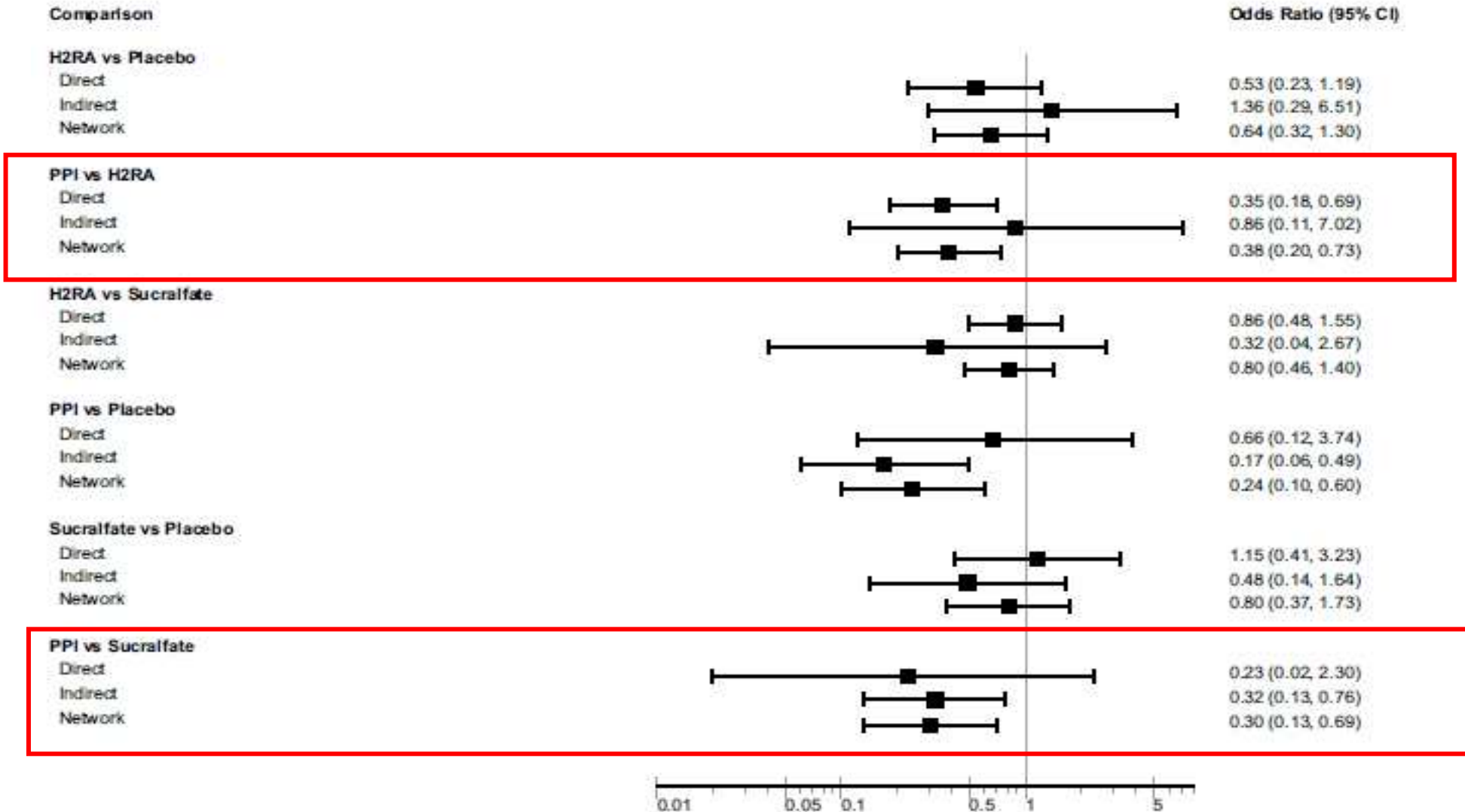
Stewardship of Stress Ulcer Prophylaxis (SUP)



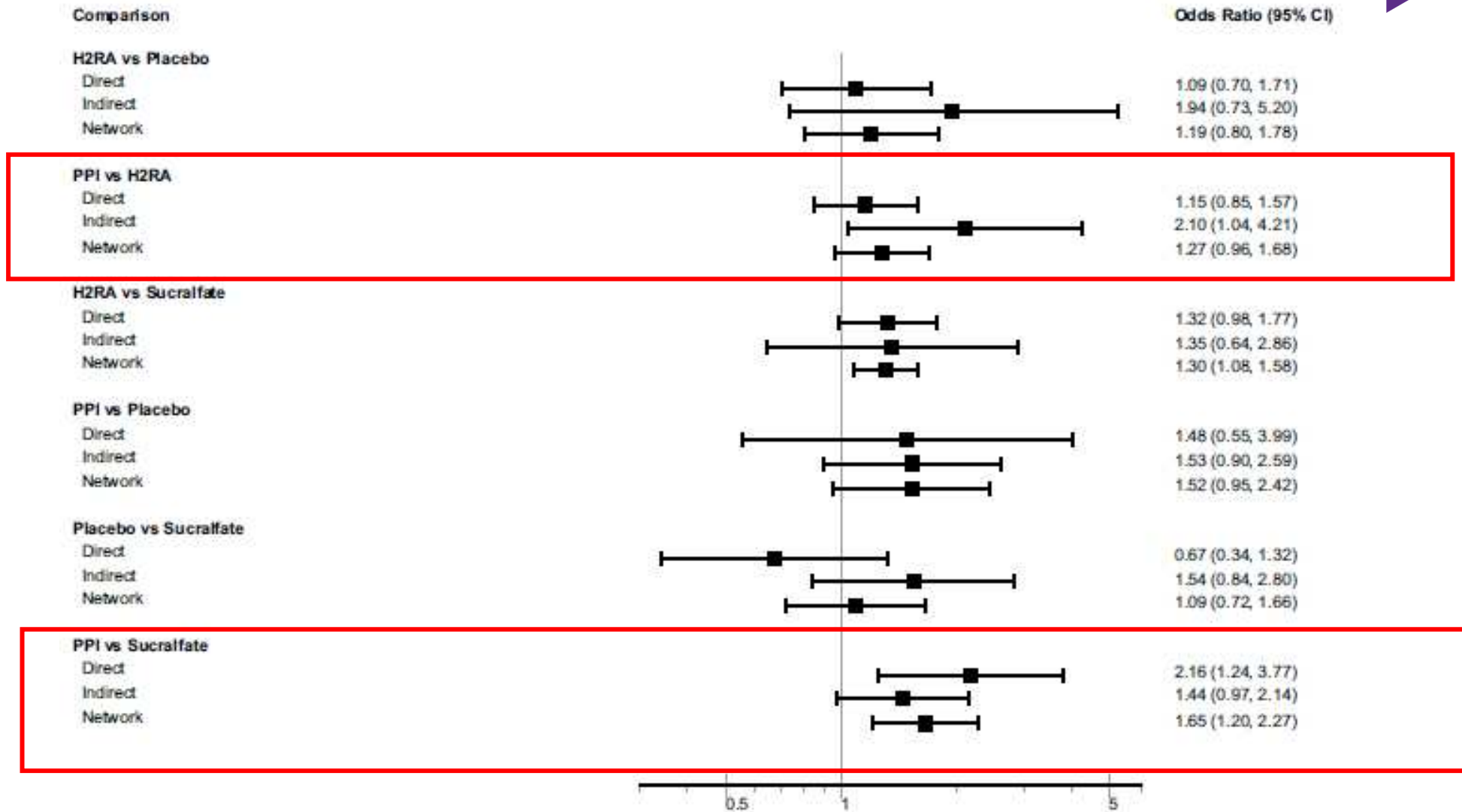
- ▲ The most common complication of SUP is pneumonia
- ▲ ICU enteral fed patients –
 - △ no benefit & may increase risk for pneumonia (Huang study)
 - △ Avoid unnecessary use
- ▲ Acute Stroke patients (Systematic Review & Meta-Analysis)
 - △ Acid suppressive medications are an important contributor to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



SUP: Impact on Bleeding Risk



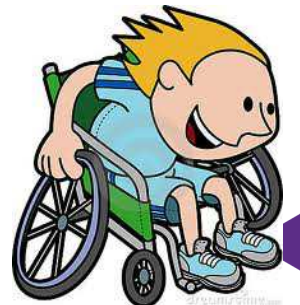
SUP: Impact on Risk of Pneumonia



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



What about Incentive Spirometry?

- Commonly prescribed to improve lung function for patients with surgery, pneumonia, rib fractures, etc.
- No evidence that Incentive Spirometry is effective in the prevention of pulmonary complications in upper abdominal surgery or CABG (Cochrane 2012 & 2014)
- Postop IS did not demonstrate any effect for bariatric surgery patients on postop hypoxemia, SaO₂ level, or postop pulmonary complications (JAMA Surg 2017)



Dysphagia Management

- ▶ Dysphagia screening/acute stroke or high-risk^{2,3} populations
- ▶ Swallow exam^{2,3}
- ▶ Initiated appropriate type of nutrition & liquids³

Top tips for prevention and management of aspiration pneumonia¹

The following provides key points for clinicians to consider to avoid this hospital-acquired complication

Conduct risk assessment

Conduct a comprehensive risk assessment

Identify risk factors such as:

- Impaired swallow and/or cough reflex
- Strokes or other neuromuscular conditions
- Cancers affecting cranial nerves or the recurrent laryngeal nerve
- Poorly controlled nausea and vomiting
- Excessive alcohol consumption

For a patient at risk, develop a prevention plan as part of a comprehensive care plan

Develop prevention plan

Clinicians, patients and carers develop an individualised, comprehensive prevention plan to prevent aspiration pneumonia:

- Goals of treatment consistent with the patient's values
- Any specific nursing requirements, including equipment needs
- Any allied health interventions required, including equipment needs
- Observations or physical signs to monitor and determine frequency of monitoring, including temperature, respiratory rate and chest auscultation – and document findings in the clinical record
- Laboratory results to monitor and determine frequency of monitoring
- If specialist assistance is required

Deliver prevention plan

Where clinically indicated, deliver aspiration pneumonia prevention strategies, such as:

- Speech pathology review
- Drinking thickened fluids
- Sitting upright when eating
- Safe swallowing strategies

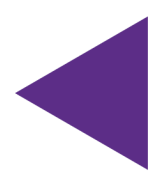
Monitor

- Monitor the effectiveness of the aspiration pneumonia prevention strategies, and reassess the patient if aspiration pneumonia occurs
- Review and update the care plan if it is not effective or is causing side effects
- Engage in reviewing clinical outcomes, identifying gaps and opportunities for improvement

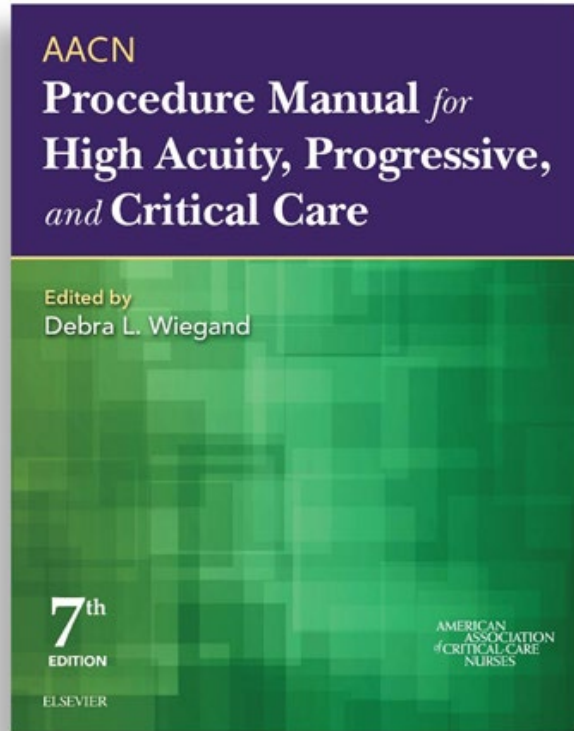
1. Australian Commission on safety and quality in healthcare hospital acquired complications information kit, Sydney: ACSQHC
2. Mitchell BG, et al. *Infect Dis Health*. 2019;24(4):229-239
3. Quinn B, et al. *Am J Infect Control*. 2020;48(5S):A23-A27.

National Survey on NVHAP

- 48% response rate
- Mostly academic centers (84%)
- 24% do not monitor for NVHAP
- 57.6% have a universal oral care policy
 - 48% lack suction toothbrush on med-surg
 - 27% lack basic oral care supplies
- 54% have a pre-surgical oral care
- 72% to 84% have early mobility, manage SUP, & do HOB elevation



AACN Procedural Manual-7th Ed



Procedure 4: Endotracheal Tube Care and Oral Care

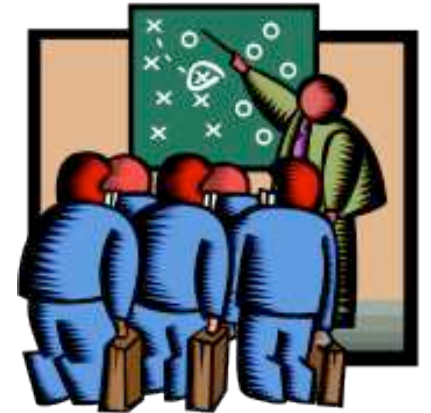
Authors:

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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



Use of the Influencer Model

Influencer Model www.Vitalsmarts.com	Motivation	Ability
Personal	Patient stories	Education
Social	Compare units	Mentor peers
Structural	Measure Recognize	Tools

Gap Analysis



Best Practice	Our Gaps	Action To Take
Comprehensive oral care for all (CDC, SHEA)	ICU vent patients only	Develop inclusive oral care protocol
Oral CHG (0.12%) periop adult CV surgery and vent pts. (CDC, ATS, IHI)	Not using CHG on these patients	Added to preprinted orders, and to protocol
Therapeutic oral care tools (ADA)	Poor quality oral care tools; Absence of denture care supplies	New tools and supplies.

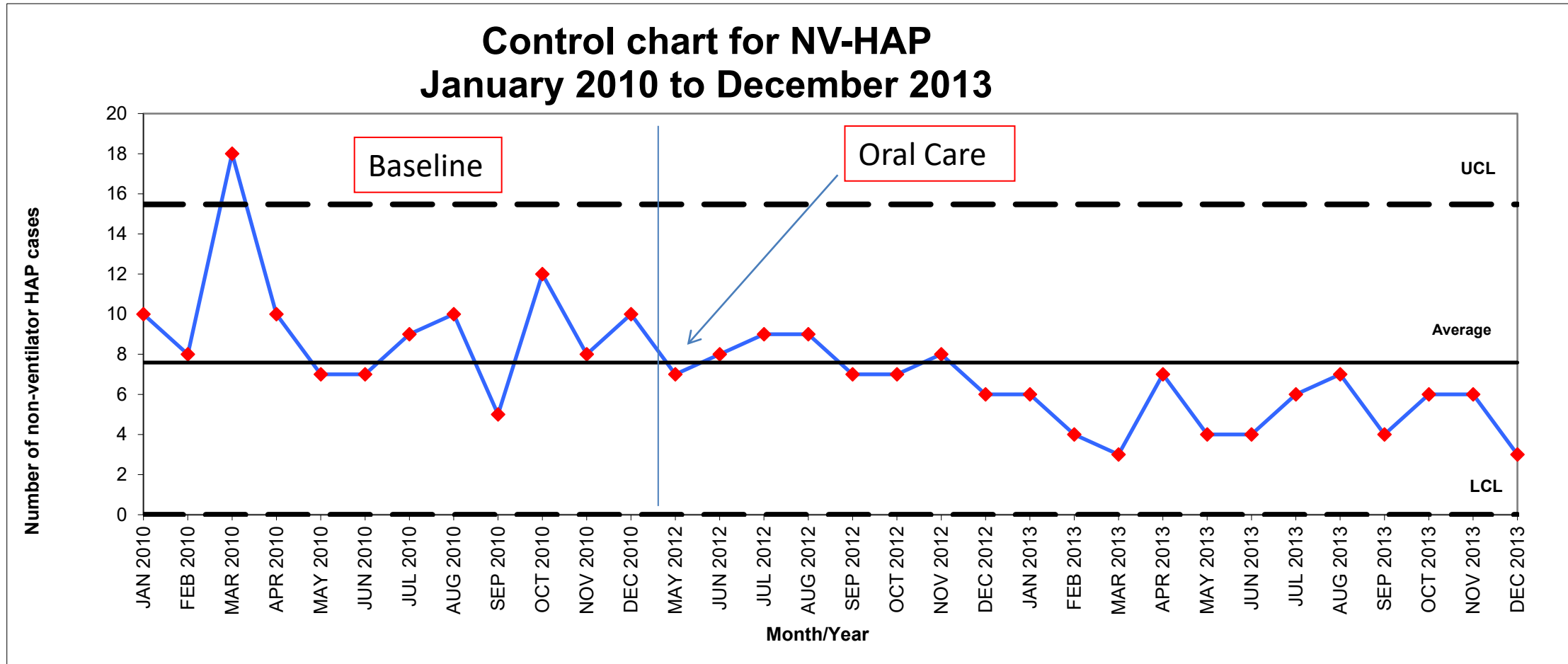


Protocol – Plain & Simple

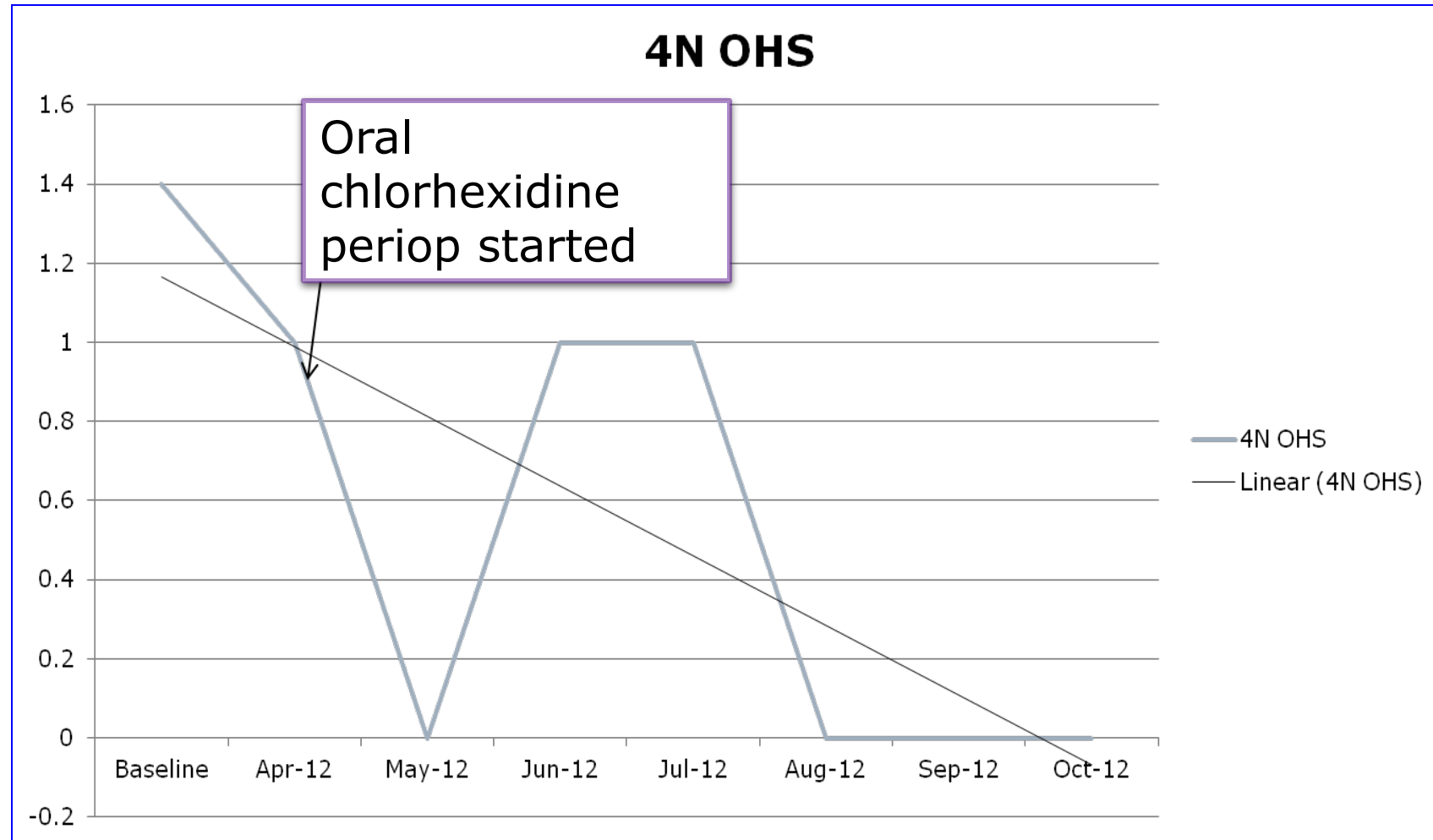
Patient Type	Tools	Procedure	Frequency
Self Care / Assist	Brush, paste, rinse, moisturizer <ul style="list-style-type: none"> • Soft-bristled toothbrush • Toothpaste with dentifrice • Antiseptic mouth rinse (alcohol-free) • Moisturizer (Petroleum-free) 	Provide tools Brush 1-2 minutes Rinse	4X / day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

NV-HAP Incidence

50 % Decrease from Baseline



Open Heart Surgery Patients: NV-HAP Reduced 75%



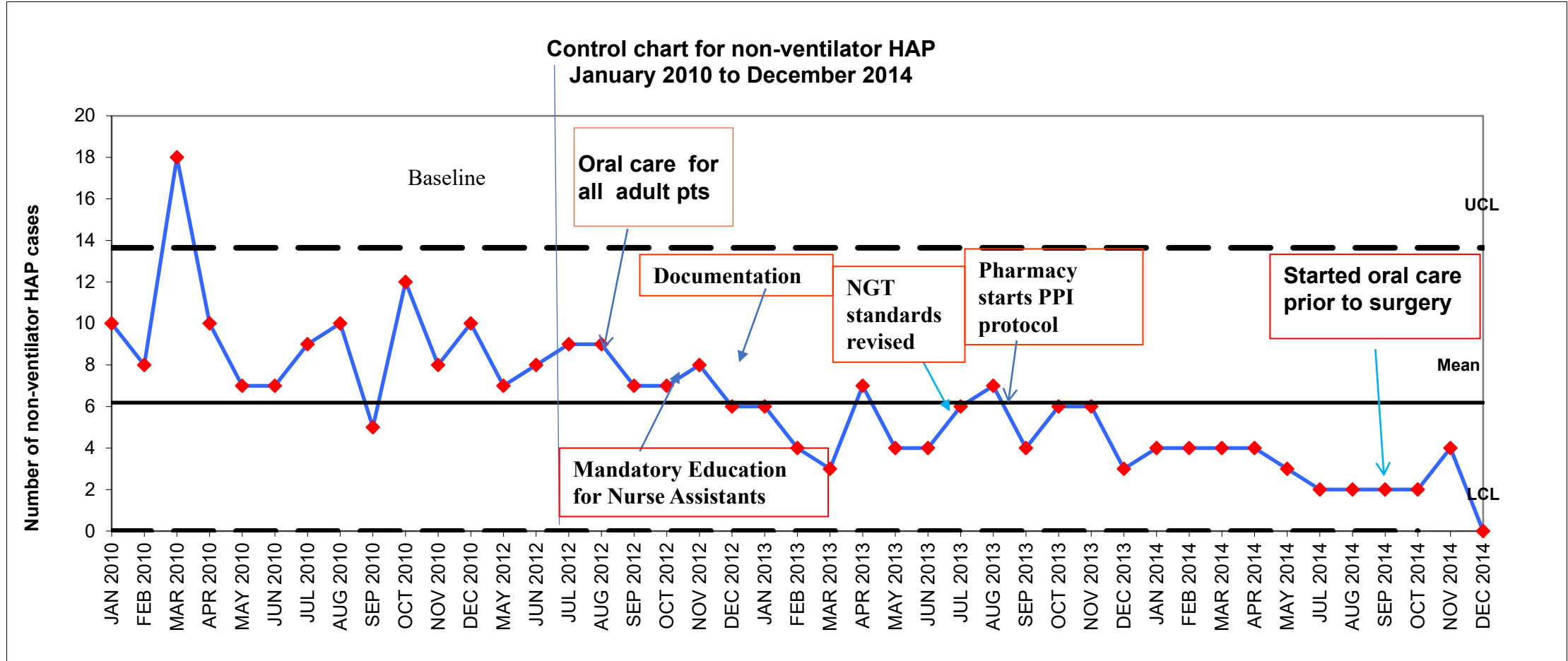
Return on Investment

- ▲ 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

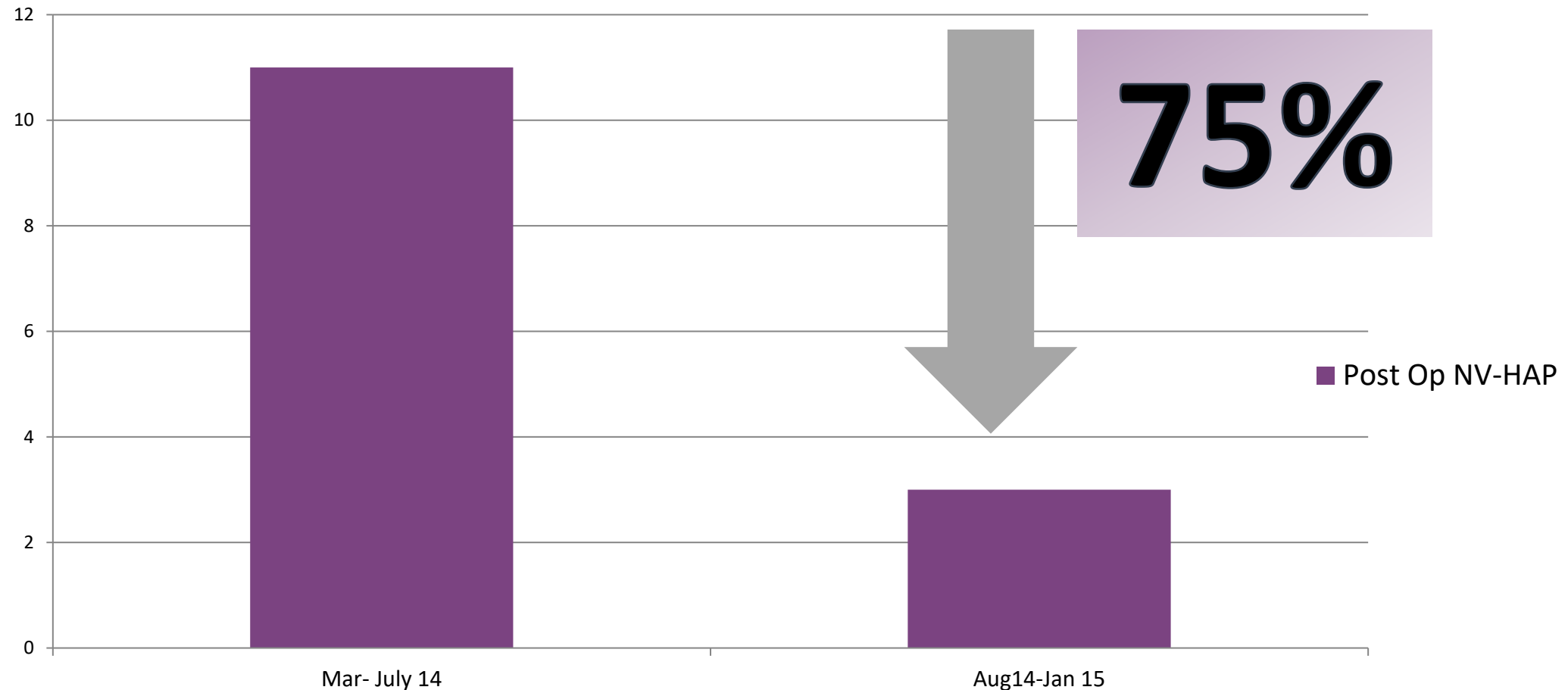
8 lives saved

PRICELESS

NV-HAP ↓ 70% from baseline!

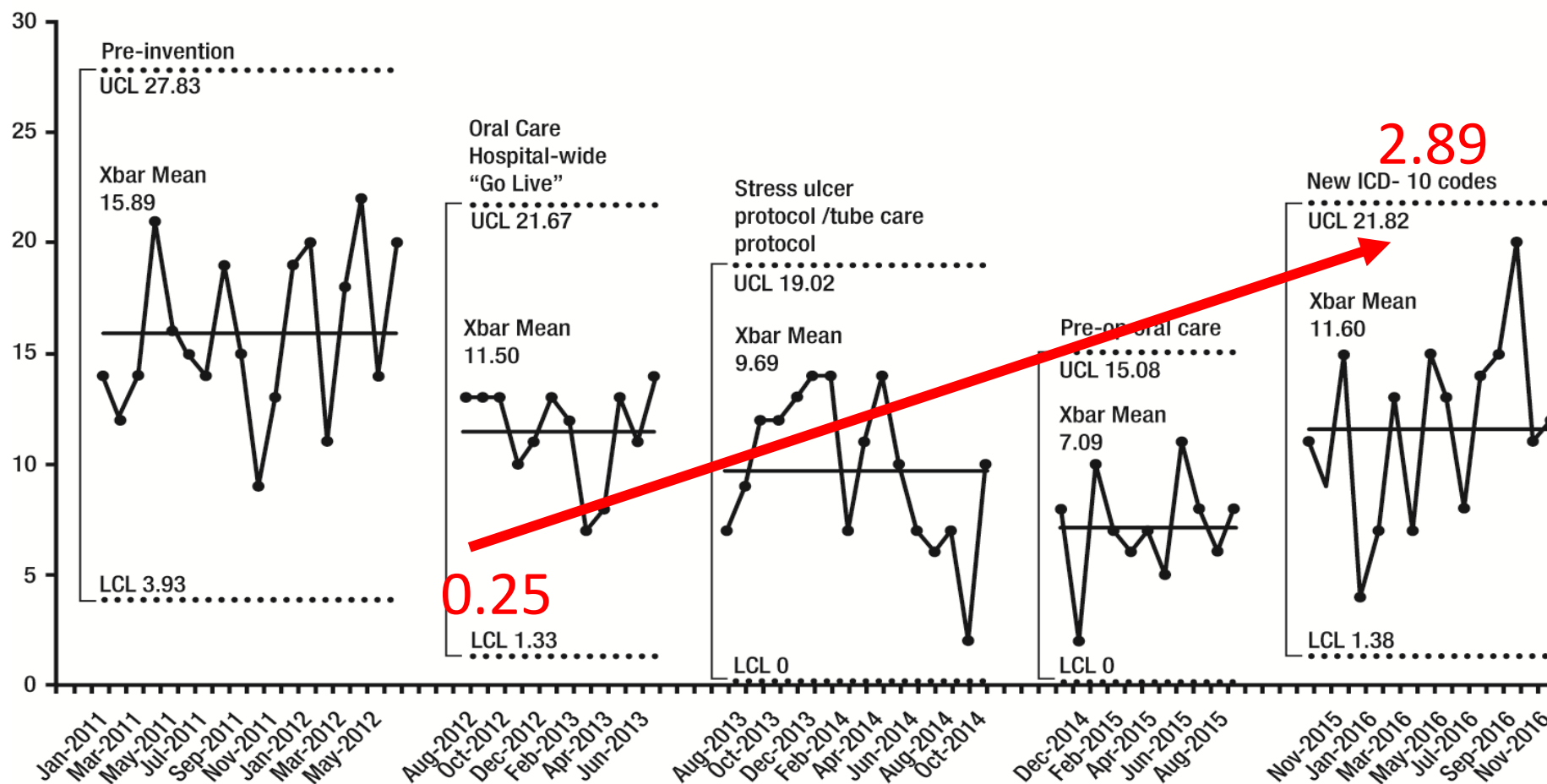


Post-Operative NV-HAP (all adult inpatient surgery) Incidence 6 months Pre-Oral Care vs. 6 Months After



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)



American Dental Association Approved Oral Care for Acute Care Setting

Oral care type	Tools	Procedure	Frequency
Self/assist (may require setup)	Soft-bristled toothbrush, toothpaste with fluoride, sodium bicarbonate (optional), alcohol-free antiseptic mouth rinse, mouth and lip moisturizer (nonpetroleum-based)	Brush for 1-2 min with toothpaste, rinse with antiseptic; moisturize as needed.	2-4 times/d
Dependent/aspiration risk/nonventilated	Soft-bristled suction toothbrush, cleansing and alcohol-free antiseptic solution, mouth and lip moisturizer (nonpetroleum-based)	Brush with suction for 1-2 minutes using liquid cleansing/antiseptic solution; moisturize as needed.	2-4 times/d
Dependent/ventilated	Soft-bristled or swab suction toothbrush, cleansing and alcohol-free antiseptic solution, mouth and lip moisturizer (nonpetroleum-based)	Brush/swab with suction for 1-2 min using liquid cleansing/antiseptic solution; moisturize as needed. Optional: Brush/swab with suction 1 min with chlorhexidine 0.12%	About every 4 h or 6 times/d Optional: Chlorhexidine 0.12% every 12 h
Dentures or edentulate (not caps)	Denture storage cup, denture brush, denture cleanser adhesive (optional)	Remove and brush/rinse dentures; brush gums and mouth; may soak dentures at night with commercial cleanser.	2 times/d Remove dentures while patient is sleeping

Outcomes:

From the Beginning to 2014

🔗 Between May 2012 and December 2014

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

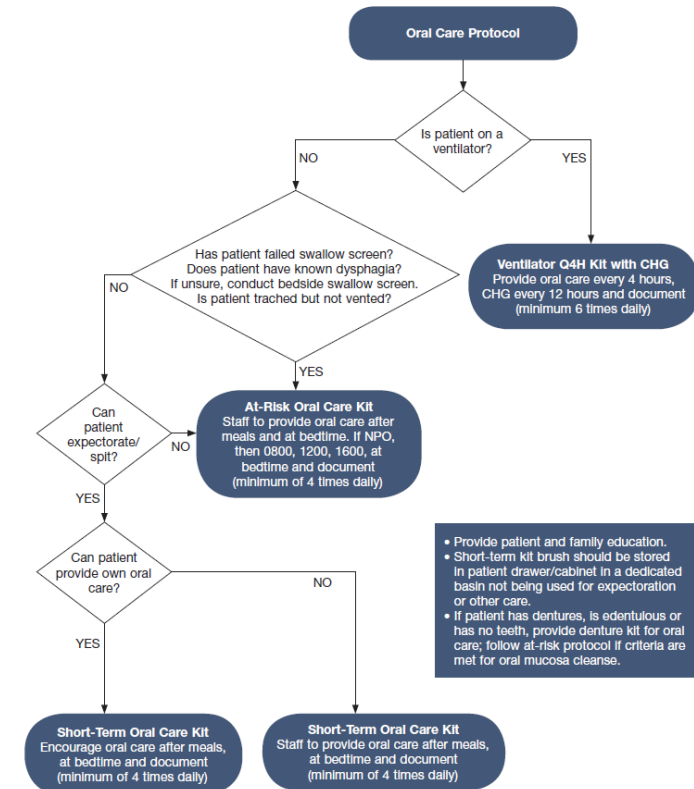
△ **\$5.9 million**

△ **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

2ND most common infection that originates in the hospital in the United States

Associated with added costs of more than **\$40k** per patient

Adds **7-9** days to a patient's 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

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:

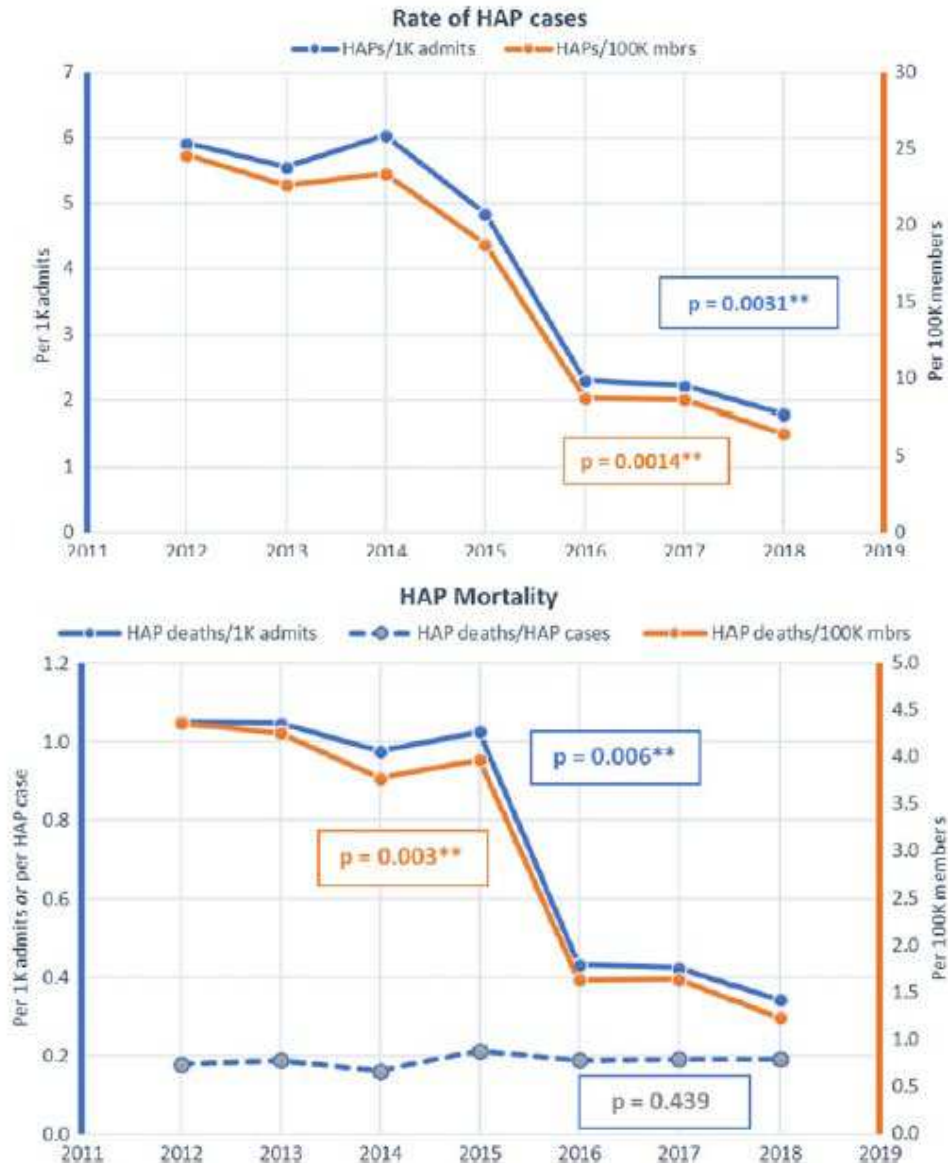
Short-term Oral Care Kit	At-risk Oral Care Kit
Use this kit if you can: <ul style="list-style-type: none">• Swallow without difficulty• Spit without difficulty <i>Recommended for use at least four times per day, including after meals and at bedtime.</i>	Use this kit if you can: <ul style="list-style-type: none">• Trouble swallowing• Difficulty spitting• Recent stroke• Tracheostomy without a ventilator <i>Recommended for use at least four times per day, 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.</i>
Ventilator Oral Care Kit Use this kit if you are on a ventilator, have a breathing tube (endotracheal tube) or a tracheostomy in place. <i>The hospital staff will provide oral care every four hours and use a special chlorhexidine (CHG) mouth rinse every 12 hours.</i>	<i>If you or your family are unable to provide your oral care, a staff member will assist you.</i>

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



Oral Care-Prevention of NVHAP

- 800 bed facility
- Randomize 4 units -2 experimental/2 control
- Experimental received enhanced oral care & targeted education
- Freq of oral care 4x daily
- Control units received edu on usual oral care

Self-care and staff-assist. Able to expectorate (spit) 	EQUIPMENT <ul style="list-style-type: none"> Soft toothbrush, ADA approved Toothpaste and mouth rinse, ADA approved Mouth moisturizer pm or mouthwash Dental floss or interdental cleansers (optional) Lip balm (optional) FREQUENCY <ul style="list-style-type: none"> After each meal and before bedtime. If patient is NPO, oral care should be done 2-4 times daily. 	PROCEDURE <ol style="list-style-type: none"> Set patient up at sink or in bed with all equipment. Instruct patient to brush teeth for 1-2 minutes. Use mouth rinse twice a day, swish for 20 to 30 seconds. If patient is able and supply is available, use floss or interdental cleansers. May moisturize interior of mouth and lips using an oral swab pm. Discard disposable equipment/swab in appropriate receptacle.
Dependent for oral care. Not able to expectorate (spit). At risk for aspiration. 	EQUIPMENT <ul style="list-style-type: none"> Suction toothbrush with oral cleaning solution packet (as appropriate and available) Soft toothbrush moistened with clean tap water or alcohol-free mouthwash Mouth moisturizer pm Dental floss or interdental cleansers (optional) Lip balm (optional) FREQUENCY <ul style="list-style-type: none"> After each meal and before bedtime. If patient is NPO, oral care should be done 2-4 times daily. 	PROCEDURE <ol style="list-style-type: none"> Moisten suction or regular toothbrush as noted. Assist the patient to brush all surfaces of the teeth until clean (1-2 minutes). Suction debris from mouth. Apply mouth moisturizer using an oral swab, to the interior of the oral cavity and apply lip balm. Discard disposable equipment in appropriate receptacle.
Dependent on oral care. Patient on a ventilator. 	EQUIPMENT <ul style="list-style-type: none"> Suction toothbrush/ oral swab Oral cleansing solution Mouth moisturizer May consider chlorhexidine oral rinse per hospital policy — current studies are unclear as to benefit and harm FREQUENCY <ul style="list-style-type: none"> Every four hours and pm to remove oral debris. 	PROCEDURE <ol style="list-style-type: none"> Provide suction pm to remove oropharyngeal secretions that can migrate down the tube and settle on top of the cuff. Obtain suction toothbrush/oral swab and moisten with oral cleansing solution. Connection suction toothbrush to continuous suction. If chlorhexidine is used, remove the debris and cleanse the gums, tongue, and inside of cheeks with the solution-saturated oral swab. Suction debris from mouth Apply moisturizer using oral swab to the interior of the oral cavity and lips. Discard disposable equipment/swab in appropriate receptacle.
Denture care or patients with no teeth. Before the patient goes to sleep, remove and clean dentures and place them in a denture cleansing solution once daily. 	EQUIPMENT <ul style="list-style-type: none"> Denture cup, labeled Denture brush is preferred when available, otherwise soft toothbrush ADA approved denture cleanser (for soaking) 2 oral swabs Denture adhesive (optional) Mouth rinse Mouth moisturizer pm or mouthwash FREQUENCY <ul style="list-style-type: none"> Dentures are removed for cleaning at bedtime. Remove dentures when sleeping 	PROCEDURE <ol style="list-style-type: none"> After removing dentures, place in a labeled denture cup. Brush the palate, buccal surfaces, gums, and tongue with the toothbrush or swab. Patient can swish and spit mouthwash, or use oral swab to apply moisturizer. Line the sink with paper towel and add water to cushion the dentures in case you drop them. Carefully brush dentures with warm tap water. Do not use toothpaste as this may scratch the surface of the dentures. Clean and dry equipment and return to patient's bedside table. Assist patient in inserting dentures into mouth. If patient needs denture adhesive to hold firmly in place, follow manufacture directions. Soak dentures in a denture cleanser in the denture cup at bedtime.

Oral Care-Prevention of NVHAP

8709 patients

△ Control: 4163

△ Experimental: 4546

Medical control-7x more likely to develop NVHAP

Surgical units' difference did not reach statistical difference

Freq of oral care;

△ Intervention: 2.02-2.25

△ Control: .95-1.18

Treatment Group	NV-HAP			
	No	Yes	Total	Incidence Rate per 1,000 Patient-Days
Medical Control, No. (%)	2,059 (99.2)	16 (0.8)	2,075	1.40
Medical Intervention, No. (%)	2,706 (99.9)	3 (0.1) ^a	2,709	0.21
Total	4,765	19	4,784	−85 (% difference)
Surgical Control, No. (%)	2,075 (99.4)	13 (0.6)	2,088	1.17
Surgical Intervention, No. (%)	1,830 (99.6)	7 (0.4) ^b	1,837	0.51
Total	3,905	20	3,925	−56 (% difference)

CI = confidence interval; NV-HAP = nonventilator hospital-acquired pneumonia; OR = odds ratio.

^a OR for medical control vs. medical intervention units (OR: 7.1; 95% CI, 2.01-24.1, $P = 0.002$).

^b OR for surgical control vs. surgical intervention units (OR: 1.6; 95% CI, 0.65-4.1, $P = 0.29$).

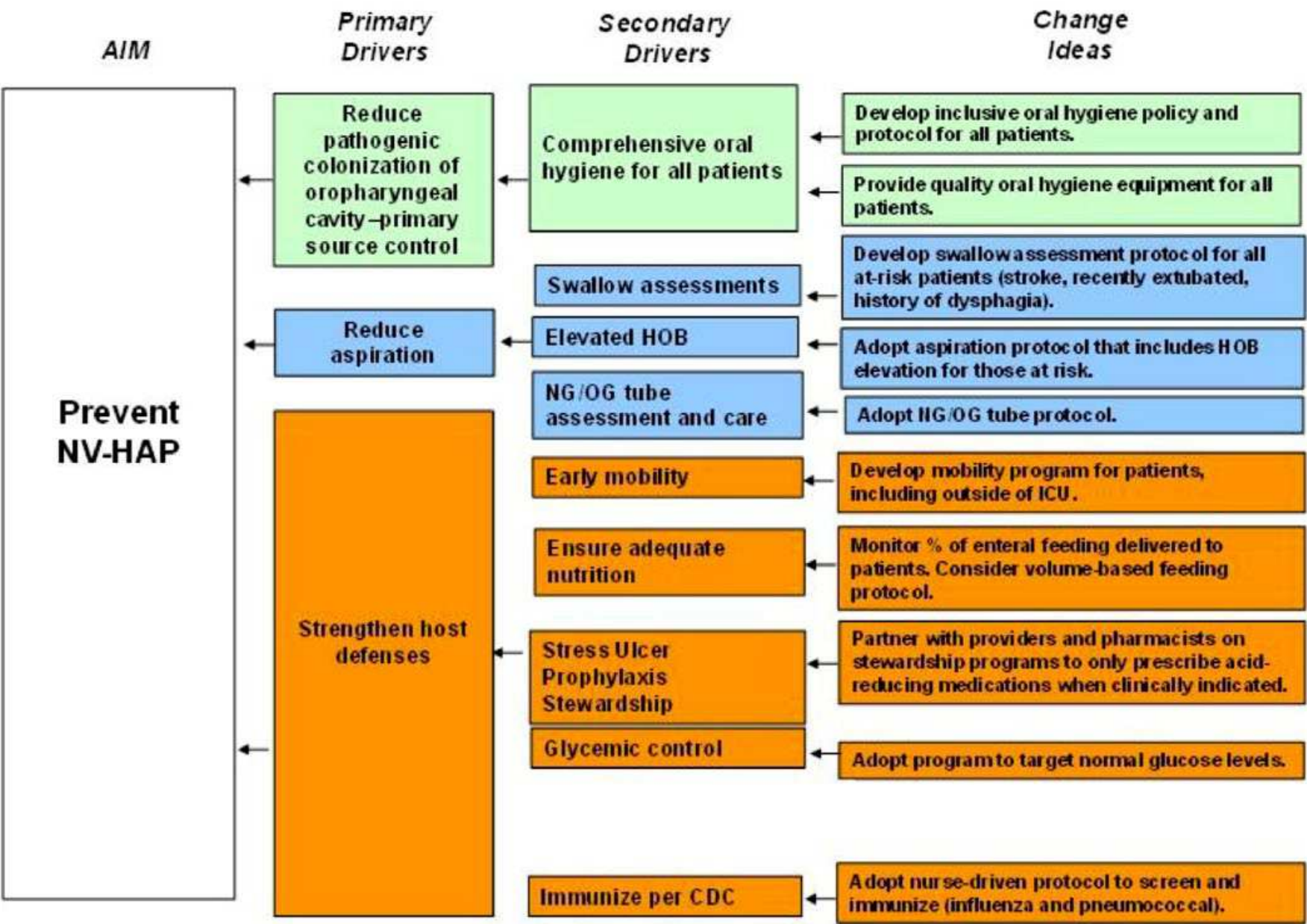
VA Initiative-2018-Nationwide Action Planning for Deployment



Single Center-Oct 2016-April 2018

- 1 VA center-↓NV-HAP from 105 cases to 8.3 cases per 1000 patient days
- 2.84 million cost savings
- 13 lives

Comprehensive NV-HAP Prevention



Healthcare-Associated Pneumonia

(Tablan et al., 2003; Davis, 2012)

1. Staff education and involvement in infection prevention.
2. Infection and microbiologic surveillance with data on local drug resistant pathogens.
3. Appropriate cleaning, sterilization or disinfection and maintenance of equipment, devices and environment.
4. Vaccinate staff and high risk patients (i.e. Flu shots).
5. Deep breathing exercises and ambulation.
6. Isolate infected patients as indicated.
7. Rapid screening with isolation as indicated.
8. Limit symptomatic staff and visitors.
9. Maintain intact, moist, and healthy oral lining and mucosa.
10. [†]Monitoring and early removal of invasive devices.
11. [†]Anti-microbial stewardship program.
12. ^{1‡}Swallow screens.
13. [‡]Lung expansion/mobilize.
14. [‡]Adequate nutrition.
15. [‡]Serum glucose in target range.
16. See prevention strategies for Aspiration Pneumonia.



A person with a backpack is silhouetted against a bright, snow-capped mountain peak. The person is standing on a rocky outcrop, looking towards the mountain. The mountain is covered in snow and has sharp, jagged peaks. The sky is a clear, pale blue.

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

Future State--Objective Surveillance Definitions for NV-HAP: Clinical Indicators in the EHR

	Worsening oxygenation	≥3 days of new antibiotics	Temp > 38°C	White Blood Cell Count <4 or >12	Chest-X-Ray or CT Chest	Respiratory culture
Definition #1	✓					
Definition #2	✓	✓				
Definition #3	✓	✓	Either			
Definition #4	✓	✓	✓			
Definition #5	✓	✓	✓	✓		
Definition #6	✓	✓	✓	✓	✓	
Definition #7	✓	✓	Either		✓	
Definition #8	✓	✓	✓	✓	✓	✓
Definition #9	✓	✓	Either		Either	
Definition #10	✓	✓	✓	✓	Either	

Identified 0.6 event per 100 admission and associated with a 6 fold higher risk of death compared with matched controls

**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.**





Kathleen Vollman

ADVANCING NURSING THROUGH KNOWLEDGE & INNOVATION



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HAI prevention courses by Kathleen Vollman

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



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