

The Impact of Patient Hygiene on Hospital Acquired Infections

26043B

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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, Safety culture for AHA
- Consultant and speaker bureau
 - △ Stryker's Sage business
 - △ LaJolla Pharmaceutical
 - △ Baxter healthcare
 - △ Potrero Medical

Objectives

- Describe the forces within the current healthcare environment that are targeting reduce bacterial load and HAI's
- Identify and detail the evidence-based practices for bathing critically ill patients
- Discuss possible barriers to practice changes and realistic solutions to assist the team in the implementation process



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 patient's host defense through proactive use of evidence-based hygiene care strategies

**Hand
Hygiene**

**Comprehensive
Oral Care Plan**

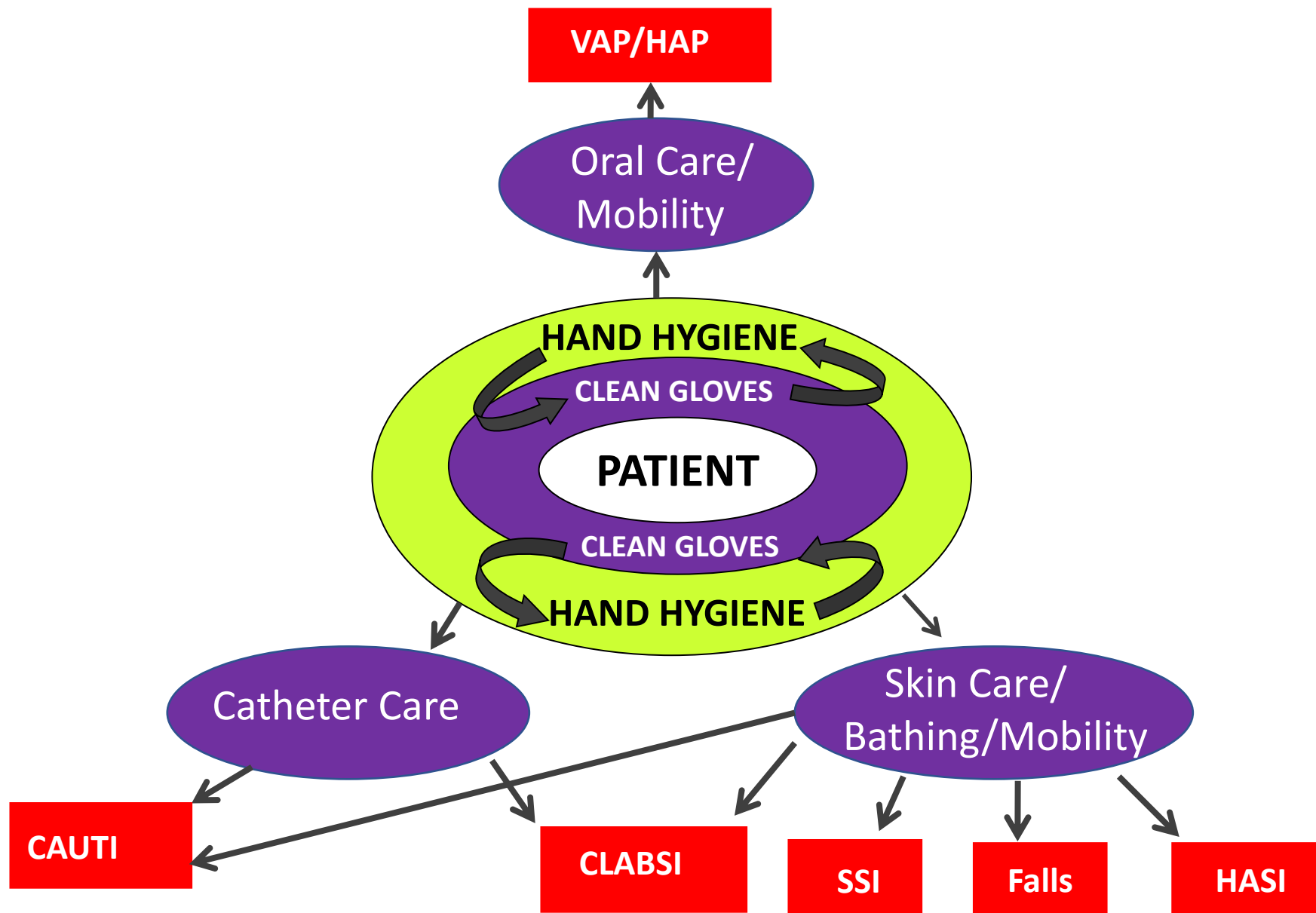
**Incontinence-
Associated
Dermatitis
Prevention
Program**

**Bathing &
Assessment**

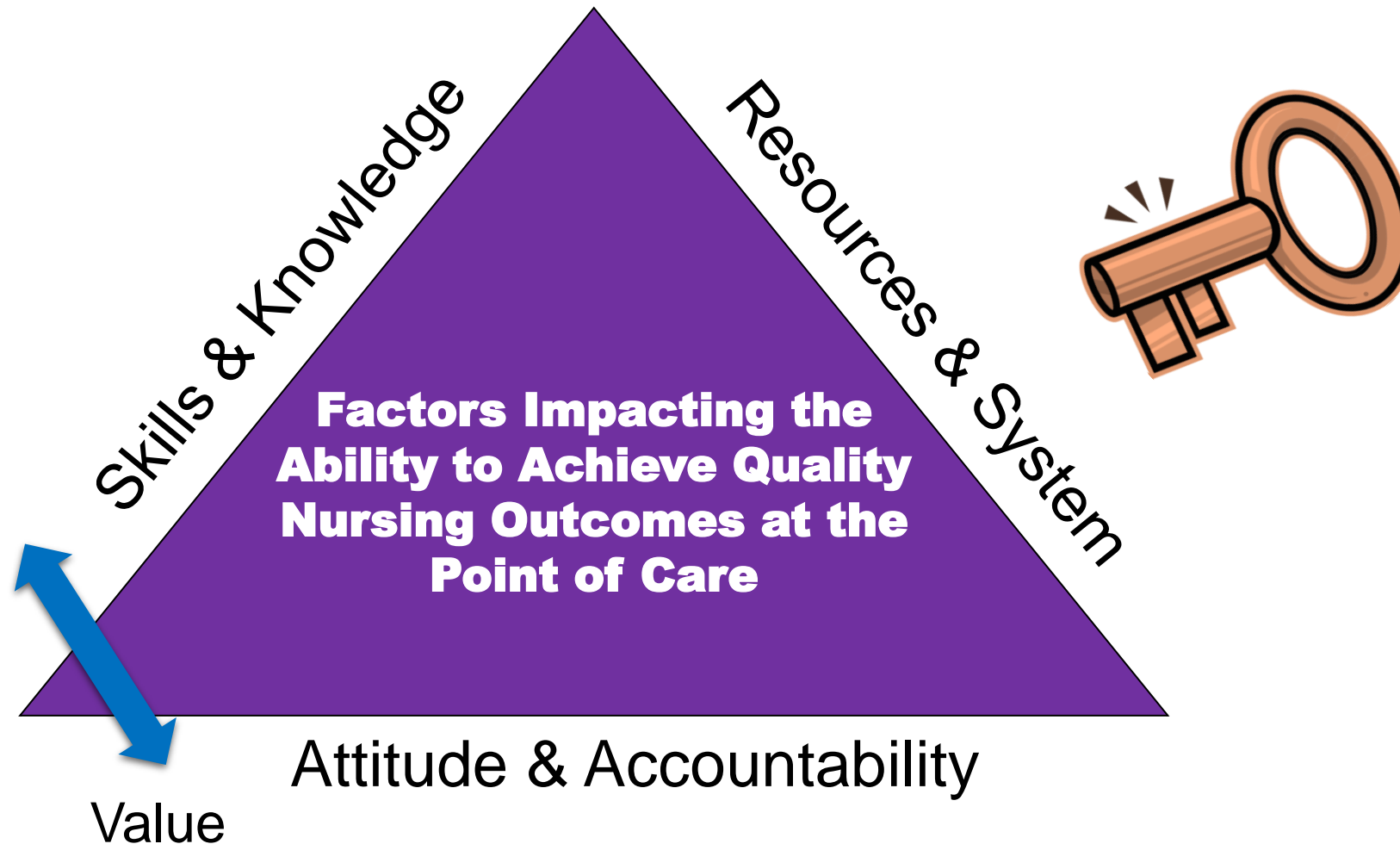
**Pressure
Injury Risk
Reduction**

**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

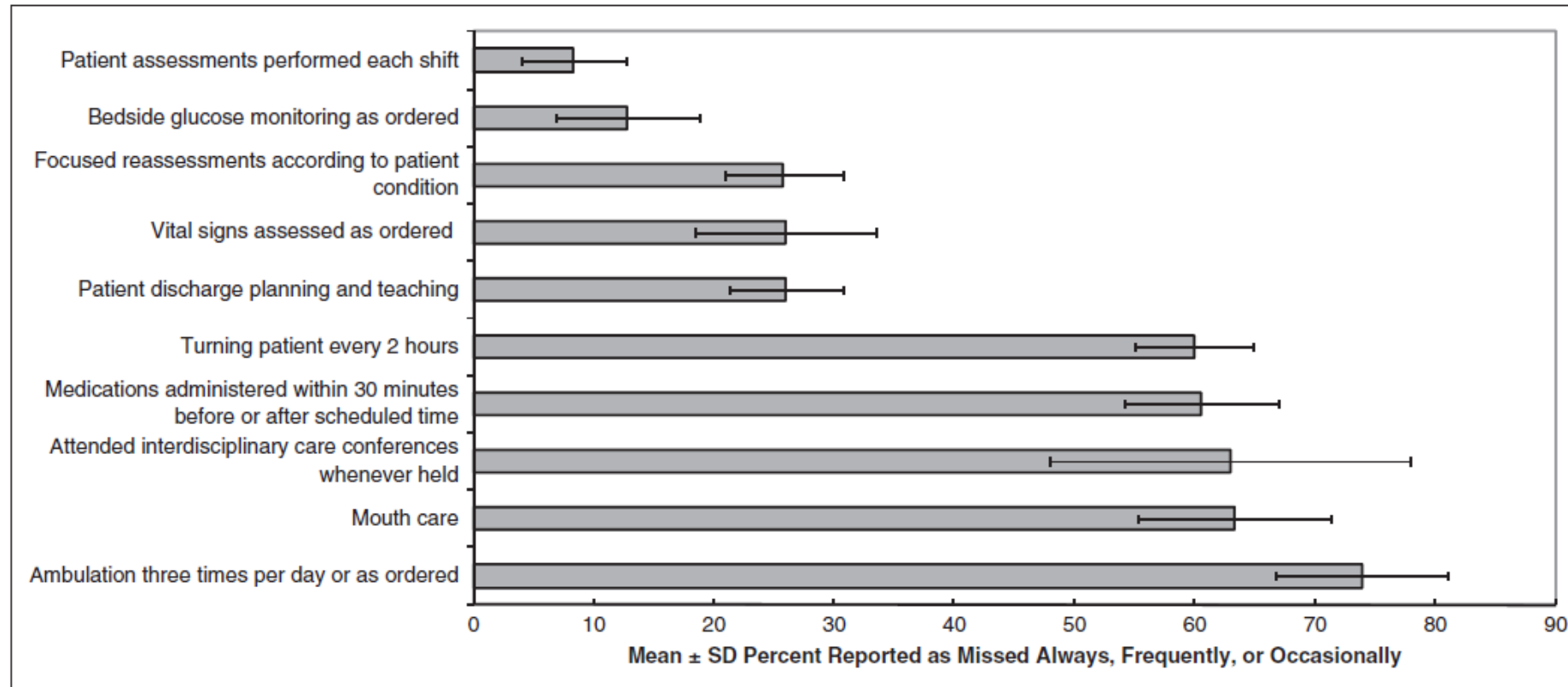


Figure 2. Elements of care most and least frequently missed. The solid bars represent the means across all 10 hospitals, and the range lines indicate the standard deviations.

Patient Perceptions of Missed Nursing Care

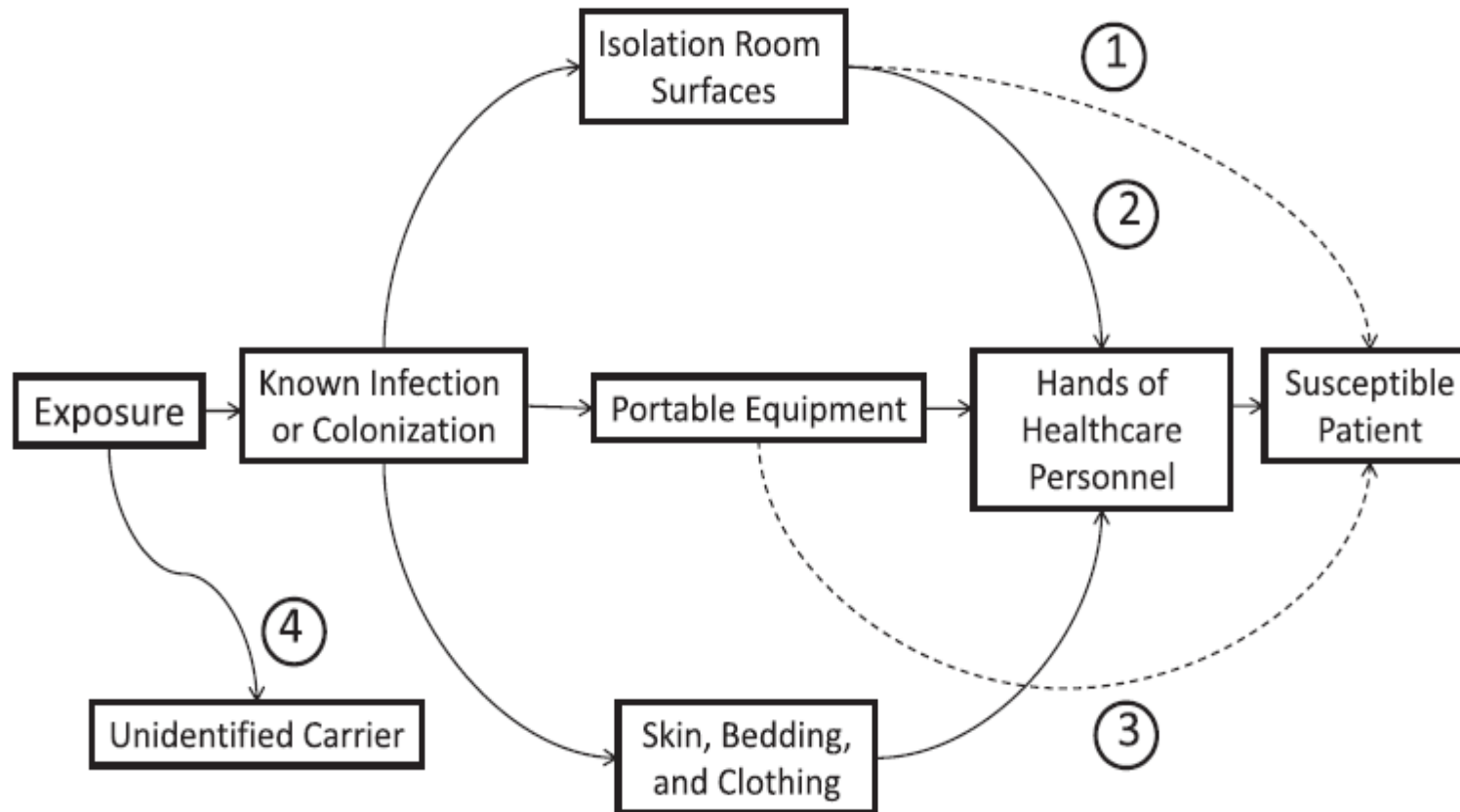
Table 2. Elements of Nursing Care by Ability of Patient to Report and Extent Missed*

| | Fully Reportable | Partially Reportable | Not Reportable |
|-------------------|---|---|--|
| | | | <ul style="list-style-type: none"> ■ Patient assessment ■ Surveillance ■ IV site care |
| Frequently Missed | <ul style="list-style-type: none"> ■ Mouth care ■ Listening ■ Being kept informed | <ul style="list-style-type: none"> ■ Ambulation ■ Discharge planning ■ Patient education | |
| Sometimes Missed | <ul style="list-style-type: none"> ■ Response to call lights ■ Response to alarms ■ Meal assistance ■ Pain medication and follow-up | <ul style="list-style-type: none"> ■ Medication administration ■ Repositioning | |
| Rarely Missed | <ul style="list-style-type: none"> ■ Bathing | <ul style="list-style-type: none"> ■ Vital signs ■ Hand washing | |

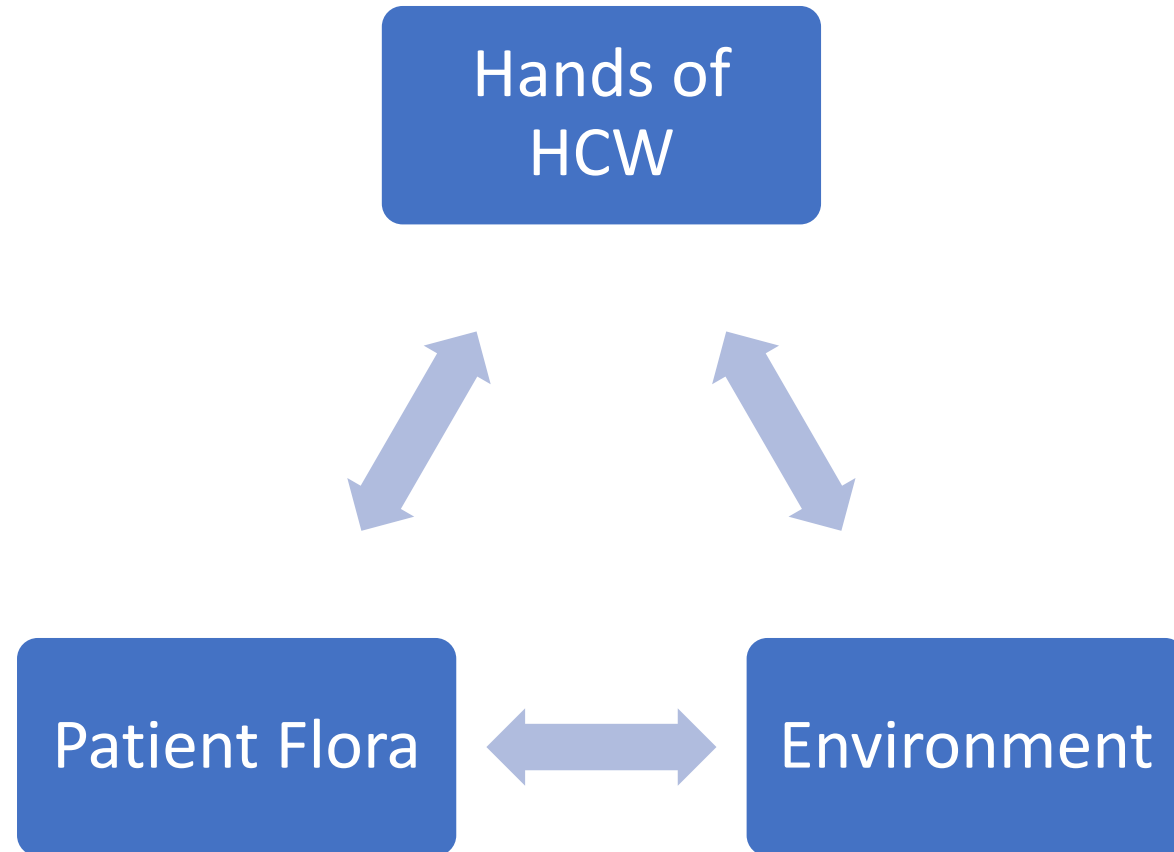
* IV, intravenous.

Common Routes of Transmission

C.J. Donskey / American Journal of Infection Control 41 (2013) S12-S19



3 Main Vectors of Infection



Impact from the Vectors of Infection

- ▲ Patients' endogenous flora (40% - 60%)
- ▲ Cross-infection via the hands of healthcare personnel (HCP; 20% - 40%)
- ▲ Antibiotic-driven changes in flora (20% - 25%)
- ▲ Contamination of the environment (20%).

Vertical vs. Horizontal

🔗 Vertical approach refers to a narrow-based program focusing on a single pathogen (selective of the specific MDRO)

- △ AST to identify carriers
- △ Implementation of measures aimed at preventing transmission from carriers to other patients
 - Isolation
 - Hand hygiene

🔗 Horizontal approach to infection prevention and control measures refers to broad-based approaches attempting reduction of all infections due to all pathogens

- △ No screening
- △ CHG bathing
- △ Universal nasal coverage
- △ No isolation
- △ Limit lines/tubes
- △ Hand hygiene

The Bath: The First Line Of Defense

Early Detection of Skin Injury



Nurse!!!

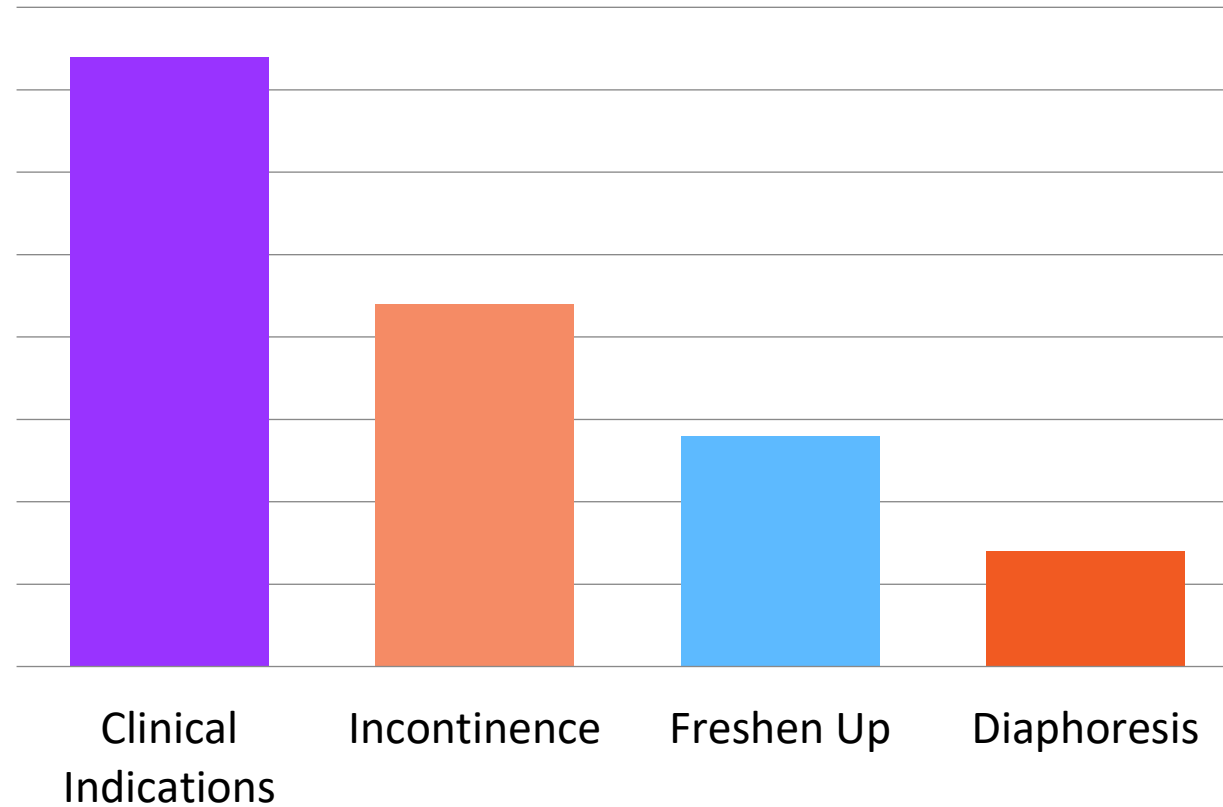
Reducing
Microorganism
spread

Efficiency & Effectiveness

Health/Social Wellbeing



Reasons for Bathing



Timing of the Bath












40% baths occur 2400 – 0600

- Timing for bathing varies globally
 - Consider patient need for sleep and energy reserves
- Avoid:

- △ Nurse preference
- △ Organizational factors
- △ Unit norms

Coyer FM, et al. *Aust Crit Care*. 2001;24:198-209
Celik S, et al. *J Clin Nurs*. 2004;14:102-106
Tamburri LM, et al. *Am J Crit Care*. 2004;392:102-113

Activities That Increase VO_2

| | |
|---|-----|
|  Dressing change | 10% |
|  Agitation | 18% |
|  Bath | 23% |
|  Suctioning | 27% |
|  Increased work of breathing | 40% |
|  Weigh on sling scale | 36% |
|  Position change | 31% |
|  Linen change – occupied bed | 22% |
|  Chest physiotherapy | 35% |



Patients At Risk

Multi-Drug Resistant Organisms

- △ Immunodeficiencies
- △ Breaks in skin integrity related to invasive devices
- △ Open wounds
- △ Co-morbidities
- △ Hand transmission
- △ Equipment contamination/ Hospital environment

Damaging the Natural Barriers to Infection...the Skin

- △ Bathing techniques
- △ Soaps
- △ Wash cloths



Optimal Hygiene

- 🌀 pH balanced (4-6.8)
 - △ Stable pH discourages colonization of bacteria & ↓ risk of infection
 - △ Bar soaps may harbor pathogenic bacteria
- 🌀 Excessive washing/use of soap compromises the water holding capacity of the skin
- 🌀 Non-drying, lotion applied
- 🌀 Multiple steps can lead to large process variation

Traditional Bathing



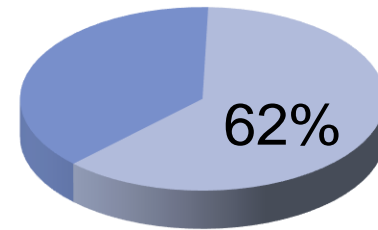
Why are there
so many bugs
in here?

Soap and water basin bath was an independent predictor for the development of a CLABSI

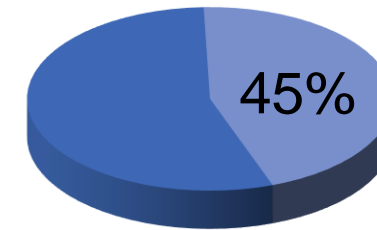
Bath Basins: Potential Source of Infection

Large multi-center study evaluates presence of multi-drug resistant organisms

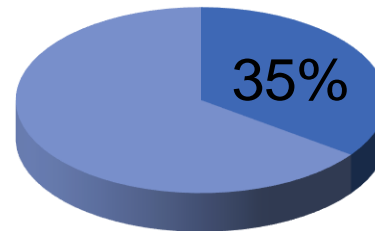
Total hospitals: 88
Total basins: 1,103



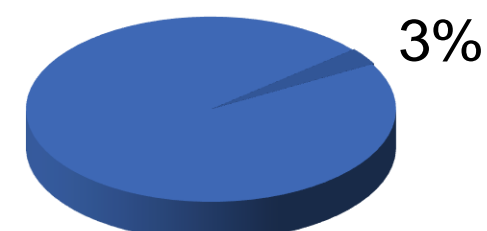
Contaminated
686 basins/88 Hospital



Gram negative bacilli
495 basins/86 hospitals



Colonized w/ VRE
385 basins/ 80 hospitals



MRSA
36 basins/28 hospitals

Mechanisms of Contamination

🔗 Skin flora

🔗 Multiple-use basins

△ Incontinence cleansing

△ Emesis

△ Product storage

🔗 Bacterial biofilm from tap water



Shannon RJ, et al. *J Health Care Safety Compliance Infect Control*. 1999;3:180-184.

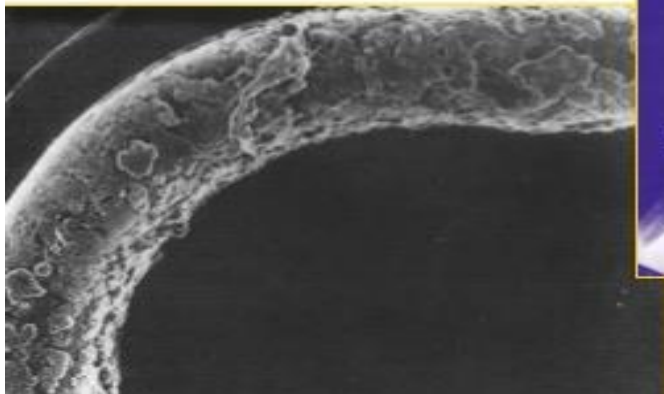
Larson EL, et al. *J Clin Microbiol*. 1986;23(3):604-608.

Johnson D, et al. *Am J Crit Care*, 2009;18(1):31-38, 41.

Marchaim D, et al. *Am J Infect Control*. 2012;40(6):562-564.

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Biofilms are Ubiquitous



Pathogens **2015**, *4*, 373–386; doi:10.3390/pathogens4020373

OPEN ACCESS

pathogens

ISSN 2076-0817

www.mdpi.com/journal/pathogens

Review

Opportunistic Premise Plumbing Pathogens: Increasingly Important Pathogens in Drinking Water

Joseph O. Falkinham, III ^{1,*}, Amy Pruden ² and Marc Edwards ²

Clinical Infectious Diseases

INVITED ARTICLE

HEALTHCARE EPIDEMIOLOGY: Robert A. Weinstein, Section Editor



Healthcare Outbreaks Associated With a Water Reservoir and Infection Prevention Strategies

Hajime Kanamori,^{1,2} David J. Weber,^{1,2} and William A. Rutala^{1,2}

¹Division of Infectious Diseases, University of North Carolina School of Medicine, and ²Hospital Epidemiology, University of North Carolina Health Care, Chapel Hill

Health | Local News | Northwest | Puget Sound

Operating-room machines test positive for Legionella at UW Medicine

Originally published September 19, 2016 at 2:19 pm | Updated September 19, 2016 at 7:31 pm

Understanding Water

- 🔗 All water with the exception of sterile water and filtered water is contaminated with microbes (eg, potable water, tap water, showers, and ice).
- 🔗 In healthy persons, contact or ingestion of such water rarely leads to infection.
- 🔗 However, contact or ingestion of such water may cause infection in immunocompromised persons or when applied to non-intact skin
- 🔗 Transmission of these pathogens from a water reservoir may occur by direct and indirect contact, ingestion and aspiration of contaminated water, or inhalation of aerosols*
- 🔗 Compared sink & water based care activities to non sink and non water based care activities on GNB colonization in ICU. Found rate dropped from 26.1 to 21.6 colonization pre 1000 ICU days. Greater reduction with longer ICU LOS's

Waterborne Infection

Hospital Tap Water

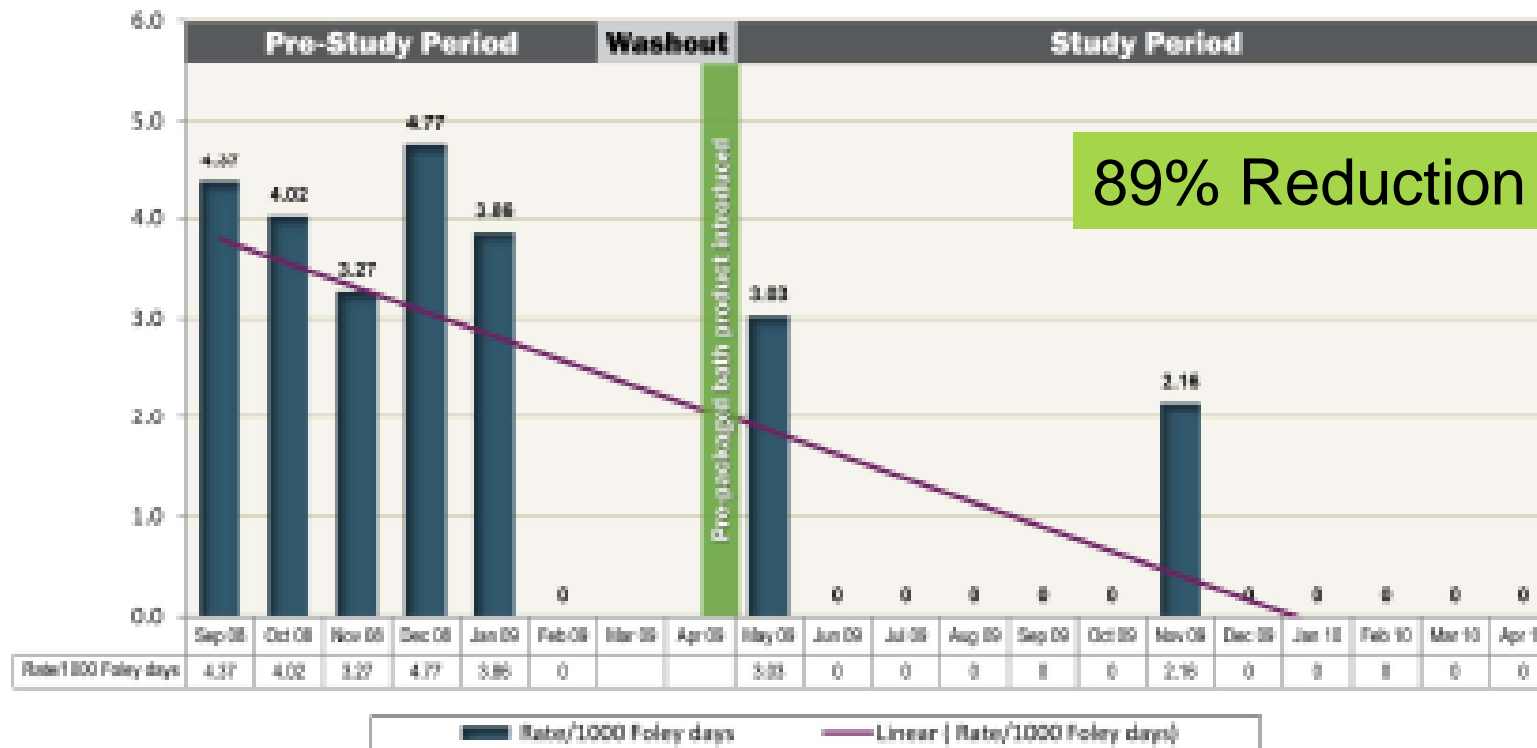
- 🔗 Bacterial biofilm
- 🔗 Most overlooked source for pathogens
- 🔗 29 studies demonstrate an association with HAIs and outbreaks
- 🔗 Transmission:
 - △ Drinking
 - △ Sinks
 - △ Bathing
 - △ Rinsing items
 - △ Contaminated environmental surfaces
 - △ Contaminated ice machines
- 🔗 Immunocompromised patients at greatest risk



Anaissie EJ, et al. *Arch Intern Med*. 2002;162(13):1483-1492.
Cervia JS, et al. *Arch Intern Med*, 2007;167:92-93
Trautmann M, et al. *Am J of Infect Control*, 2005;33(5):S41-S49,
<https://www.pinterest.com/pin/332914597437828576/?l=t>
Kanwar A, et al. *Am J Infect Control*. 2017;45(11):1273-1275.

Reducing UTI's Through Basinless Bathing

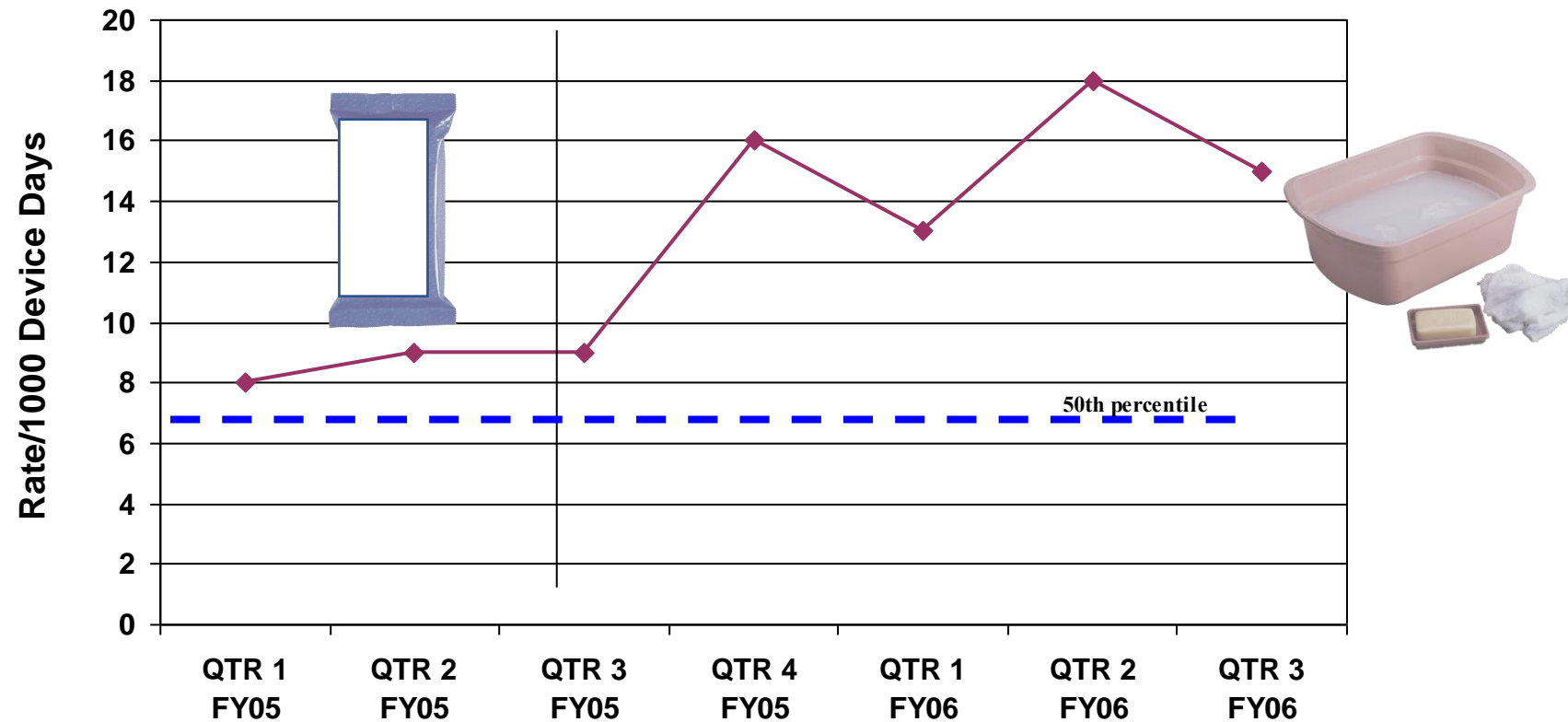
FIGURE 2. Hospital-Acquired CAUTI on 2 Medical/Surgical Units



CA-UTI 7.5 per 1000 catheter days to 4.42 per 1000 catheter days, then to .46 per 1000 catheter days

Impact on UTI with Basin Bathing

UTI Rate- Removal of Prepackaged Bath Product QTR 3 FY05



The Effect of Bathing with Basin and Water and UTI Rate, LOS and Costs



| Unit Census: 14 | | | | |
|---|-----------------------------------|-------------------|---|--|
| Phases | Product Cost | No. of UTI | Median⁴ LOS 17 Days | Median⁴ Cost (4857.00) |
| I- Pre-Packaged Bathing Washcloths (9 months) | \$10,530 ¹ (\$3.00) | 25 | 175 | \$117,175 |
| II- Basin/Water (9 months) | \$3,510 ² (\$1.00) | 48 | 336 | \$224,916 |
| III- Additional Product Cost, UTI, LOS, COSTS | \$7,020 | 23 ³ | 151 | \$107,741 |

¹Based on 3 packages of 8 towels each ²Based on product cost of towels, soap, and basin³ Difference between phase I pre-package/phase II basin water⁴



Review of Literature: Bathing & CAUTI's



- ▶ Bacterial contamination of bath basins is common leading to the recommendation that bathing wipes replace bath basins to reduce HAI's & CAUTI's
- ▶ Non medicated basin less bathing lowered the incidence of CAUTI's, decreased bathing time and resulted in a cost savings
- ▶ No data to support benefit of CHG wipes in reducing CAUTI's
 - △ Studies on going



Cleansing of Patients with Indwelling Catheter

- ▲ Indwelling catheter care should occur with the daily bath (basinless bathing), as a separate procedure using clean technique
- ▲ There is no evidence to support 2x a day indwelling catheter care
- ▲ If a large liquid stool occurs, bathe the patient with basinless bathing
- ▲ Apply barrier cloth to area of skin requiring protection

Comparison of Wash Basin Baths & Disposable Baths

- ▶ RCT comparing basin bath to disposable bath
- ▶ 58 patient served as own control
- ▶ Baths were observed
- ▶ Nurse bathed same patient using both methods
- ▶ Measured
 - △ Duration & quality of bath
 - △ Patient satisfaction
 - △ Nurse satisfaction
 - △ Cost-
 - Basin bath: towels, soap, moisturizer, hot water, basins
 - Disposable package bath and towels

Table 1 Duration

| | <i>Disposable baths (n = 58) Minutes (interval)</i> | <i>Wash basins (n = 58) Minutes (interval)</i> | <i>Wilcoxon signed-rank test (p-value)</i> |
|-------------|---|--|--|
| Preparation | 4 (2–5) | 5 (3–10) | <0.001 |
| The bath | 21 (8–35) | 26 (13–42) | <0.001 |
| Cleaning up | 4 (1–6) | 5 (2–8) | <0.001 |
| Total | 29 (14–44) | 36 (22–54) | <0.001 |

Less time was used with the disposable bath in all three categories.
This was significant ($p < 0.001$)

Table 2 Patients' bath type preferences

| <i>Patient interview</i> | <i>Prefer disposable bath</i> | <i>Prefer wash basins</i> | <i>Equal</i> |
|------------------------------|-----------------------------------|-------------------------------|--------------|
| n = 51* | 24 (47%) | 11 (22%) | 16 (31%) |

Table 3 Nurses' bath type preferences

| <i>Nurse ID</i> | <i>Prefer disposable baths (n)</i> | <i>Prefer wash basins (n)</i> | <i>Equal (n)</i> |
|---------------------|--|-----------------------------------|----------------------|
| Nhl -1 | 5 | 0 | 0 |
| Llb -2 | 5 | 1 | 0 |
| Nbj -3 | 12 | 1 | 0 |
| Hm -4 | 11 | 2 | 0 |
| Jl -5 | 8 | 0 | 0 |
| Cp -6 | 6 | 2 | 1 |
| Total | 47 (87%) | 6 (11%) | 1 (2%) |

A significant number of nurses preferred the disposable bath when comparing the two bath types ($p < 0.01$).

Changing IP Culture at the Unit Level

2 subacute medical units with ↑ HAI's

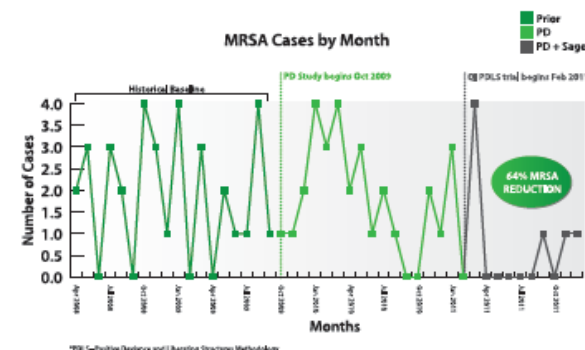
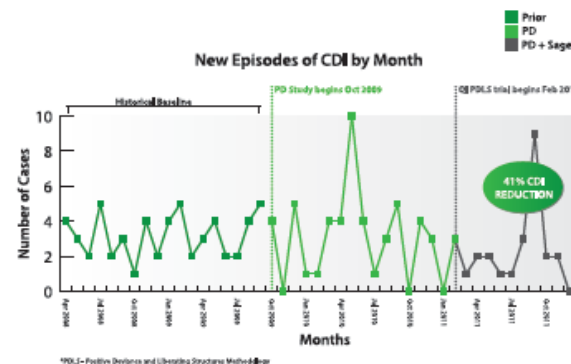
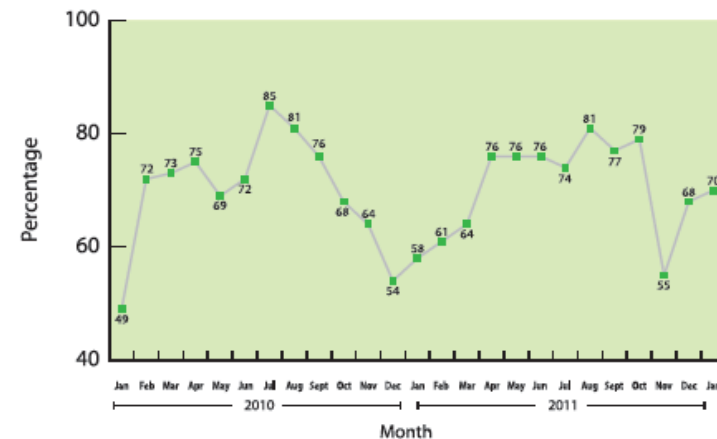
QI initiative to change infection prevention culture

- △ Environmental cleaning
- △ hand hygiene
- △ ward policy and procedures
- △ patient care
 - basinless bathing/removed basins
 - single use toiletry
 - isolation BP cuffs
 - IP checklist

RESULTS

Since the commencing of the project in October 2009 to December 2011, hand hygiene compliance has increased by over 30%, MRSA rates have decreased 64% and C. difficile has decreased 41%. Since the removal of the washbasins in January of 2011, there have been no gastroenteritis outbreaks.

Figure 1. Hand Hygiene Compliance CP7



For Successful Banning of Basins for Patient Care

▲ We need to provide alternatives for the other functions:

| Current | New |
|---|--|
| Emesis | Emebags being installed in every adult and ped pt. room, ACU, PACU |
| Storage of patient items | Clear plastic “baggies” Trial of “Concierge List” to decrease waste of unused/unneeded products |
| Foot soaks | Shampoo caps, prepackaged |
| Shampoo patient’s hair | Shampoo caps par’d on all units |
| 24 hour urine, ice | Store some basins in lab to be dispensed with each 24 hour jug |
| Bath cloths with no insulation, cold halfway through bath | Bath cloths with insulation to stay warm longer |

Changing Bathing & Incontinence Management Impacts CAUTI's



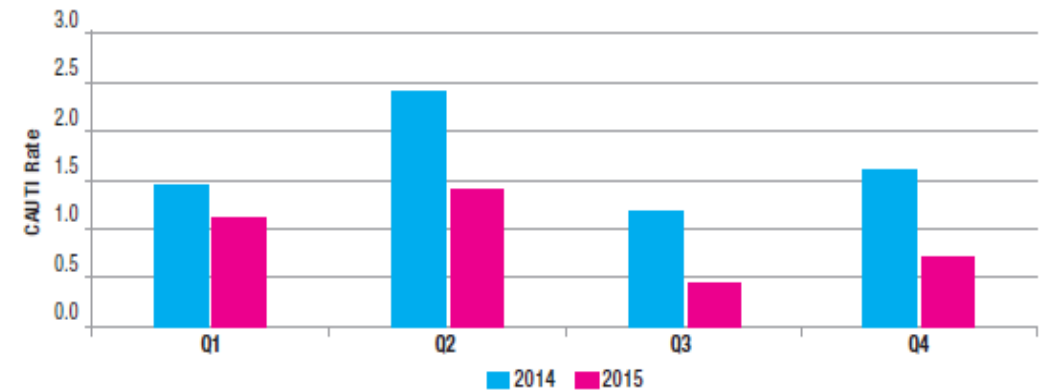
Pre implementation

- △ Daily bath with reusable basin & soap and tap water
- △ Incontinence cleaning, peri-spray, soap and tap water

New bathing & incontinence protocol

- △ Basins eliminated
- △ Prepackage bathing & peri spray/prepackage cloths

59% reduction



| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|--------------------|-------|-------|-------|-------|-----|-------|-------|-------|-------|-------|-------|-----|
| 2014 Catheter Days | 1,210 | 1,211 | 1,063 | 1,276 | 999 | 1,056 | 1,095 | 1,121 | 1,146 | 1,105 | 1,076 | 987 |
| # of CAUTI | 2 | 3 | 0 | 3 | 4 | 1 | 2 | 2 | 0 | 2 | 0 | 3 |
| 2014 CAUTI Rate | 1.7 | 2.5 | 0.0 | 2.4 | 4.0 | 0.9 | 1.8 | 1.8 | 0.0 | 1.8 | 0.0 | 3.0 |

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec |
|--------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| 2015 Catheter Days | 916 | 710 | 961 | 697 | 714 | 681 | 886 | 822 | 540 | 883 | 866 | 1050 |
| # of CAUTI | 2 | 0 | 1 | 2 | 0 | 1 | 1 | 0 | 0 | 1 | 1 | 0 |
| 2015 CAUTI Rate | 2.2 | 0.0 | 1.0 | 2.9 | 0.0 | 1.5 | 1.1 | 0.0 | 0.0 | 1.1 | 1.2 | 0.0 |

The removal of the basin has been shown to reduce risk factors for UTIs!

ROI for 12-month intervention: \$33,234.00

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

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

Build the Will: NV-HAP Causes Harm

🔗 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.
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Lacerna CC, et al. Infec control & Hosp Epidemiology 2020;41, 547-552

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

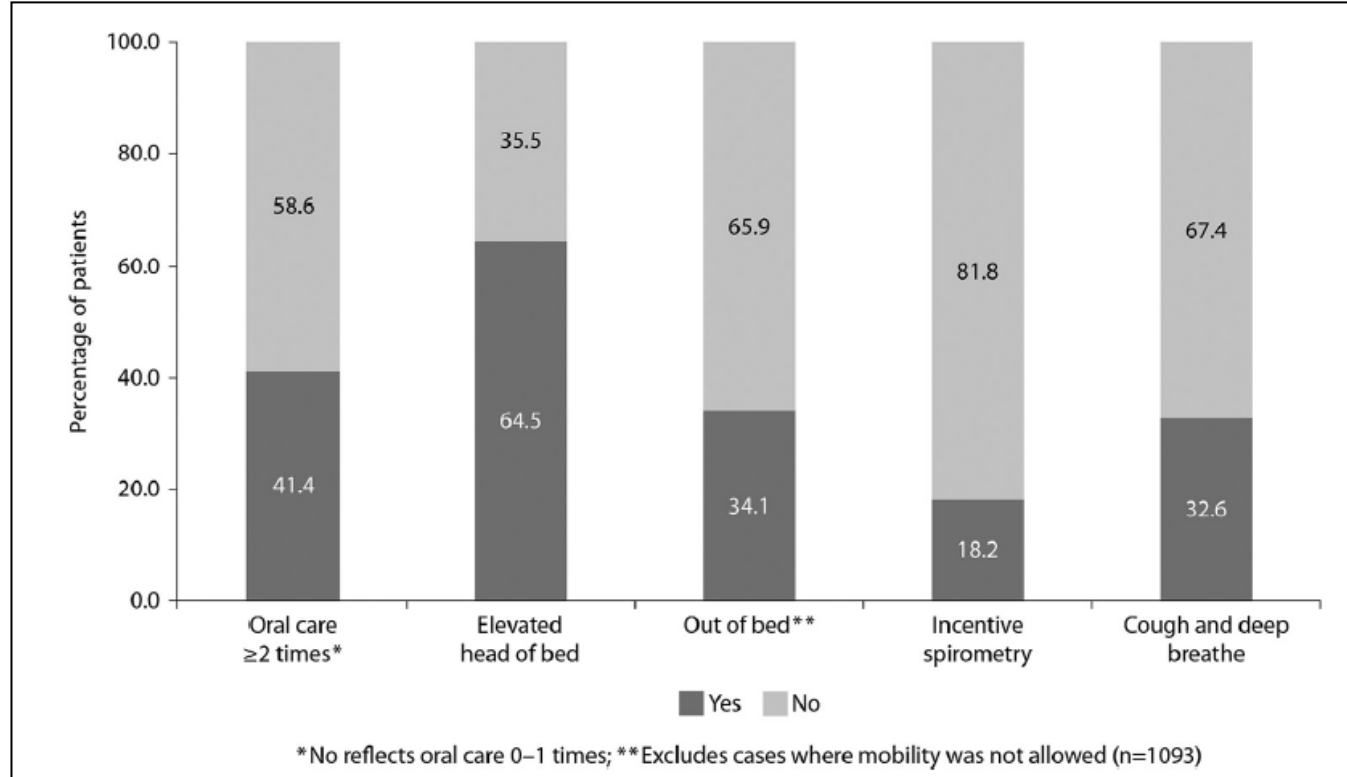


- ▲ Multicenter retrospective chart review
- ▲ Extracted NV-HAP cases per the 2014 ICD-9-CM codes for pneumonia not POA and the 2013 CDC case definition
- ▲ 21 hospitals completed data collection
- ▲ Measured nursing care missed 24hrs before diagnosis
- ▲ Non-vent HAP occurred on every unit



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)

Is Pneumonia Part of the Sepsis Picture?

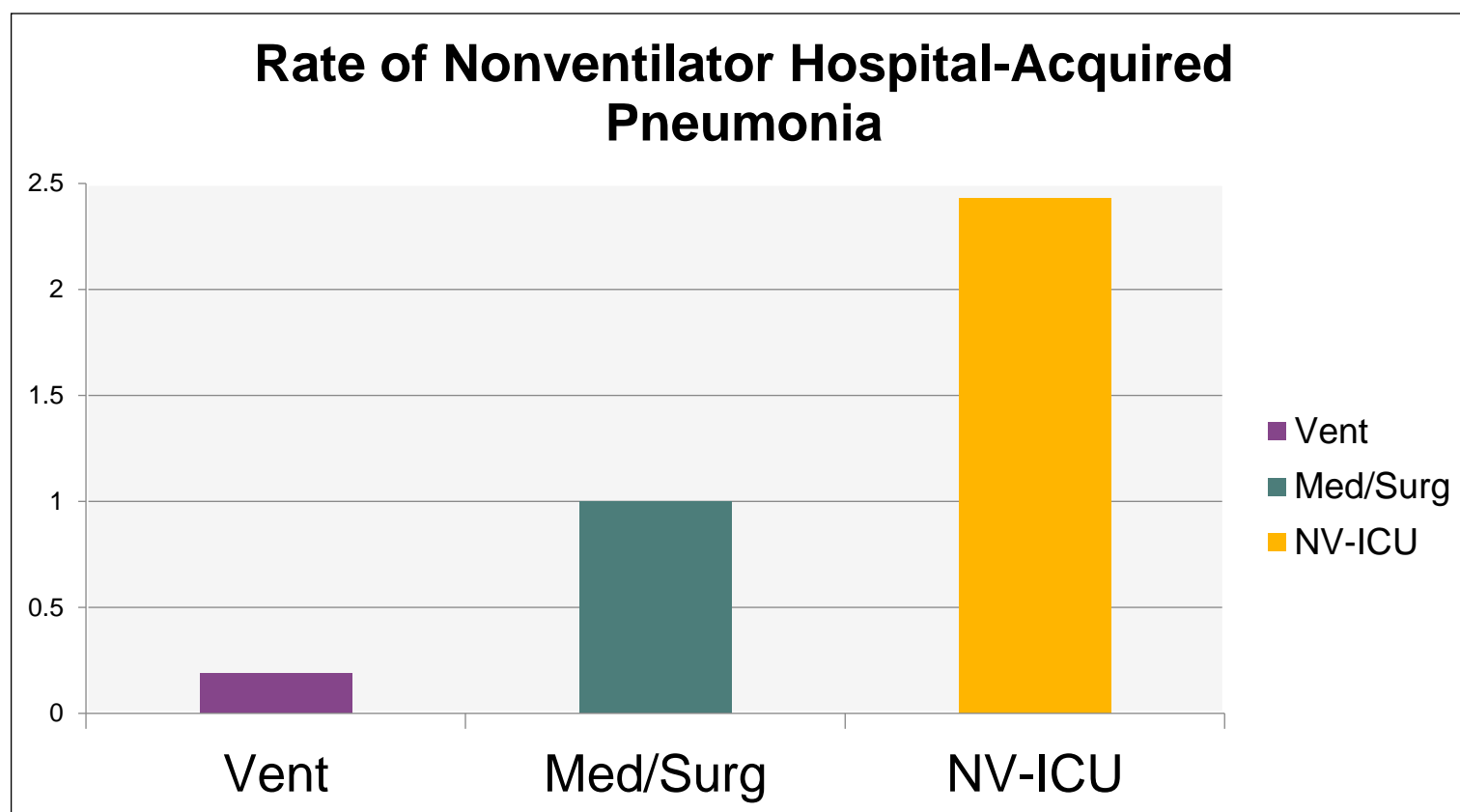
30-50% of sepsis cases may initiate with pneumonia

| 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



Where is the Highest Risk for NV-HAP?



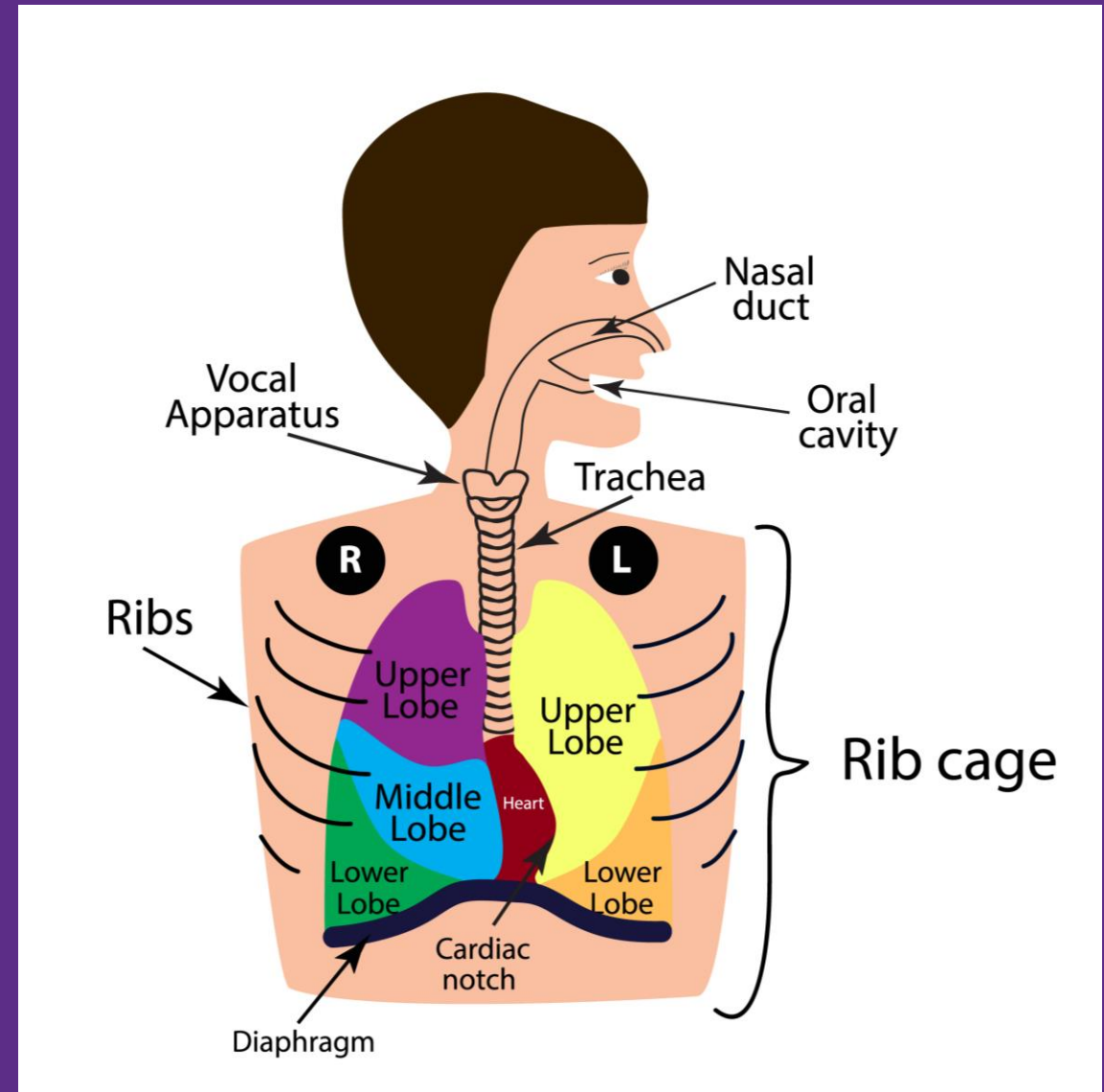
NV-HAP per 1000 patient days

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



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



Where does Pneumonia Start: Oral Bacteria during Hospitalization & Illness

🔬 Oral cavity

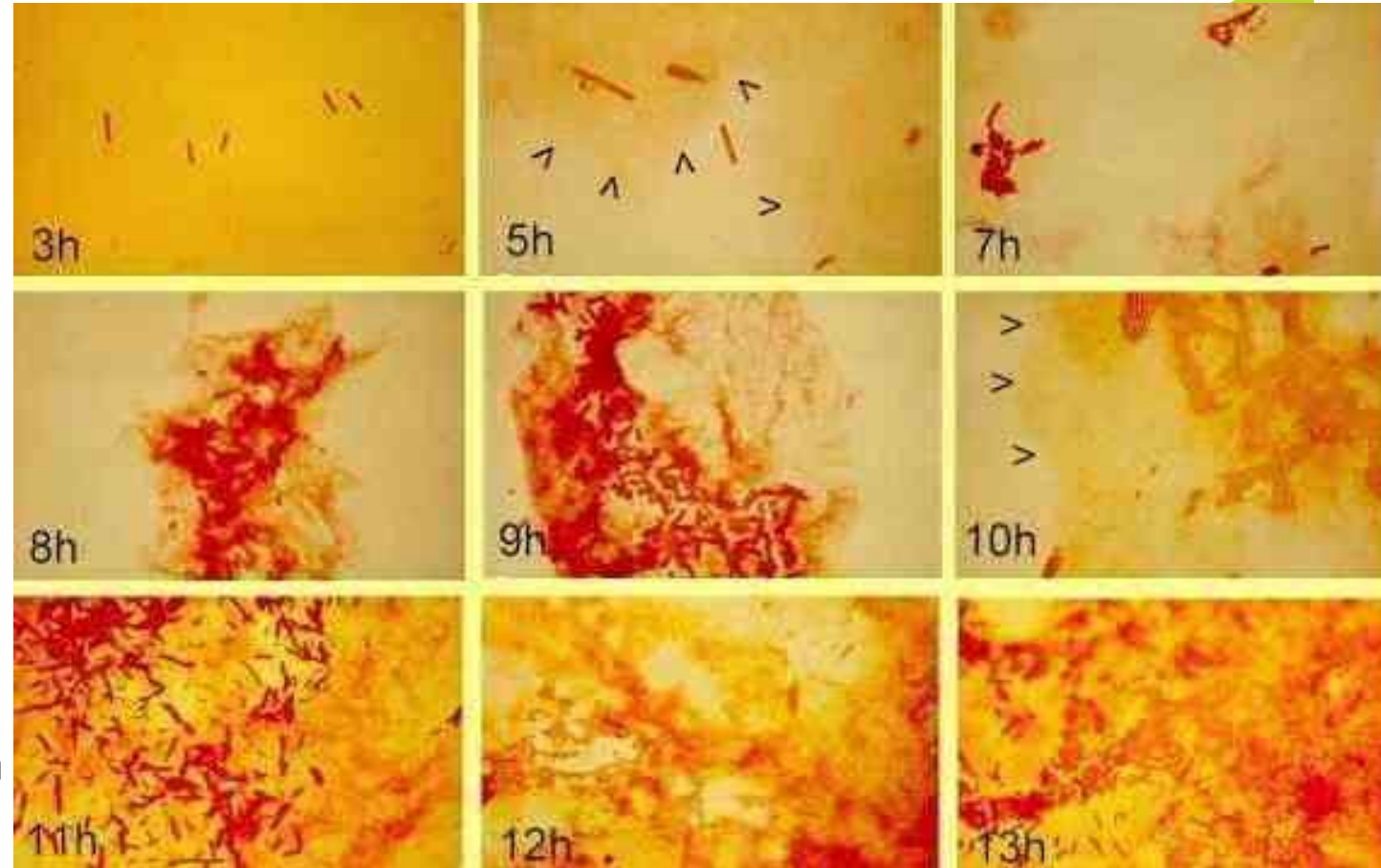
- △ > 1 billion oral microbes
- △ 700-1000 species
- △ Replicate's 5 x in 24hr period

🔬 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



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%

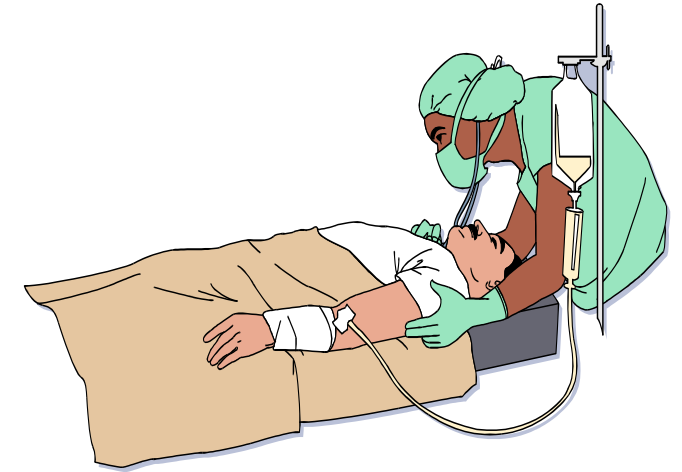
In the lung parenchyma



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

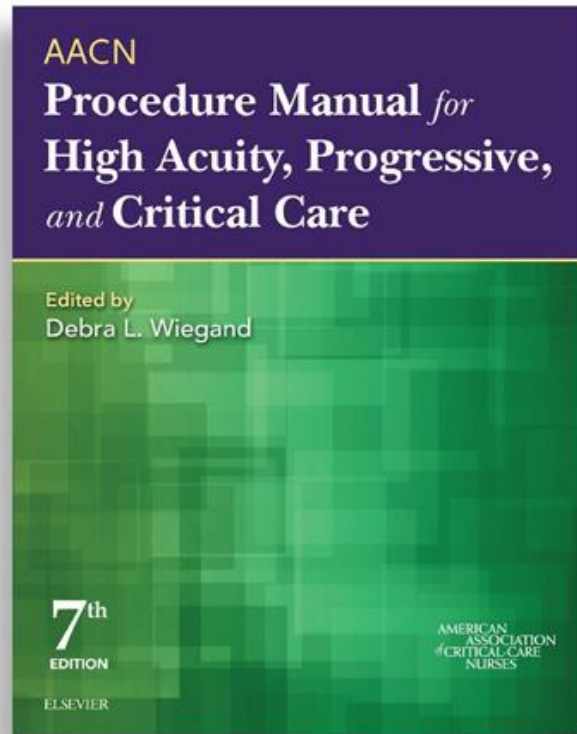
- Supine position
- CNS depressant medications
- Invasive tubes

Weak Host

- Surgery
- Immobility
- Co-morbid conditions

HAP

AACN Procedural Manual-7th Ed



Procedure 4: Endotracheal Tube Care and Oral Care

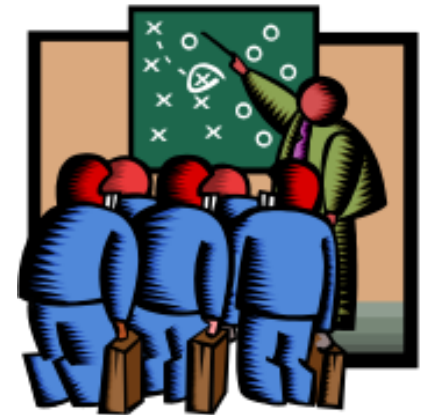
Authors:

Kathleen M Vollman
Mary Lou Sole
Barbara Quinn

SMCS HAP Prevention Plan

Phase 1: Oral Care

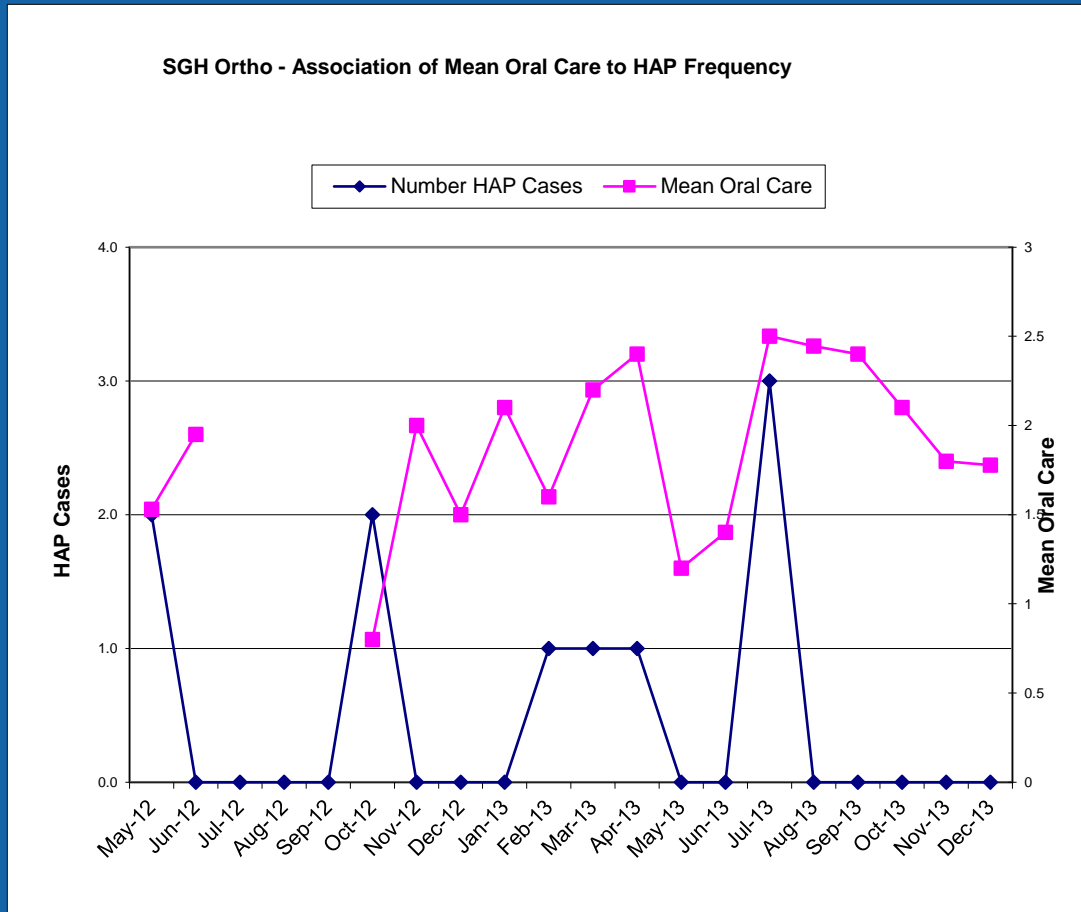
- Formation of new quality team: Hospital-Acquired Pneumonia Prevention Initiative (HAPPI)
- New oral care protocol to include non-ventilated patients
- New oral care products and equipment for all patients
- Staff education and in-services on products
- Ongoing monitoring and measurement
 - Monthly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



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 |

Provide Meaningful Data



Ortho Unit had ZERO HAP cases in the last 4 months of 2013!!

Great WORK!!

Remember, the goal is to provide and document oral care after each meal and before bedtime.

Oral Care Knowledge & Attitude Survey:



Method:

- Staff survey
- Pre – Post education

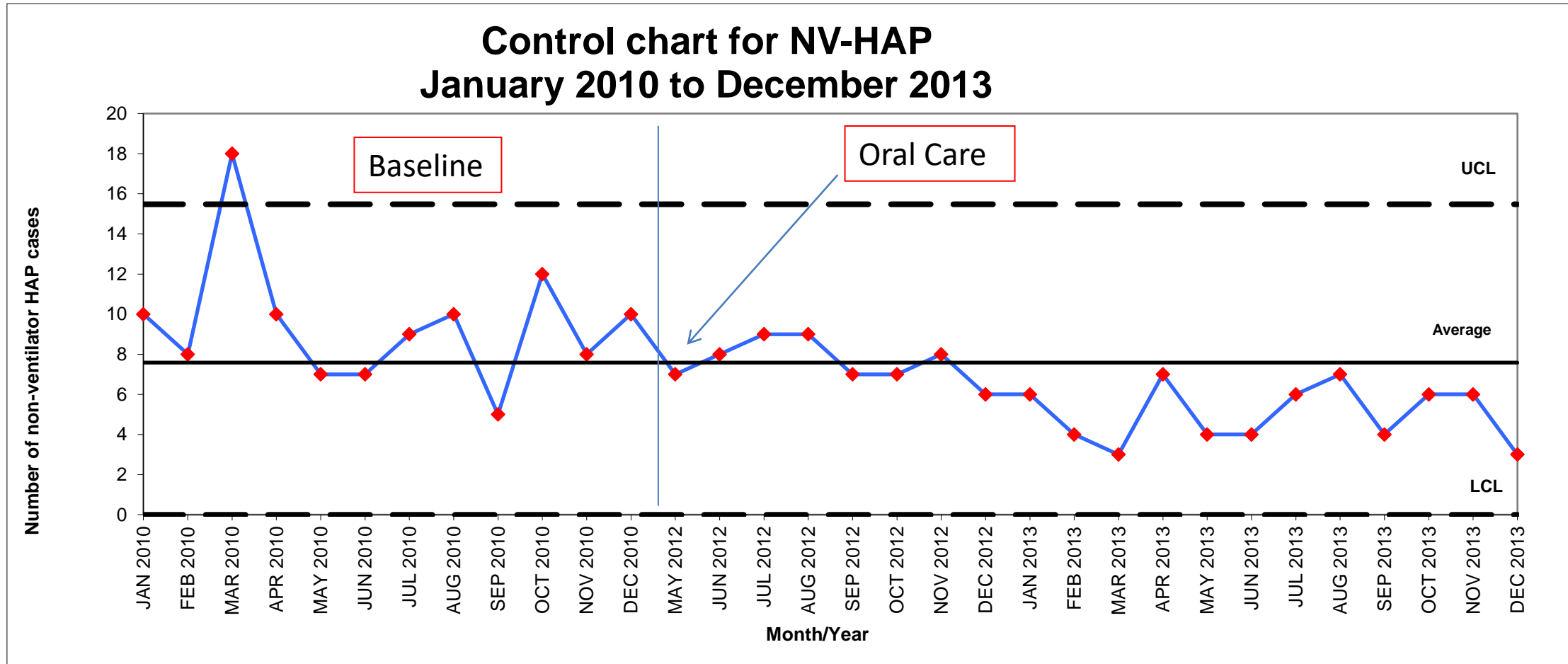
Results:

- Awareness of oral care protocol (77%)
- Priority of care for NAs (96%)
- RN perception that their patients received oral care (300%)

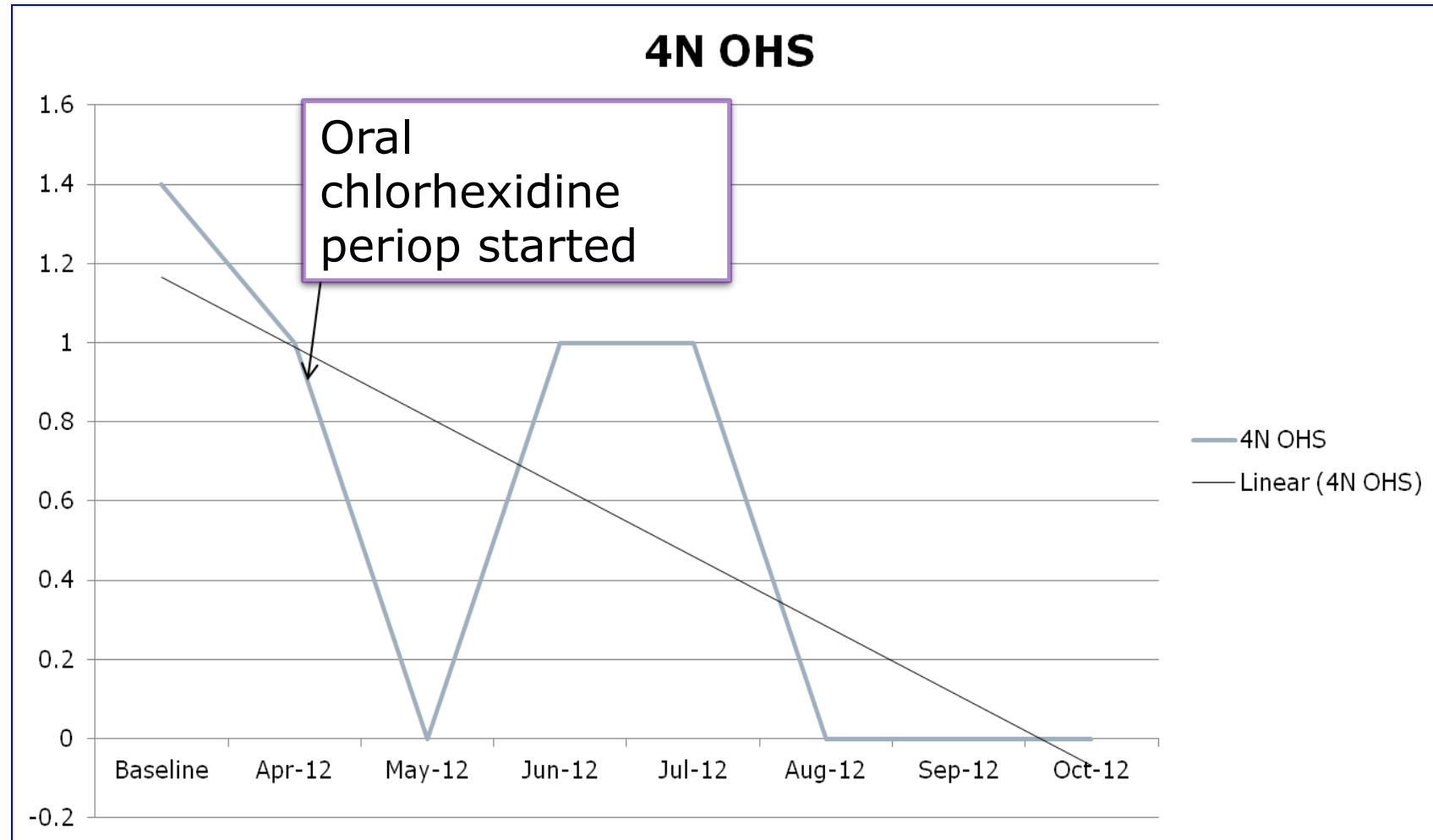


NV-HAP Incidence

50 % Decrease from Baseline



Open Heart Surgery Patients: NV-HAP Reduced 75%



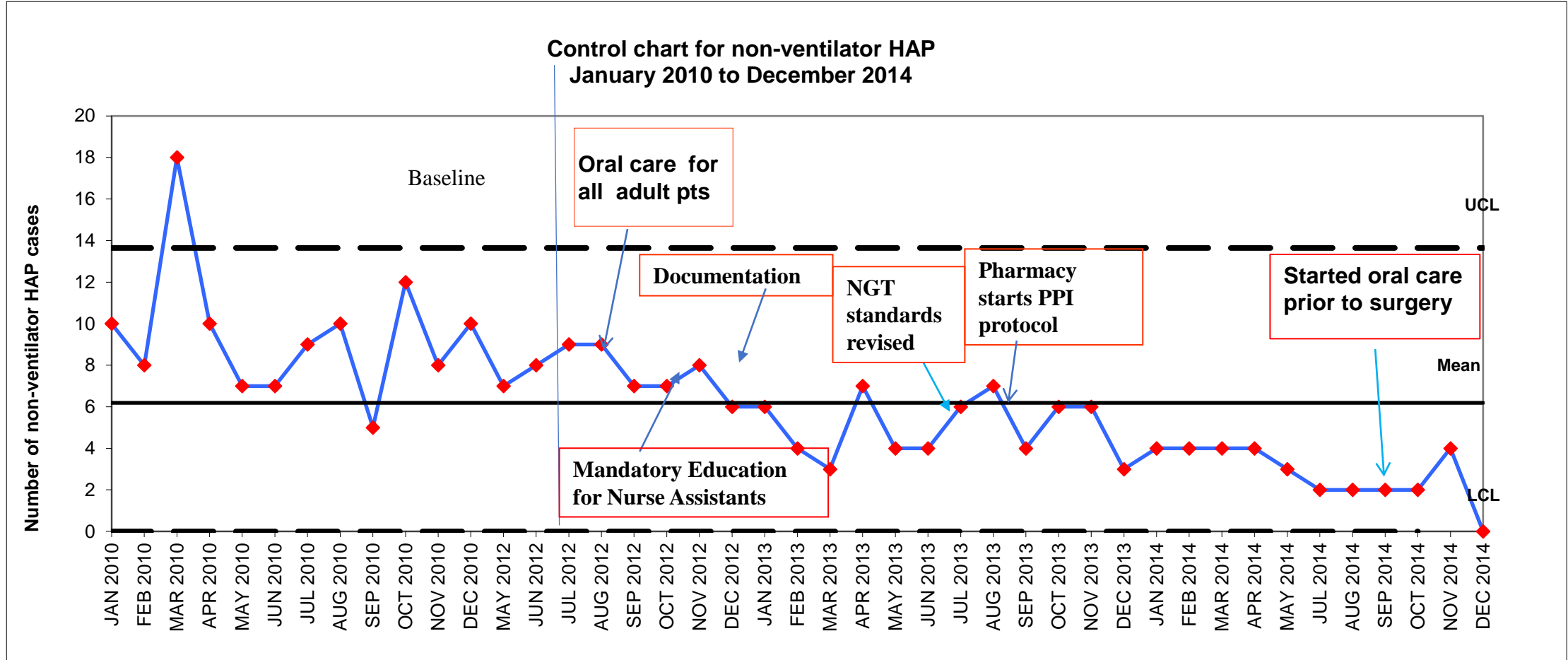
Return on Investment

- 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

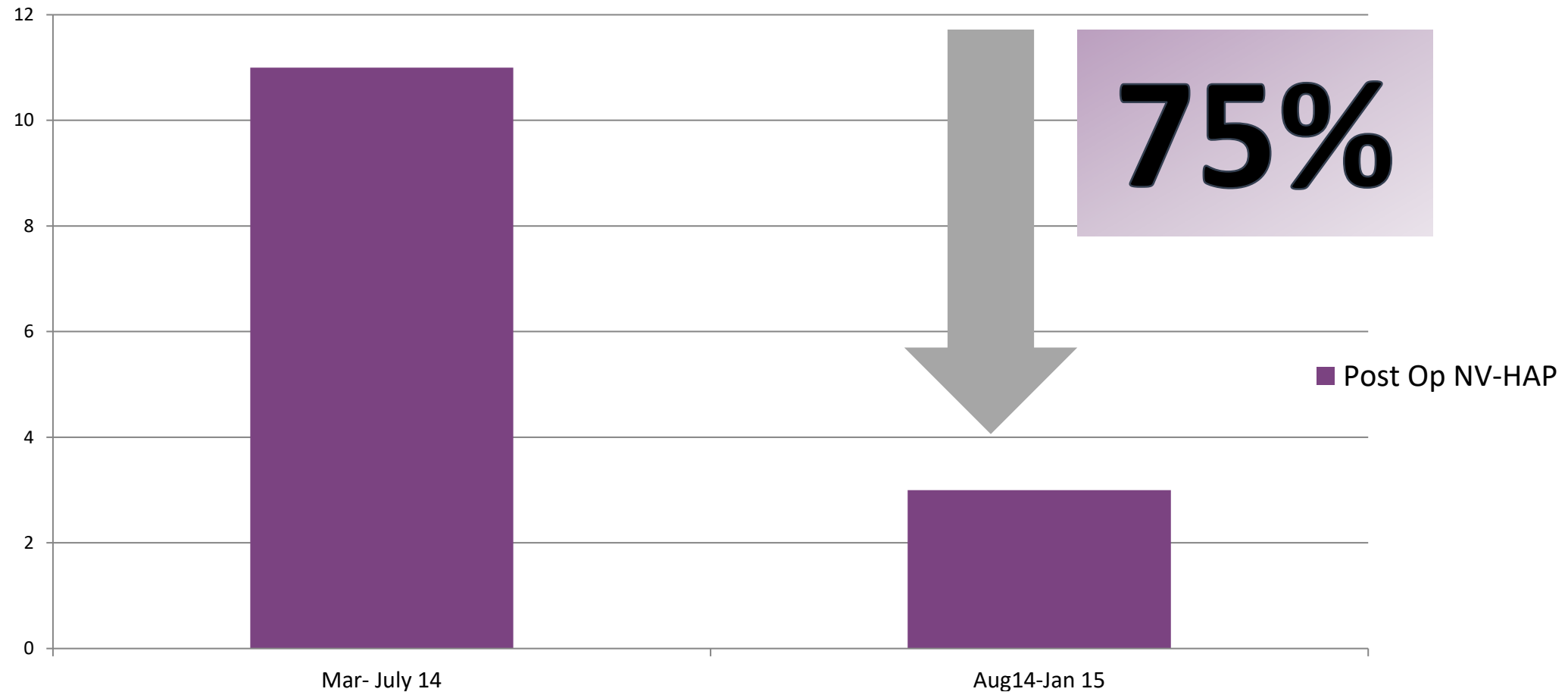
8 lives saved

PRICELESS

NV-HAP ↓ 70% from baseline!

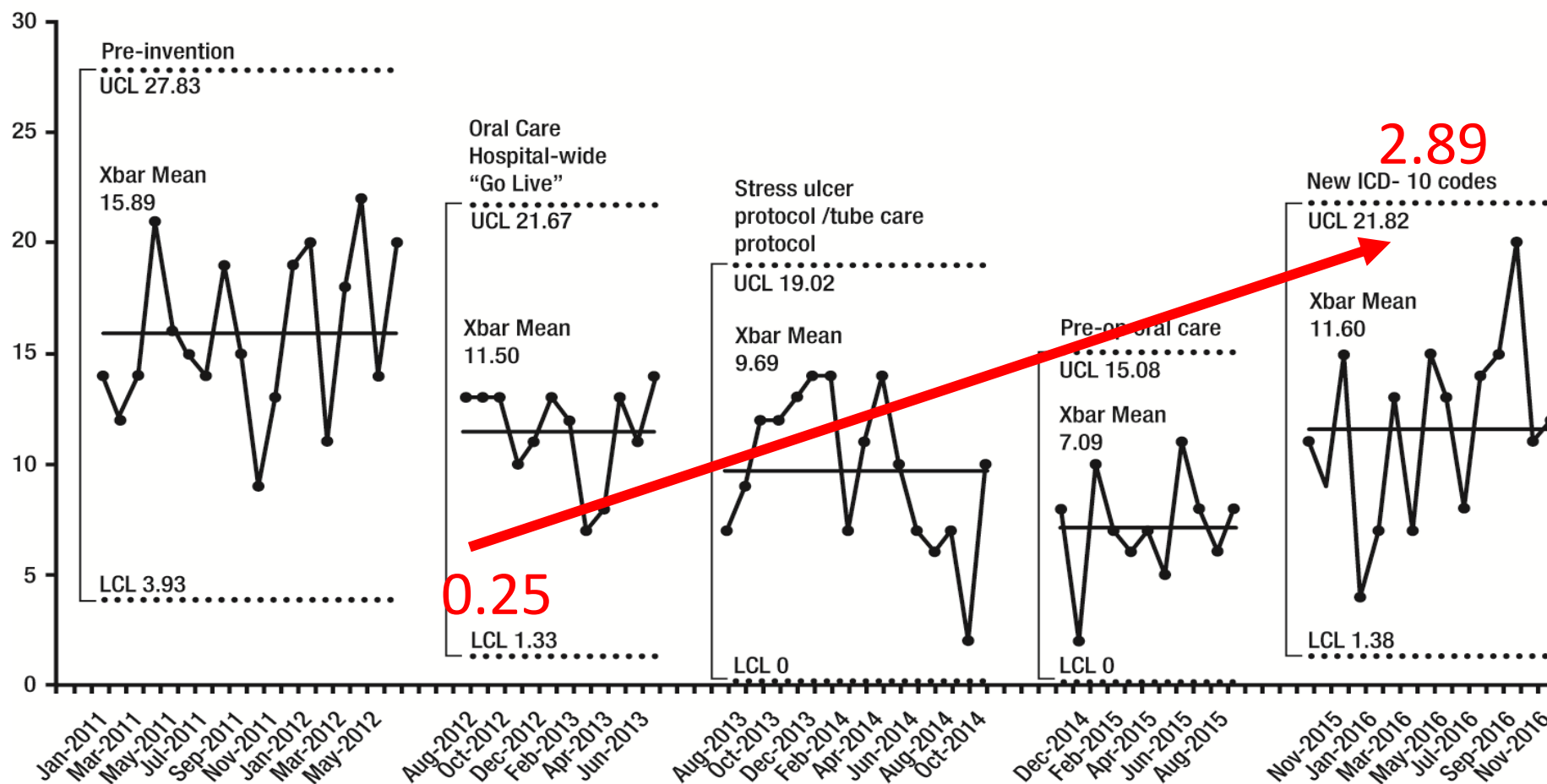


Post-Operative NV-HAP (all adult inpatient surgery) Incidence 6 months Pre-Oral Care vs. 6 Months After



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)



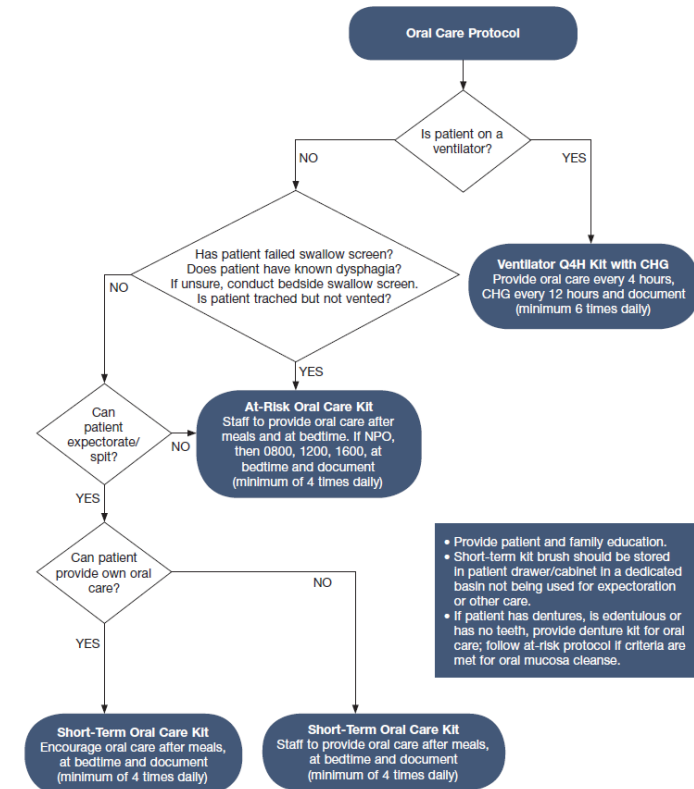
Outcomes:

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:

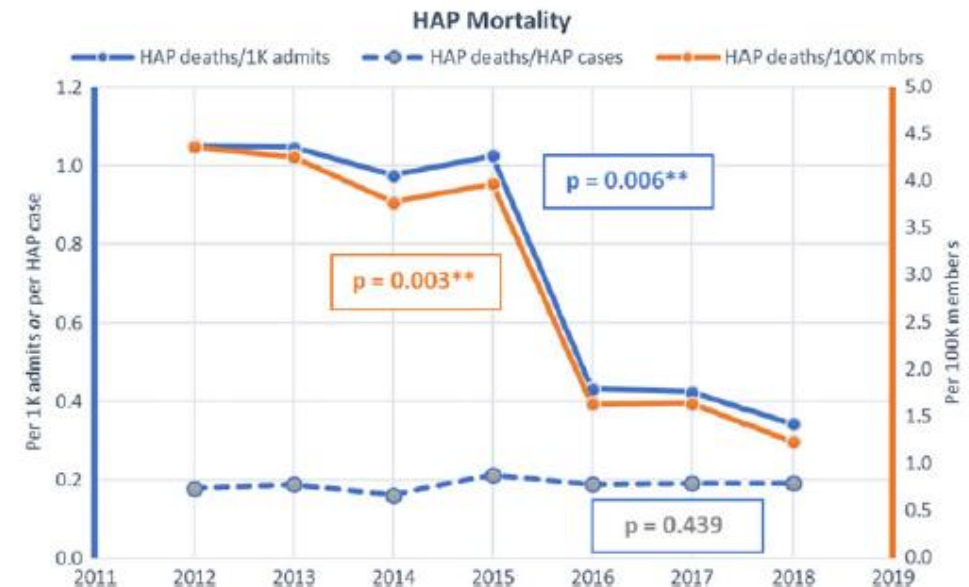
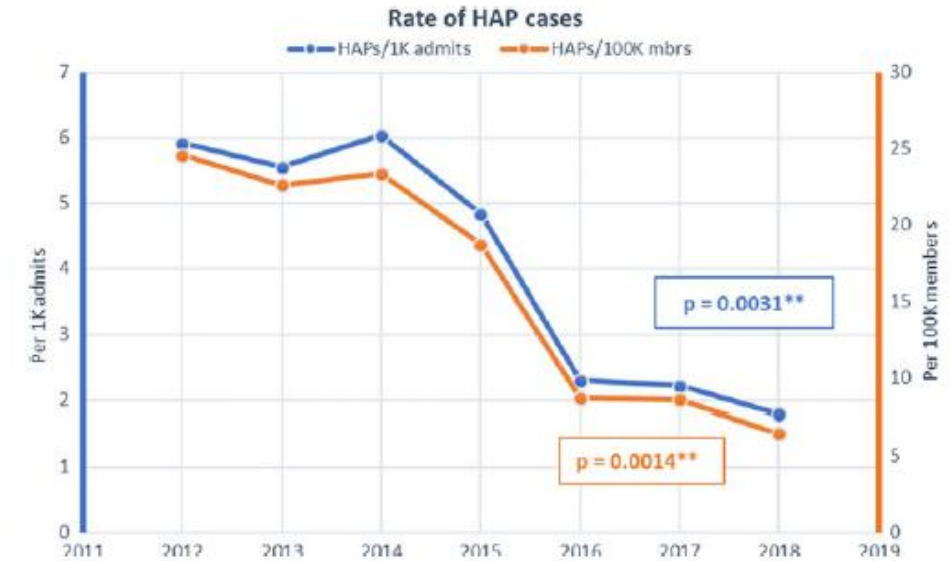
| Short-term Oral Care Kit | At-risk Oral Care Kit |
|--|--|
| Use this kit if you can: <ul style="list-style-type: none">• Swallow without difficulty• Spit without difficulty <i>Recommended for use at least four times per day, including after meals and at bedtime.</i> | Use this kit if you can: <ul 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.

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A Successful Program to ↓ NVHAP in a Large Hospital System

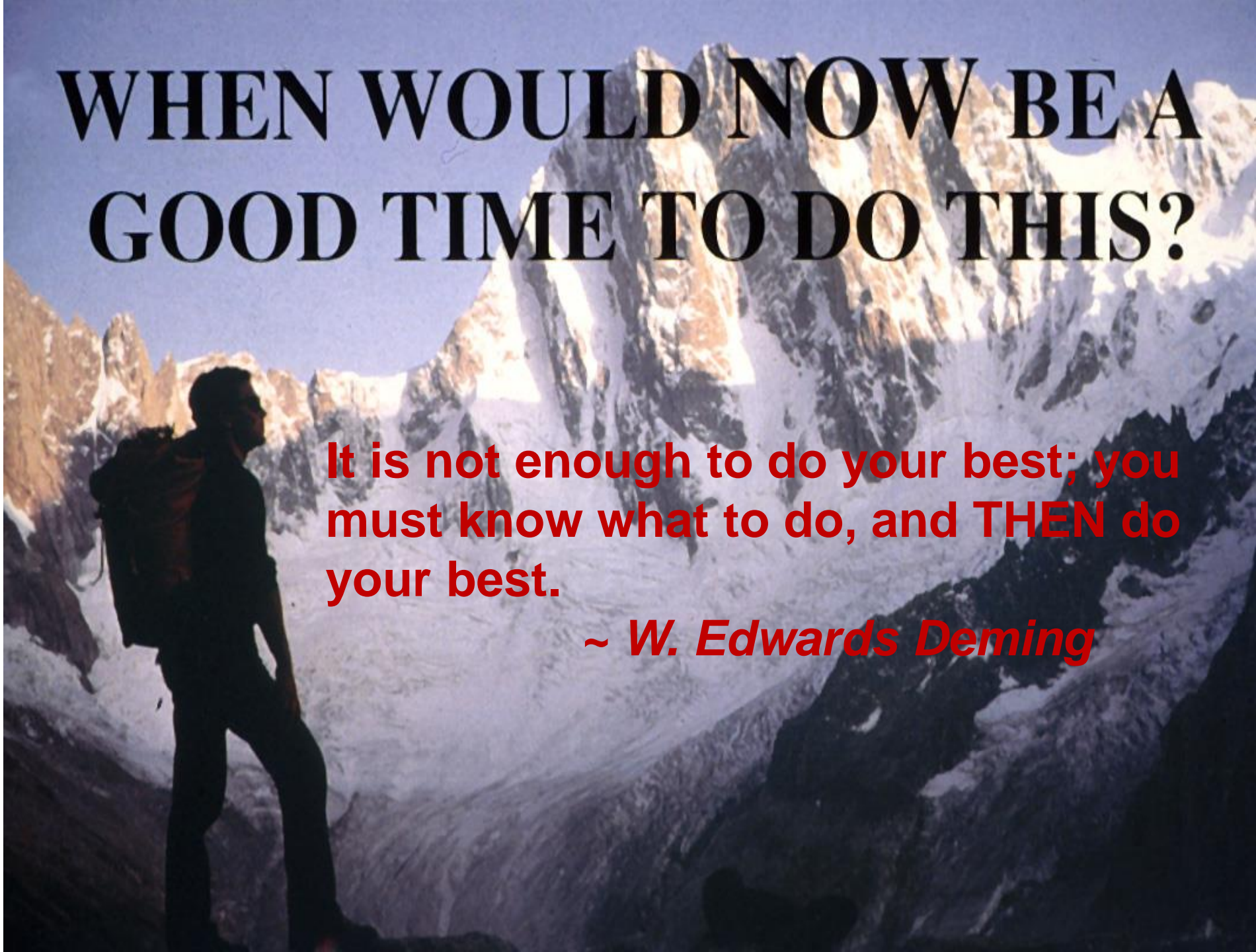
- 21 hospital system
- Longitudinal observational design
- Intervention
 - △ Upright for meals, mobilization, swallow evaluation, sedation restrictions, rigorous oral care, feeding tube care (ROUTE)
- Additional results
 - △ Reduction in antibiotic days
 - Carbapenem, quinolone, aminoglycoside & vancomycin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



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.**



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