The Next Big Adventure: Addressing the risk factors associated with Non-Ventilator Hospital Acquired Pneumonia

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Disclosures

• Consultant-Michigan Hospital Association Keystone Center
• Consultant/Faculty for CUSP for MVP—AHRQ funded national study
• Subject matter expert CAUTI, CLABSI, HAPU, Sepsis, Safety culture
• Consultant and speaker bureau
  • Sage Products a business unit of Stryker
  • Eloquest Healthcare
  • Urology Division of Medline
• Baxter 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 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

Factors Impacting the Ability to Achieve Quality Nursing Outcomes at the Point of Care

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

* IV, intravenous.

Comparison of HAI’s between 2011 and 2015 in Acute care

<table>
<thead>
<tr>
<th>HAI</th>
<th>2011- 11,282 patients</th>
<th>2015 – 12,299 patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pneumonia</td>
<td>.98%</td>
<td>.89%</td>
</tr>
<tr>
<td>CDI</td>
<td>.54%</td>
<td>.54%</td>
</tr>
<tr>
<td>SSI</td>
<td>.97%</td>
<td>.56%</td>
</tr>
<tr>
<td>BSI</td>
<td>.44%</td>
<td>.41%</td>
</tr>
<tr>
<td>UTI</td>
<td>.58%</td>
<td>.32%</td>
</tr>
<tr>
<td>GI other</td>
<td>.22%</td>
<td>.25%</td>
</tr>
</tbody>
</table>

Patients at risk for an HAI is 16% lower in 2015 versus 2011

Magill SS et al. NEJM 2014;370:1198-208
Magill SS, et al. NEJM 2018;379:1732-1744
Declines in Hospital-Acquired Conditions

National efforts to reduce hospital-acquired conditions such as adverse drug events and injuries from falls helped prevent 20,500 deaths and saved $7.7 billion between 2014 and 2017.
Non-Vent Pneumonia: Addressing Risk Factors
Build the Will: NV-HAP?

• HAP 1st most common HAI in U.S.
• Increased morbidity $\rightarrow$ 50% are not discharged home
  • Increased mortality $\rightarrow$ 18%-29%
  • Extended LOS $\rightarrow$ 4-9 days
  • Increased Cost $\rightarrow$ $28K$ to $109K$
  • 2x likely for readmission <30 day

<table>
<thead>
<tr>
<th>Study</th>
<th>Incidence/ Cases</th>
<th>Associated Mortality (%)</th>
<th>+LOS (Days)</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Davis, J. &amp; Finley E. ERIC</td>
<td>1,620</td>
<td>18.9%</td>
<td>Not queried</td>
<td>Total cost all cases $47,462,290 Per case $29,297</td>
</tr>
<tr>
<td>Penn Safety Authority (2012)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Davis, J. &amp; Finley E. (2018)</td>
<td>1,380</td>
<td>22.5%</td>
<td>* 6 years later</td>
<td>Total cost all cases $42,259,340 Per case $30,622</td>
</tr>
<tr>
<td>Still a serious patient safety issue</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Magill et al. Point Prevalence Study</td>
<td>(2014) PNA 21.8 % of all HAIs</td>
<td>PNA prevalence increased percentage of HAI cases</td>
<td>* 4 years later</td>
<td></td>
</tr>
<tr>
<td>CDC NEJM 2014, 2018</td>
<td>(2018) PNA 25%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Still a serious patient safety issue</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Micek, Chew, Hamptom &amp; Kollef (2016)</td>
<td>174 cases NV-HAP</td>
<td>15.5% vs. 1.6%</td>
<td>15.9 vs. 4.4</td>
<td></td>
</tr>
<tr>
<td>Matched controls equally sick patients</td>
<td></td>
<td>8.4 X more likely to die</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Equally sick acquire NV-HAP vs. Not</td>
</tr>
<tr>
<td>Study</td>
<td>Incidence/ Cases</td>
<td>Associated Mortality (%)</td>
<td>+LOS (Days)</td>
<td>Cost</td>
</tr>
<tr>
<td>------------------------------------------</td>
<td>----------------------------------------------------------------------------------</td>
<td>--------------------------</td>
<td>-------------</td>
<td>-------------------------------------------</td>
</tr>
<tr>
<td>See et al. (2016)</td>
<td>Retrospective review 8 hospitals in PA 2011-2012 VAP excluded 30% of 838 cases reviewed by CDC epidemiologists</td>
<td>30.9%</td>
<td></td>
<td>Note: verified that ICD data was reasonably reliable to monitoring incidence</td>
</tr>
<tr>
<td>Giuliano, Baker, Quinn (2018)</td>
<td>3.63/1,000 pt/days (overall incidence 1.6%)</td>
<td>14.5%</td>
<td>4</td>
<td>$36,400 $14.5B total vs. $1.3B VAP (2012 data)</td>
</tr>
<tr>
<td>Baker &amp; Quinn, HAPPI-2 Incidence Study (2018)</td>
<td>Nationwide study 21 hospital sample of 2014 data</td>
<td>16%</td>
<td>7.9</td>
<td>ICU utilization Readmissions Morbidity</td>
</tr>
<tr>
<td>NVHAP Impact on Medicaid Patients (DentaQuest unpublished data)</td>
<td>3.29 % vs. 0.02% VAP</td>
<td>17.9%</td>
<td>6</td>
<td>$43K /case $1.6B 10% Medicaid dollars</td>
</tr>
</tbody>
</table>
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 (2009-2011)
Results:

<table>
<thead>
<tr>
<th>YEAR</th>
<th>NO. OF NV-HAP CASES</th>
<th>NO. OF NV-HAP DEATHS</th>
<th>% OF NV-HAP CASES CONTRIBUTING TO DEATH</th>
<th>NO. OF VAP CASES</th>
<th>NO. OF VAP DEATHS</th>
<th>% OF VAP CASES CONTRIBUTING TO DEATH</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td>1,976</td>
<td>363</td>
<td>18.4 (95% CI: 16.5 to 20.3)</td>
<td>922</td>
<td>163</td>
<td>17.7 (95% CI: 15.0 to 20.5)</td>
</tr>
<tr>
<td>2010</td>
<td>1,848</td>
<td>366</td>
<td>19.8 (95% CI: 17.8 to 21.8)</td>
<td>737</td>
<td>144</td>
<td>19.5 (95% CI: 16.3 to 22.7)</td>
</tr>
<tr>
<td>2011</td>
<td>1,773</td>
<td>315</td>
<td>17.8 (95% CI: 15.8 to 19.7)</td>
<td>640</td>
<td>127</td>
<td>19.8 (95% CI: 16.4 to 23.3)</td>
</tr>
<tr>
<td>Total</td>
<td>5,597</td>
<td>1,044</td>
<td>8.7 (95% CI: 7.5 to 19.8)</td>
<td>2,299</td>
<td>434</td>
<td>8.9 (95% CI: 7.1 to 20.7)</td>
</tr>
</tbody>
</table>

Note: NV-HAP refers to nonventilator-hospital-acquired pneumonia and VAP refers to ventilator-associated pneumonia.
### Is Pneumonia Part of the Sepsis Picture?

<table>
<thead>
<tr>
<th>Site of infection</th>
<th>Frequency %</th>
<th>Mortality %</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male</td>
<td>Female</td>
</tr>
<tr>
<td>Respiratory</td>
<td>41.8</td>
<td>35.8</td>
</tr>
<tr>
<td>Bacteremia</td>
<td>21.0</td>
<td>20.0</td>
</tr>
<tr>
<td>Genitourinary</td>
<td>10.3</td>
<td>18.0</td>
</tr>
<tr>
<td>Abdominal</td>
<td>8.6</td>
<td>8.1</td>
</tr>
<tr>
<td>Device related</td>
<td>1.2</td>
<td>1.0</td>
</tr>
<tr>
<td>Wound/ soft tissue</td>
<td>9.0</td>
<td>7.5</td>
</tr>
<tr>
<td>Central nervous system</td>
<td>0.7</td>
<td>0.5</td>
</tr>
<tr>
<td>Endocarditis</td>
<td>0.9</td>
<td>0.5</td>
</tr>
<tr>
<td>Other/ unspecified</td>
<td>6.7</td>
<td>8.6</td>
</tr>
</tbody>
</table>

30-50% of sepsis cases may initiate with pneumonia.

Angus, 2013, NEJM, p.841.
NV-HAP SMCS Research Findings: 2010

24,482 patients and 94,247 patient days

**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%)

**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.

Baker D, Quinn B, Amer J of Infect Control, 2018;46:2-7
HAPPI-2 Incidence of Non-Vent Hospital-Acquired Pneumonia

Results:
• 1,300 NV-HAP (0.12-2.28 per 1,000 pt days)
  • 18.4% 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)

Baker D, Quinn B, Amer J of Infect Control, 2018;46:2-7
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
ICU-Acquired Pneumonia
VAP vs. NV-HAP

Methods:
• Prospective study of 135 consecutive episodes over 3 years of adults with ICU-acquired pneumonia
• Compared clinical and microbiological characteristics of VAP and NV-HAP

Results for VAP & NV-HAP were not statistically different:
• Pathogens,
• Comorbid conditions,
• Severity parameters,
• Mortality, and
• Hospital length of stay

Among NV-HAP patients, 79 (52%) needed subsequent intubation
Where is the Highest Risk for NV-HAP?

Rate of Nonventilator Hospital-Acquired Pneumonia

NV-HAP per 1000 patient days

Slide courtesy of Barb Quinn
Addressing the risk-factors associated with NV-HAP through evidence based fundamental nursing care strategies
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

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Formation of Biofilm Over 13 Hours

Loesche, W. 2012
http://helios.bto.ed.ac.uk/bto/microbes/biofilm.htm
Risk Factors for Oral Bacteria in the Hospital

• Poor oral health in the U.S. (CDC, 2011)
• Increased bacteria counts
  • Plaque, gingivitis, tooth decay
  • Reduced salivary flow
• 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 throughout 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

El-Solh AA. Chest. 2004;126:1575-1582
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

- **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

Micro-Aspiration During Sleep in Healthy Subjects

• Prospective duplicate full-night studies
• 10 normal males 22-55 yrs of age

• Methods:
  • Radioactive 99mTc tracer inserted into the nasopharynx
  • Lung scans conducted immediately following final awakening
  • No difference in sleep efficacy between 2 study nights

• Results:
  • 50% of subjects had tracer in the pulmonary parenchyma upon final awakening
  • No difference in age, time spent in bed, efficacy of sleep, apnea-hyponea index, arousal plus awakening index or % sleep in the supine position between subjects that aspirated and those that did not

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 (30-45 degrees)

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 32% with HOB vs. 68% supine

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
- Chronic disease
  - DM, HF, CKD, COPD, alcoholism
- Immunocompromised
- More than 6 medications
- Low albumin
- On antibiotics
- Dependent for ADLs
- Smokers

Slide courtesy of Barb Quinn
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

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)


Slide courtesy of Barb Quinn
Missed Oral Hygiene
Procedure 4: Endotracheal Tube Care and Oral Care

Authors:
Kathleen M Vollman
Mary Lou Sole
Barbara Quinn
Impact of Oral Care on HAP

**FIGURE 2.** Effects of oral care on preventing non-ventilator-associated pneumonia (non-VAP).

**FIGURE 3.** The effect of mechanical oral care on non-ventilator-associated pneumonia (non-VAP).
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

# Use of the Influencer Model

<table>
<thead>
<tr>
<th>Influencer Model</th>
<th>Motivation</th>
<th>Ability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personal</td>
<td>Patient stories</td>
<td>Education</td>
</tr>
<tr>
<td>Social</td>
<td>Compare units</td>
<td>Mentor peers</td>
</tr>
<tr>
<td>Structural</td>
<td>Measure Recognize</td>
<td>Tools</td>
</tr>
</tbody>
</table>
## Gap Analysis

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

# Protocol – Plain & Simple

<table>
<thead>
<tr>
<th>Patient Type</th>
<th>Tools</th>
<th>Procedure</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self Care / Assist</td>
<td>Brush, paste, rinse, moisturizer</td>
<td>Provide tools</td>
<td>4X / day</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Brush 1-2 minutes</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rinse</td>
<td></td>
</tr>
<tr>
<td>Dependent / Aspiration Risk</td>
<td>Suction toothbrush kit (4)</td>
<td>Package instructions</td>
<td>4X / day</td>
</tr>
<tr>
<td>Dependent / Vent</td>
<td>ICU Suction toothbrush kit (6)</td>
<td>Package instructions</td>
<td>6X / day</td>
</tr>
<tr>
<td>Dentures</td>
<td>Tools + Cleanser Adhesive</td>
<td>Remove dentures &amp; soak</td>
<td>4X / day</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Brush gums, mouth</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rinse</td>
<td></td>
</tr>
</tbody>
</table>

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

Control chart for NV-HAP
January 2010 to December 2013

Open Heart Surgery Patients: NV-HAP Reduced 75%

Oral chlorhexidine periop started
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!

Control chart for non-ventilator HAP
January 2010 to December 2014

- Oral care for all adult pts
- Documentation
- NGT standards revised
- Pharmacy starts PPI protocol
- Started oral care prior to
- Mandatory Education for Nurse Assistants

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

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

Warren C et al. AJN 2019;119(2):44-51
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
3 Steps YOU can Take to Address NV-HAP
Two Options for Measuring NV-HAP Baseline and Outcome Metric

A. International Classification of Diseases (ICD-10) for Pneumonia AND Not Present on Admission
   • J12 – 18.9 minus CAP, VAP, Pneumonitis
   • Use for tracking only

B. ICD 10 NVHAP + NHSN definition for NVHAP
   • More labor-intensive; more accurate
Metrics for NVHAP

- Percent NVHAP (#NVHAP / #patients X 100)
- NVHAP/1000 pt days (#NVHAP / # pt days X 1000)
- NVHAP Count
- No national benchmark so set internal goal
- Current literature: 1.22 – 5.9 / 1000 pt days
Future State--Objective Surveillance
Definitions for NV-HAP: Clinical Indicators in the EHR

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<tr>
<th>Definition</th>
<th>Worsening oxygenation</th>
<th>≥3 days of new antibiotics</th>
<th>Temp &gt; 38°C</th>
<th>White Blood Cell Count &lt;4 or &gt;12</th>
<th>Chest-X-Ray or CT Chest</th>
<th>Respiratory culture</th>
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Slide used with permission B. Quinn  
Klompas, et. al (2018). ID Week Poster
Process Metrics for NV-HAP (examples)

- Reducing germs in mouth:
  - Frequency of oral care delivered / per patient day
- Reducing aspiration risk:
  - % patients with swallow screens complete
  - % patients on continuous TF with HOB >30 degrees
  - % patients up in chair for meals
- Strengthen host defenses
  - % non-ICU patients with daily mobilization
  - % patients with BG 100-180
  - % patients not on stress ulcer prophylaxis
  - % patients on enteral feeding who receive >80% of ordered calories
2. GAP Analysis
3. Manage the Change

• Utilize a scientific model to provide structure
  Include:
  • Sponsorship support
  • Communication
  • Education for staff and patients/families
  • Engagement of staff
  • Feedback
  • Accountability
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.