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

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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
INTERVENTIONAL PATIENT HYGIENE (IPH)

VAP/HAP
Oral Care/Mobility
HAND
Patient
HYGIENE
Catheter Care
Skin Care/Bathing/Mobility
CA-UTI
CA-BSI
SSI
HASI


Achieving the Use of the Evidence

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

Skills & Knowledge
Resources & System
Value
Attitude & Accountability

**Why HAI's? Protecting Patients From Harm**

<table>
<thead>
<tr>
<th>Estimates: 183 Hospitals in 10 States</th>
</tr>
</thead>
<tbody>
<tr>
<td>HAI: 722,000/year</td>
</tr>
<tr>
<td>HAI-related deaths: 75,000/year</td>
</tr>
<tr>
<td>Hospitalized patients develop infection: 1 out of 25 (4%)</td>
</tr>
<tr>
<td>Death due to sepsis/septic shock: 700/day</td>
</tr>
<tr>
<td>Money spent: $45 billion/year</td>
</tr>
<tr>
<td>Increase risk of readmission: 27 days vs. 59 days</td>
</tr>
</tbody>
</table>


**Health Care Associated Infection Data**

<table>
<thead>
<tr>
<th>Measurement</th>
<th>NHSN 2012 3742 hospitals in US</th>
<th>Estimated # of Infections</th>
</tr>
</thead>
<tbody>
<tr>
<td>HAP/per 1000 patient days</td>
<td></td>
<td></td>
</tr>
<tr>
<td>VAP/per 1000 vent days</td>
<td>Range of pooled means 0.2 (Ped CVICU) -4.4 (Burn ICU)</td>
<td>49,900</td>
</tr>
<tr>
<td>CLA-BSI/per 1000 cath days</td>
<td>Range of pooled means 0.8 (CVICU)-3.4 (Burn ICU) Step-down-Ward 0.3 (Adult Rehab)-2.4 (Burn)</td>
<td>15,600</td>
</tr>
<tr>
<td>CA-UTI/per 1000 cath days</td>
<td>Range of pooled means 0.7 (Peds Surgical)-5.0 (Neuro ICU) 0.0 (Well Baby) – 4.1 (Peds rehab)</td>
<td>35,600</td>
</tr>
</tbody>
</table>

– 75% of HAI not related to devices (CAUTI, CLABSI, VAP)

• Recommendation:
  – As device-related infections decrease, expand surveillance and prevention activities to include other HAIs


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**Improvement Seen Except CAUTI’s**

• 46 percent decrease in CLABSI between 2008 and 2013
• 19 percent decrease in SSI related to the 10 select procedures tracked in the report between 2008 and 2013
• **6 percent increase in CAUTI between 2009 and 2013**
• 8 percent decrease in MRSA bacteremia between 2011 and 2013
• 10 percent decrease in C.difficile infections between 2011 and 2013

www.cdc.gov/hai/progress-report
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 |
| Frequently Missed                             | Mouth care        | Ambulation       |
|                                               | Listening         | Discharge planning|
|                                               | Being kept informed | Patient education |
| Sometimes Missed                              | Response to call lights | Medication administration |
|                                               | Response to alarms | Repositioning    |
| Raresly Missed                                | Meal assistance   | Pain medication and follow-up |
|                                               | Pain medication and follow-up | Vital signs |
|                                               | Hand washing      |                 |

*IV. Intravenous


Missed Nursing Care*

Definition: Hospital-Acquired Pneumonia

- Hospital-acquired pneumonia (HAP)
  - 48 hours
  - Meets algorithm of criteria (CDC, 2003)

- Types of HAP
  - VAP
  - NV-HAP
  - Post op pneumonia

ATS (2005)
CDC (2003)

Why NV-HAP?

- HAP 1st most common HAI in U.S.
  - Increased morbidity → 50% are not discharged back home
  - Increased mortality → 18%-29%
  - Extended LOS → 4-9 days
  - Increased Cost → $28K to $109K
  - 2x likely for readmission <30 day
- Understudied, under-addressed
- Focus has been on the other HAP → VAP
  - Surveillance not required….yet

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>NV-HAP Cases</th>
<th>NV-HAP Deaths</th>
<th>% of NV-HAP Deaths Contributing to Death</th>
<th>VAP Cases</th>
<th>VAP Deaths</th>
<th>% of VAP Deaths 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 21.7)</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>18.7 (95% CI: 17.5 to 19.8)</td>
<td>2,299</td>
<td>434</td>
<td>19.9 (95% CI: 17.1 to 20.7)</td>
</tr>
</tbody>
</table>

Note: NV-HAP refers to non-ventilated hospital-acquired pneumonia and VAP refers to ventilator-associated pneumonia.

Mortality
Incidence
Total deaths
Total cost
Wide-spread

Incidence, Prevalence of NV-HAP: A Local Study (2010)

• Purpose:
  – Determine incidence and clinical factors of NV-HAP

• Method:
  – Descriptive, quasi-experimental study using retrospective data
  – Inclusion criteria:
    • All adult discharges
    • ICD-9 codes of pneumonia not POA
    • AND met CDC definition of HAP


Hap ICD-9 Codes

<table>
<thead>
<tr>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>480.8</td>
</tr>
<tr>
<td>481</td>
</tr>
<tr>
<td>482</td>
</tr>
<tr>
<td>482.1</td>
</tr>
<tr>
<td>482.2</td>
</tr>
<tr>
<td>482.39</td>
</tr>
<tr>
<td>482.41</td>
</tr>
<tr>
<td>482.42</td>
</tr>
<tr>
<td>482.82</td>
</tr>
<tr>
<td>482.83</td>
</tr>
<tr>
<td>482.89</td>
</tr>
<tr>
<td>483.8</td>
</tr>
<tr>
<td>484.1</td>
</tr>
<tr>
<td>484.6</td>
</tr>
<tr>
<td>484.7</td>
</tr>
<tr>
<td>485</td>
</tr>
<tr>
<td>486</td>
</tr>
</tbody>
</table>
NV-HAP SMCS Research Findings: 2010

24,482 patients and 94,247 patient days

<table>
<thead>
<tr>
<th>Incidence:</th>
<th>Cost:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• 115 adults</td>
<td>• $4.6 million</td>
</tr>
<tr>
<td>• 62% non-ICU</td>
<td>• 23 deaths</td>
</tr>
<tr>
<td>• 50% surgical</td>
<td>• Mean Extended LOS 9 days</td>
</tr>
<tr>
<td>• Average age 66</td>
<td>• 1035 extra days</td>
</tr>
<tr>
<td>• Common comorbidities:</td>
<td></td>
</tr>
<tr>
<td>❖ CAD, COPD, DM, GERD</td>
<td></td>
</tr>
<tr>
<td>• Common Risk Factors:</td>
<td></td>
</tr>
<tr>
<td>❖ Dependent for ADLs (80%)</td>
<td></td>
</tr>
<tr>
<td>❖ CNS depressant meds (79%)</td>
<td></td>
</tr>
</tbody>
</table>


NV-HAP Study #1: Conclusions

- HAP is occurring in nonventilated patients
- Costing lives and dollars
- Patients are at risk on ALL units
- Preventative nursing care is missed
Preventing NV-HAP Through Evidence Based Fundamental Nursing Care Strategies

Pathogenesis → Prevention

Germs in Mouth
- Dental plaque provides microhabitat
- Bacteria replicate 5X/24 hrs

Aspirated into Lungs
- Most common route
- 50% of healthy adults micro-aspirate in sleep

Weak Defenses
- Poor cough
- Immunosuppressed
- Multiple co-morbidities
Micro Aspiration During Sleep in Healthy Subjects

- Prospective duplicate full-night studies
- 10 normal male’s 22-55 yrs of age
- Methods:
  - Radioactive \(^{99}\text{Tc}\) tracer inserted into the nasopharynx
  - Lung scans conducted immediately following final awakening
  - No difference in sleep efficacy btwn 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.


Prevention
• Comprehensive oral care
  Germs in Mouth
• Aspiration prevention strategies
  Aspirated
• Strengthen host defenses
  Weak Host

Prevent HAP

ATS Guidelines (2005)
• 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

Risk Factors for Oral Bacteria in the Hospital

Oral Cavity Response to Disease and Insult

Mobilizes defense to maintain integrity & function

If initial defense fails, the oral cavity shifts to resisting the invasions impact

If resistance fails (seen in older adults at risk)
the oral cavity succumbs

Infection
Bleeding & Inflammation
Pain
Difficulty Eating & Communicating

Significant Independent Predictors of Aspiration Pneumonia

- Dependant for feeding
- Dependant for oral care
- Number of decayed teeth
- Tube feeding
- Multiple medical diagnoses
- Number of medications
- Dry mouth
- Smoking

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 VAP’s 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

Munro CL & Grap MJ. AJCC. 2004;13:25-34
Formation of Biofilm Over 13 Hours

Loesche, W. 2012

• Method
  – Quasi-experimental, comparative study
  – Adults, acute Neuroscience unit Western Canada
  – 51 retrospective patients – standard oral care
  – 34 prospective patients – enhanced oral care

• Results
  – Statistically significant decrease in NV-HAP (p<0.05)

Oral Intensity: Reducing NV-HAP in Neuro Impaired Patients

Impact of Oral Care on HAP

Phase 2:
Could NV-HAP be decreased simply brushing the patient’s teeth?

Nine out of ten dentists recommend brushing your teeth.
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><strong>Personal</strong></td>
<td>Patient stories</td>
<td>Education</td>
</tr>
<tr>
<td><strong>Social</strong></td>
<td>Compare units</td>
<td>Mentor peers</td>
</tr>
<tr>
<td><strong>Structural</strong></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 Brush 1-2 minutes Rinse</td>
<td>4 X / day</td>
</tr>
<tr>
<td>Dependent / Aspiration Risk</td>
<td>Suction toothbrush kit (4)</td>
<td>Package instructions</td>
<td>4 X / day</td>
</tr>
<tr>
<td>Dependent / Vent</td>
<td>ICU Suction toothbrush kit (6)</td>
<td>Package instructions</td>
<td>6 X / day</td>
</tr>
<tr>
<td>Dentures</td>
<td>Tools + Cleanser Adhesive</td>
<td>Remove dentures &amp; soak Brush gums, mouth Rinse</td>
<td>4X / day</td>
</tr>
</tbody>
</table>
Patient and family education part of daily nursing care

Did You Know
The best way to prevent pneumonia is through good oral care. Sutter Medical Center, Sacramento is working to reduce the number of infections through effective use of new oral care tools:
- Toothpaste with baking soda that removes plaque
- Antiseptic oral rinse that kills germs that cause pneumonia
- A soft toothbrush that won’t harm sensitive gums

Our nursing staff are working to educate patients and families about the proper methods to prevent pneumonia.

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%)

Frequency of Oral Care:
Increased in the ICU

Frequency of Oral Care for Non-vented patients in the ICU ↑ 300%
Mean Frequency of Oral Care in Relationship to NV- HAP

Oral Care Frequency Per 24 Hours – All Units
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%

4N OHS

Oral chlorhexidine periop started
Rate of NV-HAP 2010-2013

- 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

12 lives saved

PRICELESS
HAP Significant Trend Downward
Jan 2010-June 2014

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

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

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
Driving Change

- Gap analysis
- Build the Will
- Protocol Development

Structure

+ 

Process

Outcomes

- Make it Prescriptive
- Overcoming barriers
- Daily Integration

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.