What is your hospital doing about the #1 hospital-acquired infection?

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Shannon Munro, PhD, APRN, BC, NP
Karen K. Giuliano, PhD, RN, FAAN, MBA
The story of May and how we began this journey

• May is a 57 year old grandmother who develops non-ventilator associated hospital acquired pneumonia (NV-HAP)

• *Why does this keep happening?*

Photo from: Internet source: Emma Winn Healthy Elderly
http://www.fhms.surrey.ac.uk/nutritionandbone/swiss.html
We knew VAP was a problem –

But what about NV-HAP?

Is it a problem too?

Our story led to questions and research
How much non-ventilator pneumonia was occurring in the hospital? Why was no one talking about it?

• Was it happening in other hospitals?

• If so, who was “at-risk”?

• Can it be prevented? How?
#1: Hospital-Acquired Pneumonia (non-vent most of the cases)
<table>
<thead>
<tr>
<th>Study</th>
<th>Incidence/ Cases</th>
<th>Associated Mortality</th>
<th>+LOS</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Davis &amp; Finley (2012)</td>
<td>5,600 /3 yrs</td>
<td>18.9%</td>
<td>Not queried</td>
<td>$28,000</td>
</tr>
<tr>
<td>Giuliano Baker Quinn (2018)</td>
<td>2/100 pts</td>
<td>14.5%</td>
<td>4 days</td>
<td>$36,400</td>
</tr>
<tr>
<td>2012 HCUP National database (AHRQ)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Magill et al. CDC Point Prevalence</td>
<td>2011 - PNA 22 % of all HAIs</td>
<td></td>
<td></td>
<td>$40,000</td>
</tr>
<tr>
<td>2015 - #1 25% 1 in 4 hospital infections</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Micek, Chew, Hamptom &amp; Kollef (2016)</td>
<td>174 cases NV-HAP Matched controls equally sick</td>
<td>15.5%vs. 1.6%</td>
<td>15.9 days vs. 4.4</td>
<td></td>
</tr>
<tr>
<td>See et al. (2016)</td>
<td>Retrospective review 8 hospitals in PA</td>
<td>30.9%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2011-2012 VAP excluded</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>30% of 838 cases reviewed by CDC epidemiologists</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Magill, et.al. (2014) NEJM. 370(13), p 1198-1208
See, et. al. (2016). ICHE, 37, 818-824 doi:10.1017/ice.2016.74
### Pneumonia and Sepsis

(Mayr et al, 2014, Virulence)

<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>

50% of sepsis cases initiate as pneumonia (Angus, 2013, NEJM, p.841)
**NOT ON YOUR DASHBOARD:**
What HAIs are you working on right now?

<table>
<thead>
<tr>
<th>Type</th>
<th>% Prevalence</th>
<th>% Associated Mortality</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAUTI</td>
<td>13%</td>
<td>1.5%</td>
<td>$1,108</td>
</tr>
<tr>
<td>CLABSI</td>
<td>5-10%</td>
<td>12%</td>
<td>$33,618</td>
</tr>
<tr>
<td>SSI</td>
<td>22%</td>
<td>3%</td>
<td>$19,305</td>
</tr>
<tr>
<td>HAP</td>
<td>25% (2015 data)</td>
<td>19%</td>
<td>$40,000</td>
</tr>
</tbody>
</table>

Magill et.al. (2014) CDC’s Point Prevalence Study US HAI: NEJM. 370(13), p 1198-1208
Centers for Disease Control and Prevention

- Included for the first time in its top TEN public health concerns:

  Healthcare-associated infections
  #1 Hospital-acquired pneumonia
  1 in 4 hospital-acquired infections

PHOTO: www.cdifffoundation.org

CDC (2015) Prevention Status Report
How can non-ventilator hospital-acquired pneumonia be prevented?
Most Hospital Acquired Pneumonia Starts in the Mouth

Microbiome of Oral Cavity
- 200 billion oral microbes
- 700 -1000 species

**Disruption of Microbiome**
- Risk with hospitalization
- Changes in saliva pH and production

- 48 hours for HAP pathogens in mouth
  - *If aspirated = 100,000,000 bacteria/mL saliva into lungs*

**PLUS – MICROASPIRATIONS**

http://helios.bto.ed.ac.uk/bto/microbes/biofilm.htm / Loesche, W. 2012/
Why might NV-HAP by the “bigger beast”? 

Photo: http://www.molartron.com/super-heroes/bristle-beast/
“Identify the most modifiable risk factors and develop prevention programs to address them.” (CDC, 2003)

- **SOURCE CONTROL:**
  - Reduce harmful pathogens - Comprehensive oral care *applies to all patients/most modifiable*

- **Reduce aspiration with:**
  - Swallow evaluation
  - HOB elevated
  - Tube Care

- **Increase host resistance with:**
  - Early mobility  Keep patients warm during surgery
  - Pulmonary toilet  Stabilize glucose
  - Limit use of acid suppressive meds

Prevent HAP
Daily Host Protection is Challenging

I think you should be more specific here in step two.

Then a miracle occurs...

Photo: http://cafehayek.com/2014/03/then-a-miracle-occurs.html
Missed Prevention Opportunities = Missed Nursing Care

**ELEVATED HOB**
- Missed: 34%
- Achieved: 66%

**MOBILITY**
- Missed: 59%
- Achieved: 41%

**ORAL CARE**
- Missed: 73%
- Achieved: 27%

**IS/C&DB**
- Missed: 84%
- Achieved: 16%
A Pneumonia Prevention Story
From the field:
Barbara Quinn RN, MS, ACNS-BC,
Incidence of NV-HAP:
(2012 used 2010 data)

*similar results from Kaiser and the VA*

- Sutter Medical Center:
  - 24,482 patients; 94,247 patient days
  - 115 NV-HAP
  - 1 NV-HAP/125 patients
  - Most on Med/Surg Units
  - This served as our baseline data

- Estimated cost in one year:
  - $4.6 million
  - 23 deaths
  - 1035 days

How We Addressed NV-HAP & Post-Op Pneumonia at our facility

Select Interventions based on Gap Analysis findings & best available evidence-based practices

Measure baseline NV-HAP/ Process rates oral care

Gather an interdisciplinary team

Use a scientific implementation and change model - IHI QI process and Influencer Model™ Vital Smarts

Use

Measure

Gather

Select
1. Focus on one intervention at a time, beginning with the most modifiable risk factors.
2. Monitor process and outcome measures; calculate return on investment (ROI).
3. Provide feedback to staff, patients, and leadership.
4. Celebrate and share your successes.

Process for Change
<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 physician 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>Upgraded tools and supplies.</td>
</tr>
</tbody>
</table>

SHEA = Society for Healthcare Epidemiology of America  
CDC = Centers for Disease Control & Prevention  
ADA = American Dental Association  
IHI = Institute for Healthcare Improvement
American Dental Association approved
Oral Care Protocol

<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>4 X / day</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Brush 1-2 minutes, rinse</td>
<td></td>
</tr>
<tr>
<td>Dependent / Aspiration Risk / Non-vent</td>
<td>Suction toothbrush kit (4)</td>
<td>Brush 1-2 minutes, suctioning as needed, Apply moisturizer</td>
<td>4 X / day</td>
</tr>
<tr>
<td>Dependent / Vent</td>
<td>ICU Suction toothbrush kit (6) CHG</td>
<td>Brush/swab 1-2 minutes, suctioning as needed, Apply moisturizer</td>
<td>6 X / day CHG 2X / day</td>
</tr>
<tr>
<td>Dentures</td>
<td>Tools + Cleanser Adhesive</td>
<td>Brush dentures with warm water after each meal, Brush/swab gums, mouth. Remove dentures and soak at night.</td>
<td>4X / day</td>
</tr>
</tbody>
</table>
Acknowledgement: Thank you to Dr. Richard Scoville for his assistance with our Control Charts.
Post operative NV-HAP (all adult inpatient surgery)
Incidence 6 months pre oral care vs. 6 months after

Mar- July 14 vs Aug14-Jan 15

75%
Return on investment:
What does pneumonia prevention mean?

• Between May 2012 and December 2014
• we avoided 164 cases of NV-HAP
  • 31 lives saved
  • $5.9 million not spent
  • 656-1476 hospital days avoided
What is the VA doing about NV-HAP?
Shannon Munro, PhD, APRN, BC, NP
Nurse Researcher
VA Medical Center, Salem, Virginia
50 beds: 2 geriatric long term care units, 63 cases prevented at average cost of $40,000 each; note the mean is combined for both units.
5 Month Est. Post-intervention Savings=$120,000

44 beds: Medical surgical units
Houston VAMC Chosen as 2\textsuperscript{nd} VA Implementation Site

\textbf{NV-HAP down 100\% from baseline, $480,000 and 2 lives saved, February-July 31, 2017}

45 beds: Houston VAMC CCU and 3D SDU
National Implementation Toolkit

Preventing Non-Ventilator Associated Hospital-Acquired Pneumonia (NV-HAP) by Engaging Nurses to Complete Inpatient Oral Care
Sharing the Message

A message for Veterans and Families: https://bcove.video/2yIDPFw
A message for VA Clinicians: https://bcove.video/2xivuXG
Did you know that brushing your teeth can prevent many health problems including pneumonia?

Oral health is an important part of your overall health. In your own mouth, you may have noticed that rough, fuzzy, or unclean feeling if you don’t brush your teeth. This is from plaque—a sticky film that builds up on the surfaces of your teeth and contains billions of germs. The germs found in plaque feed on the sugar in foods you eat.

Germs in your mouth can make your gums red, swollen, and infected. Germs can also cause tooth decay (cavities), gum disease, and even pneumonia.

The germs in your mouth multiply five times every 24 hours and are frequently swallowed into your lungs during sleep. When you swallow these germs into your lungs, they can cause pneumonia. Regular tooth brushing lowers the number of germs in your mouth and the risk of developing pneumonia by 30%.

What is pneumonia?

Pneumonia is a serious infection of the lungs, in which oxygen has trouble reaching your blood, causing your body’s cells to not work properly. A person with pneumonia might find it harder to breathe, especially if the pneumonia affects both lungs. The most common cause of pneumonia is bacteria (germs).

Most patients with pneumonia experience fever, chills, cough, chest pain, and shortness of breath. Some patients also experience headache, low energy, loss of appetite, and confusion.

Patients who develop pneumonia in the hospital often have to stay 10-14 days longer. Additionally, 40% of Veterans who develop pneumonia while in the hospital are discharged to a long-term facility for additional care.

If you have any questions or concerns about pneumonia and how brushing your teeth can help, consult your health care team.

What can you do to prevent pneumonia?

Brushing your teeth at least twice a day—after meals and before bedtime—will keep you healthier and reduce your chances of developing pneumonia. This will also help you leave the hospital sooner.

Be sure to brush your teeth gently and thoroughly to remove plaque and germs, trying not to miss any areas as you brush. Your nurse can help you with this! Keep in mind that it’s not how hard you brush that matters.

Be sure to continue brushing your teeth twice a day once you are at home. Use a toothbrush that is soft with flexible bristles. Soft bristles can flex and are gentle on delicate gum tissue surrounding the teeth. Use a small amount of fluoride toothpaste, about the size of a pea. If you are unable to use toothpaste, we recommend brushing your teeth with tap water alone.

A worn out toothbrush does not remove plaque effectively. Toothbrushes should be replaced about every 3 months or sooner, before bristles look bent, worn, or frayed.

DID YOU KNOW?

During sleep, mouth germs are frequently swallowed into the lungs and can cause pneumonia.

Brushing your teeth lowers your chances of developing hospital-acquired pneumonia by 30%.

Brushing your teeth at least twice a day will keep you healthier and help you leave the hospital sooner by preventing pneumonia.

Healthy Mouth. Healthy Body.

During sleep, mouth germs are frequently swallowed into the lungs and can cause pneumonia.

Brushing your teeth lowers your chances of developing hospital-acquired pneumonia by 30%.

Brushing your teeth at least twice a day will keep you healthier and help you leave the hospital sooner by preventing pneumonia.
Next steps: Surveillance and gap analysis

Pneumonia

• Measuring population health in your hospitals – surveillance
• ICD codes (See et al study found ICD codes to be reliable in PA hospitals)
• CDC definition
• Point prevalence surveys for quality checks and monitoring
• Monitor for changes in external and internal forces that may impact data

Process Measures

• Check EHRs – may not have basic care data points for assessments and daily care
• Equipment use (oral care supplies, etc.)
• Perioperative checklists & flow sheets
Education is not enough

- Evaluate current practices including input from nurses, physicians, infection control, speech therapists, occupational therapists & dentists.
- Simplify standard operating procedures.
- Assure effective oral care supplies are readily available.
- Share evidence: educate patient, family, & staff.
- Actively monitor & celebrate progress and successes.
HAP #1 hospital-acquired infection, costing patient lives and dollars (NV-HAP 60%)

NV-HAP can be prevented and harm to patients reduced

Monitoring for NV-HAP and prevention programs must rise to the same level of attention as other hospital-acquired infections.
Questions ??

One must always be aware, *to notice*, even though the cost of noticing is to become responsible.

*Thylias Moss*