Healthcare-Associated Infections Across the Spectrum of Care

Susan E. Coffin, MD, MPH
UPENN School of Medicine, Department of Pediatrics
Medical Director, Infection Prevention and Control
Children’s Hospital of Philadelphia
Part 3: Prevention of Healthcare-Associated Infections in Long Term Care Facilities
Objectives

1. Understand the burden and spectrum of healthcare-associated infections across the spectrum of care.
2. Review the epidemiology of the most common hospital-associated infections.
3. Examine how to prevent common causes of healthcare-associated infections in long-term care facilities.
4. Identify the risk for healthcare-associated infections in ambulatory care settings.
Long-term Care in the U.S.

- Long-term care facilities (LTCF) include
  - Nursing homes
  - Skilled nursing facilities
  - Rehabilitation centers

- Residential facility that provides nursing and other care for people who cannot be served in community setting
  - Chronic conditions or recovery from acute conditions

- 1 in 4 Americans will spend time in a nursing home
  - At any given time, 1.5 million Americans in LTCF’s
HAI Risk for Patients in LTCF

• Risks similar to patients in acute care hospitals
  – Advanced age/impaired immune system
  – Comorbid conditions
  – Early hospital discharges
• Challenges to basic hygiene
  – Cognitive deficits
  – Blurring of home and medical care settings
• Large reservoir of antibiotic-resistant organisms
• Use of medical devices
  – 5% of patients have urinary catheters
  – Approximately half of facilities provide infusion therapies
# Common HAI in LTCF

<table>
<thead>
<tr>
<th>RESPIRATORY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Influenza</td>
</tr>
<tr>
<td>Aspiration pneumonia</td>
</tr>
<tr>
<td>Tuberculosis</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>GASTROINTESTINAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Norovirus</td>
</tr>
<tr>
<td>Food-borne illness</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>OTHER</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAUTI</td>
</tr>
<tr>
<td>Methicillin-resistant <em>Staph aureus</em></td>
</tr>
<tr>
<td>Vancomycin-resistant <em>Enterococcus</em></td>
</tr>
</tbody>
</table>
# Common HAI in LTCF

<table>
<thead>
<tr>
<th>RESPIRATORY</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Influenza</td>
</tr>
<tr>
<td></td>
<td>Aspiration pneumonia</td>
</tr>
<tr>
<td></td>
<td>Tuberculosis</td>
</tr>
<tr>
<td>GASTROINTESTINAL</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Norovirus</td>
</tr>
<tr>
<td></td>
<td>Food-borne illness</td>
</tr>
<tr>
<td>OTHER</td>
<td></td>
</tr>
<tr>
<td></td>
<td>CAUTI</td>
</tr>
<tr>
<td></td>
<td><em>Methicillin-resistant Staph aureus</em></td>
</tr>
<tr>
<td></td>
<td>Vancomycin-resistant <em>Enterococcus</em></td>
</tr>
<tr>
<td>Reservoir</td>
<td>Transmission</td>
</tr>
<tr>
<td>-----------</td>
<td>--------------</td>
</tr>
<tr>
<td>HCW &gt;&gt; Patients &gt;&gt; Visitors</td>
<td>Respiratory droplets</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>INFLUENZA Resistant Organisms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients &gt;&gt; HCW</td>
</tr>
<tr>
<td>Direct and indirect contact</td>
</tr>
</tbody>
</table>

**Interventions**
- Hand hygiene and respiratory etiquette
- HCW vaccination
- Visitor screening
- Patient vaccination, surveillance, cohorting
- Hand hygiene
- Environmental cleaning
- Judicious use of antibiotics
What is Surveillance?

Surveillance (sərˈveɪ.əns or sərˈveɪələns):

the monitoring of behavior, activities, or other changing information, usually of people for the purpose of influencing, managing, directing, or protecting.
Surveillance

A different model for surveillance may be needed due to limited staffing of infection control programs and nature of care provided

- Weekly “walk rounds”
- Syndromic surveillance >> lab surveillance
- Chart reviews, staff interviews, antibiotic use

Select surveillance targets based on population’s risk, current trends, and emerging threats
Using Surveillance Data

- Monitor quality of care
- Educate staff
- Early detection of outbreaks
- Assess impact of interventions

**LTCF A – Priority HAI**

- Influenza
- CAUTI
- MRSA

Infections per 1000 patient days

<table>
<thead>
<tr>
<th>Quarter</th>
<th>Infections</th>
</tr>
</thead>
<tbody>
<tr>
<td>3Q2009</td>
<td>1</td>
</tr>
<tr>
<td>4Q2009</td>
<td>2</td>
</tr>
<tr>
<td>1Q2010</td>
<td>3</td>
</tr>
<tr>
<td>2Q2010</td>
<td>4</td>
</tr>
<tr>
<td>3Q2010</td>
<td>5</td>
</tr>
<tr>
<td>4Q2010</td>
<td>6</td>
</tr>
<tr>
<td>1Q2011</td>
<td>7</td>
</tr>
<tr>
<td>2Q2011</td>
<td>6</td>
</tr>
<tr>
<td>3Q2011</td>
<td>5</td>
</tr>
<tr>
<td>4Q2011</td>
<td>4</td>
</tr>
<tr>
<td>1Q2012</td>
<td>3</td>
</tr>
<tr>
<td>2Q2012</td>
<td>2</td>
</tr>
</tbody>
</table>
Using Surveillance Data

Influenza

Infections per 1000 patient days


Influenza
Using Surveillance Data

**Influenza**

Infections per 1000 patient days

- 3Q2009
- 4Q2009
- 1Q2010
- 2Q2010
- 3Q2010
- 4Q2010
- 1Q2011
- 2Q2011
- 3Q2011
- 4Q2011
- 1Q2012
- 2Q2012

- Influenza
Using Surveillance Data

Influenza

Infections per 1000 patient days

- 3Q2009
- 4Q2009
- 1Q2010
- 2Q2010
- 3Q2010
- 4Q2010
- 1Q2011
- 2Q2011
- 3Q2011
- 4Q2011
- 1Q2012
- 2Q2012

Influenza
Using Surveillance Data

Influenza

Infections per 1000 patient days

What happened???
Using Surveillance Data

Influenza

What happened???
HCW FLU VACCINATION
Using Surveillance Data

MRSA

What needs to happen???
Preventing Spread of Multi-Drug Resistant Organisms (MDRO)

Knowledge of reservoirs and modes of transmission can guide interventions

• Hands

• Environment

• Other patients
Preventing Spread of MDRO

Knowledge of reservoirs and modes of transmission can guide interventions

- Hands → Hand Hygiene Campaign
- Environment
- Other patients
Preventing Spread of MDRO

Knowledge of reservoirs and modes of transmission can guide interventions

- Hands → Hand Hygiene Campaign
- Environment → Re-education of Environmental Services Staff
- Other patients
Preventing Spread of MDRO

Knowledge of reservoirs and modes of transmission can guide interventions

- Hands → Hand Hygiene Campaign
- Environment → Re-education of Environmental Services Staff
- Other patients → Above + ??Cohorting
### Why do We Need to Talk About Hand Hygiene:

<table>
<thead>
<tr>
<th>Year of Study</th>
<th>Adherence Rate</th>
<th>Hospital Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>1994</td>
<td>29%</td>
<td>General and ICU</td>
</tr>
<tr>
<td>1995</td>
<td>41%</td>
<td>General</td>
</tr>
<tr>
<td>1996</td>
<td>41%</td>
<td>ICU</td>
</tr>
<tr>
<td>1998</td>
<td>30%</td>
<td>General</td>
</tr>
<tr>
<td>2000</td>
<td>48%</td>
<td>General</td>
</tr>
</tbody>
</table>
Impact of appropriate hand hygiene
### Survival of Resistant Organisms on Fomites

#### Table 1. Duration of Survival of 2 Strains of Methicillin-Resistant *Staphylococcus aureus* (MRSA) and 1 Strain of Methicillin-Susceptible *S. aureus* (MSSA) on Hospital Fomites

<table>
<thead>
<tr>
<th>Fomite</th>
<th>MRSA 1</th>
<th>MRSA 2</th>
<th>MSSA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plastic chart</td>
<td>11</td>
<td>&gt;12</td>
<td>&gt;12</td>
</tr>
<tr>
<td>Plastic laminate tabletop</td>
<td>9</td>
<td>11</td>
<td>12</td>
</tr>
<tr>
<td>Polyester cloth curtain</td>
<td>9</td>
<td>8</td>
<td>&gt;14</td>
</tr>
</tbody>
</table>

Huang et al, ICHE, 2006
The Inanimate Environment Can Facilitate Transmission

X represents VRE culture positive sites

~ Contaminated surfaces increase cross-transmission ~

When to Do Hand Hygiene

1. Before touching a patient
2. Before clean/aseptic procedure
3. After body fluid exposure risk
4. After touching a patient
5. After touching patient surroundings
Self-reported factors for poor adherence with hand hygiene

- Handwashing agents cause irritation and dryness
- Sinks are inconveniently located/lack of sinks
- Lack of soap and paper towels
- Too busy/insufficient time
- Understaffing/overcrowding
- Patient needs take priority
- Low risk of acquiring infection from patients
HCW Vaccination against Influenza

• Decreases HCW influenza infection →
  – HCW absenteeism
  – Secondary infections among HCW’s household contacts

• Especially important in facilities that care for large numbers of susceptible patients
  – Long-term care facilities
  – Pediatric centers
  – Specialty centers (oncology)

• Optimal level of HCW vaccination unknown but likely related to proportion of vaccinated staff and patients
Vaccination reduces the rate of nosocomial influenza

- Observational study at University of Virginia hospital

- Over 13 seasons

- Increasing vaccination rate among HCW associated with reduced proportion of nosocomial influenza (32% in 1987-88 to 3% in 1998 -99)
Direct Benefits of HCW Vaccination

FIGURE 1. Percent of reduction in noted outcomes in healthcare workers receiving influenza vaccination.\textsuperscript{35-39} The two bars noting reductions in patient mortality data after healthcare worker vaccination reflect data from two separate studies.\textsuperscript{36,37} All values were statistically significant when compared with those for unvaccinated control healthcare workers (\(P < .05\)).

Talbot, ICHE, 2005
Improving HCW Vaccination Rates: Strategies that work

• Education
  – Risks of disease
  – Vaccine safety and efficacy
• Improving access to vaccine
  – Mobile carts
  – Walk-in clinics, after-hours clinics
• Expanding responsibility
  – Vaccine deputies
  – Charge nurses as educators

FIGURE 1. Pediatric Prevention Network poster encouraging influenza immunization for healthcare workers.