Infection Prevention During Healthcare Construction

FCIA Conference
San Francisco, Ca.
April 29, 2010

University of California - Irvine Healthcare
Objectives

Gain an understanding of:

- how an infection may occur during healthcare construction
- the infection risk assessment process
- design choices and means/methods of construction to help prevent infections
Background

- 1.7 Million HAIs in U.S. hospitals each year
- 99,000 deaths caused by HAIs each year
- Infections & deaths linked to organisms transmitted due to construction and maintenance activity well documented in the medical literature

Tampa Tribune: February 4, 2009

• 3 young leukemia patients die after stay at St. Joseph’s Hospital in Tampa, FL.
• Children were on floor above location of construction work
• Lawsuit notes children were moved around the hospital campus for various treatments
• Claim the children were not protected from spores released during construction
• All 3 died from aspergillus infection

Mathew Gliddon, Age 5: Died April 16,
The Chain of Infection

Agent

Susceptible Host

Portal of Entry

Mode of Transmission

Reservoir

Portal of Exit
Swiss Cheese Model of Accident Causation

(After Reason)
Infectious Agents: The Culprit
How might an infection occur during construction activity?
The Chain of Infection: Agent
The Chain of Infection: Reservoir

Agent

Susceptible Host

Portal of Entry

Mode of Transmission

Reservoir

Portal of Exit
The Chain of Infection: Portal of Exit

- Agent
- Reservoir
- Portal of Entry
- Portal of Exit
- Mode of Transmission
- Susceptible Host
The Chain of Infection: Mode of Transmission

- Agent
- Reservoir
- Portal of Entry
- Portal of Exit
- Susceptible Host
- Mode of Transmission
The Chain of Infection: Portal of Entry

- Agent
- Reservoir
- Susceptible Host
- Portal of Entry
- Portal of Exit
- Mode of Transmission
The Chain of Infection: Susceptible Host

- Agent
- Susceptible Host
- Portal of Entry
- Mode of Transmission
- Portal of Exit
- Reservoir
21 cases of Invasive Aspergillosis (IA)

- High-risk oncology unit
- Unit became depressurized
- Adjacent construction occurring
- Positive environmental samples matched patients
- Six patients died

Thio, CL, et al. Refinements of Environmental Assessment During an Outbreak Investigation of Invasive Aspergillosis in a Leukemia and Bone Marrow Transplant Unit. Inf Control and Epidemiology, Vol 121, Jan 2000, 18-23.
What process is used to assess risk during healthcare construction to help prevent infections?
Terms

- ICRA: Infection Control Risk Assessment
- ICRMRs: Infection Control Risk Mitigation Measures
Requirements

- ICRA and ICRMRs required by the Joint Commission
- Included in FGI Guidelines
- Recommended by CDC Environmental Guideline
Teamwork
ICRA During Project Phases

**Planning**
- Considering broad functionality & space use
- ID populations at risk, consider relocation plan

**Schematic Design**
- Plans reflect workflow, mechanical, exterior features
- Make recommendations on workflow features

**Design Development**
- Detail of each room completed
- Design recommendations, general ICRA requirements

**Construction Documents**
- Project requirements included in bid documents
- Allows for clear & fair bidding for project

**Construction**
- Construction begins
- Solidify ICRMRs with contractor; communicate & monitor

**Occupancy**
- Handover to owner
- Validation of building performance (Commissioning;) cleanliness
FGI: ICRMR Planning

- Patient placement & relocation
- Required barriers & other protective measures for airborne contaminants
- Modifications to HVAC or water supply system
- Protection from demolition
- Training for hospital staff, visitors, construction personnel
FGI: ICRMR Planning

- Planning for utility impacts
- Planning for debris removal, traffic flow, clean-up, elevator use, construction routes
- Provision of bathroom and food facilities for construction workers
- Protection of materials & installation of clean, dry materials
## ICRA Matrix

<table>
<thead>
<tr>
<th>PATIENT Risk Group</th>
<th>TYPE A</th>
<th>TYPE B</th>
<th>TYPE C</th>
<th>TYPE D</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOW</td>
<td>I</td>
<td>II</td>
<td>II</td>
<td>III / IV</td>
</tr>
<tr>
<td>MEDIUM</td>
<td>I</td>
<td>II</td>
<td>III</td>
<td>IV</td>
</tr>
<tr>
<td>HIGH</td>
<td>I</td>
<td>II</td>
<td>III / IV</td>
<td>IV</td>
</tr>
<tr>
<td>HIGHEST</td>
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<td>III / IV</td>
<td>IV</td>
</tr>
</tbody>
</table>

Adapted from ICRA Matrix developed by J. Bartley - ECSI, Beverly Hills, MI; used with permission
Type “A” activities

Inspections and Non-invasive activities
Type “B” Activities
Type “C” Activities
Type “D” Activities

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Risk Groups 1 & 2

Group 1 Example: Office areas

Group 2 Example: Cafeteria
Risk Type 3
Risk Group 4
What design choices and means/methods of construction might help prevent infections in health care settings?
FGI: Design Elements

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HEALTHCARE
Airborne Infection Isolation Rooms
FGI: Design Elements

- Specific HVAC needs to meet the functional program and accommodate services affected by the project
- Water systems to limit waterborne opportunistic pathogens
- Surfaces and finishes
Building Materials

Mold-resistant fireproofing

Mold-resistant wallboard
Means & Methods

Materials delivered clean & dry

Storage off floor for water protection

Wallboard off floor & sealed

Exterior building materials sealed
ICRMR Examples

External work:

- Re-route pedestrian traffic
- Water dust plumes
- Contain excavation spoils
- Keep doors/windows closed in adjacent buildings
ICRMR Examples

• Existing building performance during construction is critical

• Filters must perform & air flow direction verified
ICRMR Examples

Containment Barriers for dust control

Soft walls are used for short duration projects
ICRMR Examples

Containment Barriers for dust control

Hard (temporary) walls for longer duration or higher risk projects
ICRMR Examples

Containment Barriers for dust control

Combination walls are used when a sturdy lower section is needed but dust control still needed above.
ICRMR Examples

Air Flow direction must be controlled during construction

- Negative air pressure is often required
- “Tightness” of barriers, ceilings and walls helps construction zone negative
ICRMR Examples

Air Flow direction must monitored during construction

- Many types available
- May wish to have audible or visual alarm

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Dirt & dust through buildings must be controlled

- Demolition carts covered
- Wheels cleaned
Protecting Patients is the Goal
Thank-you!