Preventing Transmission of Nosocomial Infections

Review of the Cesarean-section Antibiotic Prophylaxis Program in Jordan and Workshop on Rational Medicine Use and Infection Control

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Amman, Jordan, March 4-8, 2012

Organized by Ministry of Health, Royal Medical Services, and Jordan Food and Drug Administration in collaboration with SPS and SIAPS
Acknowledgments

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Outline

• Infection hazards in health care settings
• Interventions to prevent the spread of infections
• Risk of infection after exposure
• Prevention strategies
Infection Hazards in Health Care Settings

- **Patient**
  - Device- or procedure-associated infection
  - Contagious diseases
  - Bloodborne pathogens
  - Colonization with antimicrobial-resistant bacteria

- **Health care provider**
  - Contagious diseases
  - Bloodborne pathogens
  - Colonization with antimicrobial-resistant bacteria
Transmission of Infections in Health Care Settings

Mode of Transmission

Reservoir
- Humans
- Respiratory tract
- Skin
- GI tract
- Blood
- Water

Source
- Respiratory droplets
- Hands
- Blood/body fluids
- Devices
- Objects
- Fluids

Host
- Age
- Underlying diseases
- Immunity
- Skin and mucosal barriers
- Antimicrobial treatment
## Modes of Transmission

<table>
<thead>
<tr>
<th>Mode of Transmission</th>
<th>Examples</th>
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<tbody>
<tr>
<td>Airborne</td>
<td>Pulmonary TB, measles, varicella</td>
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<tr>
<td>Contact-Direct</td>
<td>Staphylococcus or HSV skin infection</td>
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<tr>
<td>Contact-Indirect</td>
<td>RSV bronchiolitis, AMR bacteria</td>
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<tr>
<td>Contact-Droplet</td>
<td>Pertussis, influenza, adenovirus infection</td>
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<tr>
<td>Common Vehicle</td>
<td>BSI from contaminated IV fluid</td>
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<td></td>
<td>Post-transfusion infection (HIV, HBV, HCV)</td>
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<tr>
<td>Vector</td>
<td>Malaria</td>
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</table>
Interventions to Prevent the Spread of Infection

- Hand hygiene
  - Hand washing with soap and water
  - Hand antisepsis
- Barriers
  - Gloves
  - Gowns
  - Eye protection
  - Masks
  - Other protective apparel
- Patient placement
- Handling and laundry of linen and clothing
- Handling and reprocessing of contaminated items and equipment
- Environmental cleaning and disinfection
What are the 10 most common ways that nosocomial infections spread?
When Should I Wash with Soap and Water vs. Using Alcohol Rub?

- Wash your hands with soap and water—
  - If your hands are visibly soiled
  - After caring for patients with *C. difficile*–associated diarrhea because *C. difficile* spores are not killed efficiently by alcohol
  - Before eating
  - After using the restroom
- In all other situations, you can either wash your hands or use the alcohol rub
- But *use of the rub is preferred* for the reasons discussed in the next slide
An alcohol rub or gel is more effective in reducing the number of bacteria on your hands than hand washing with plain or antimicrobial soap.
Alcohol Kills Bacteria Very Quickly

- An alcohol rub or gel reduces the number of bacteria on the hands by 100-fold or more in just 15 seconds.

Source: www.cdc.gov/handhygiene/materials.htm
When Should I Practice Hand Hygiene?

• **Before**
  • Touching a patient, especially if you will perform an invasive procedure
  • Manipulating an invasive device
  • Changing a wound dressing

• **After**
  • Touching a patient
  • Touching contaminated items
  • Removing gloves
  • Leaving the patient’s bedside or room
Using an Alcohol Rub is as Easy as 1, 2, 3...

1. **Apply a Thumbnail Size Amount to Your Palm**

2. **Spread Across Your Hands and Fingertips**

3. **Rub in briskly and allow to dry**
But I didn’t touch the patient! Why do I have to do anything?

- Many surfaces in the patient-care environment—including bedrails, IV pumps, and even computer keyboards—are often contaminated with antibiotic-resistant bacteria like MRSA, VRE, and multidrug-resistant *Acinetobacter*.

- These bacteria can survive for *days* on these surfaces.

- It’s important to practice hand hygiene after you leave the room, even if you touched only these surfaces.
Fingernails

- Fingernails can harbor large numbers of pathogenic bacteria.
- Artificial fingernails may not be worn by people with direct patient care duties.
- Natural fingernails must be 1/4 inch or less in length.
- Nail polish must be kept in good condition (no cracks or chips).
- Focus on your fingertips when you apply the alcohol gel or wash with soap and water.
Standard Precautions (1)

• These precautions apply to the care of all patients.
• Health care workers should limit contact with all secretions or biological fluids, skin lesions, mucous membranes, and blood or body fluids.
• Health care workers should wear gloves for each contact that may lead to contamination, and gown, mask, and eye protection where contamination of clothes or the face is anticipated.
Standard Precautions (2)

- Gowns should be made of washable material, buttoned or tied at the back, and protected, if necessary, by a plastic apron.
- Gloves can be inexpensive plastic gloves.
- Masks can be surgical masks made of cloth or paper.
Airborne Precautions

• Tuberculosis, measles, chickenpox (combined with contact precautions)
• Individual room with adequate ventilation
  • Door closed
  • Negative pressure, if possible
  • At least six air exchanges per hour
  • Exhaust to outside away from intake ducts
• Health care workers wear high-efficiency masks when entering the room
• Patient to stay in room, patient wears a mask when leaving the room
Droplet Precautions

• Bacterial meningitis, diphtheria, respiratory viral infections (combined with contact precautions)
• Individual room for the patient, if available
• Health care workers wear a surgical mask, with eye/nose protection if possible, within 3 feet of the patient
• Patient to stay in room, patient wears a mask when leaving the room
Contact Precautions (1)

• Enteric infections in which diarrhea cannot be controlled; skin lesions in which drainage cannot be contained
• Individual room for the patient if available
• Cohorting of patients, if possible
• Health care workers wear gloves when entering the room
• Health care workers wear a gown for patient contact or contact with contaminated surfaces or material
Contact Precautions (2)

- Health care workers practice hand hygiene before and after contact with the patient and on leaving the room
- Patient to stay in room
- Environmental and equipment cleaning, disinfection, and sterilization
Viral Hemorrhagic Fever Precautions (1)

- Individual room in an isolation ward, if possible
- Health care workers wear a scrub suit, gloves (2 pairs), gowns, apron, mask, head cover, eye protection, and boots when entering the room
- Health care workers practice hygiene at entry to and exit from the room
- Patient to stay in room
Viral Hemorrhagic Fever Precautions (2)

- Incinerate needles, syringes
- Disinfect medical instruments
- Incinerate excreta, body fluids, and nasopharyngeal secretions
- Disinfect linen
- Restrict visitors and staff
- Daily disinfection and terminal disinfection of room
Risk of Infection from Exposure to Blood Products

- HIV: 1:200,000–2,000,000
- Hepatitis B virus (HBV): 1:30,000–250,000
- Hepatitis C virus (HCV): 1:30,000–150,000
- HTLV I/II: 1:250,00–2,000,000
- Others documented: bacteria, cytomegalovirus, hepatitis A, malaria, Chagas disease
- Others possible: prions, hepatitis G virus, TT virus, and parvovirus B19
Estimates of Risk of Bloodborne Infection after Exposure

- Hollow-bore needle stick
  - HBV: 30% (20–40%)
  - HCV: 2%
  - HIV: 0.3%
- Blood splash into mucous membranes:
  - HIV 0.1%
- Blood exposure onto skin:
  - HIV <0.1%
Risk of Infection after Occupational Exposure to Blood or Body Fluids

The risk of infection depends on—

• Type of exposure
  • Parenteral > Nonparenteral
• Type of body fluid exposed to
  • Blood > Other body fluid
• Concentration of virus in fluid
  • HBV > HCV > HIV
• Volume of exposed fluid entering the body
Prevention Strategies

Strategies for preventing occupational transmission of bloodborne pathogens include the following—

• Use standard precautions consistently
• Avoid sharps injuries and needle sticks
• Use safety devices
• Immunize against HBV
• Postexposure prophylaxis program
Preventing Sharps Injuries

• Proper handling and disposal of needles and sharps—
  • Do not directly manipulate
  • Dispose into a puncture-proof container
• Use needleless intravenous systems
• Use safety needles/devices
• Practice safe surgical techniques
Treatment of Exposure Site

Following an exposure, immediate treatment should be initiated—

- Mucous membrane exposure: rinse with water
- Skin exposure: wash with soap and water
- Needle/sharps puncture site: wash with soap and water