Keys to Evidence-Based Infection Prevention in the Healthcare Setting

Marianne Pavia, MS, MT(ASCP), CLS, CIC
Disclosure

• This program is made possible by an education grant from Abbott Diabetes Care

• Excelsior Medical
Learning Objectives

- Analyze the principles, practices and regulations associated with infection prevention in a health care setting
- Analyze the route of infection in the health care setting from its source to the susceptible host
- Discuss the evidence based methods to break the chain of infection and prevent transmission in the health care setting
- Clarify the role of point of care instrument disinfection to prevent the spread of infection
- Develop creative strategies to adapt infection prevention processes to a variety of settings
The trained, competent ICP shall be able to establish an active, effective, facility-wide program to help prevent the development and spread of infections and infectious diseases.

- Prevent infection, not just control
Study in California of healthcare-associated infection (HAI) rates:

Only significant effector seen in lower rates of multidrug-resistant infections was the presence of a certified infection prevention director in the hospital.

Infection Prevention and Control Functions

- Surveillance
- Outbreak Control
- Isolation and Precautions
- Education
- Mandatory State Reporting
- Fiscal Responsibility
- Employee Health
- Antibiotic Stewardship
- Patient Safety Programs
- Hand Hygiene
Surveillance

Collecting data
- Review lab results
- Review charts
- Talk to stakeholders
- Tracking antibiotic usage

Data collection results in
- Outcome measures - # of infections
- Process measures- is equipment and supplies clean
Outbreak Control

- Most infections are sporadic
- A cluster (outbreak) implies the excess of the expected number
- Each disease has a different threshold:
  - One case of flu
  - One case of TB
  - Three cases of MRSA
Antibiotic Stewardship

- Signs and symptoms of infection
- No cultures, start prophylactic treatment
- Virus but continue antimicrobials
- Results in:
  - Antibiotic resistance
  - No new drugs in development
  - MRSA, VRE, MDRO, CRE
Regulatory Standards

Federal
- Occupational Safety and Health Administration
- CDC
- FDA

State
- Department of Health
- State Education Department
- Department of Sanitation

Others
- TJC
- APIC, SHEA
- AHA
- AORN
- CLIS
Professional Responsibility

Responsibility to adhere to scientifically accepted principles and practices of infection prevention and control

Responsibility to monitor those for whom the professional is responsible
The Chain of Infection

Pathogen
- Biological agent capable of causing disease

Reservoir
- Where infectious agent normally lives and multiplies

Mode of Transmission
- Contact, droplet, airborne, common vehicle, vector-borne

Susceptible Host
- Lacks effective resistance to pathogen

Portal of Entry
- Entry sites, mechanisms of introduction

Portal of Exit
- Mechanisms by which pathogen can leave reservoir
Breaking The Chain of Infection

**Pathogen**
- Biological agent capable of causing disease

**Reservoir**
- Where infectious agent normally lives and multiplies

**Susceptible Host**
- Lacks effective resistance to pathogen

**Portal of Entry**
- Entry sites, mechanisms of introduction

**Mode of Transmission**
- Contact, droplet, airborne, common vehicle, vector-borne

**Portal of Exit**
- Mechanisms by which pathogen can leave reservoir
Healthcare-Associated Infections HAIs

One HAI costs between $20,000-$40,000 per infection

Increases the average length of stay by 19 days

CMS and VBP will not pay for HAIs

Commitment to transforming the quality of healthcare by realigning the healthcare facility’s financial incentives to do so.
Basic Infection Control Practices

- Hand Hygiene
- Standard Precautions
- Transmission - Based Precautions
- Engineering Controls
- Disinfection of Patient Care Equipment
- Work Practice Controls
Indirect Contact Transmission

Transfer of an infectious agent through a contaminated intermediate object or person

- Hands of healthcare personnel
- Patient care devices (e.g., glucose meters)
- Instruments (e.g., endoscopes) that are not adequately reprocessed
- Medications and injection equipment

## Importance of Hand Hygiene

Hand contamination is a major cause of transmission of infection in healthcare facilities.

Improved hand hygiene is associated with lower rates of healthcare – associated infections.

According to the CDC, National adherence to recommended hand hygiene procedures is POOR, from 5 – 81% with an overall average of 40%.

Hand hygiene is the most important infection prevention intervention. **CDC**

TJC National Patient Safety Goal
### Standard IC.02.02.01

The hospital reduces the risk of infections associated with medical equipment, devices, and supplies (Most cited standard in 2011= 36%)

**EP 1. Cleaning and disinfecting medical equipment, devices, and supplies**

**EP2. Sterilizing medical equipment, devices, and supplies. (See also EC.02.04.03, EP 4)**

**EP3. Disposing of medical equipment, devices, and supplies**
**Critical Items**
- Enters sterile tissue or vascular system
  - Examples:
    - Arthroscopes, surgical instruments, vascular devices, cardiac & urinary catheters, implants, dental instruments

**Semi-Critical Items**
- Touches mucous membranes or broken skin
  - Examples:
    - Endoscopes, laryngoscopes, diaphragm fitting rings, respiratory and anesthesia equipment, vaginal ultrasound probes

**Non-Critical Items**
- Touches intact skin
  - Examples:
    - Stethoscopes, blood pressure cuffs, tabletops, bedpans, floors and furniture

**Sterilization**
- Autoclave / Liquid Sterilants
  - (Cycle / Exposure time per manufacturer)

**High-Level Disinfection**
- OPA
  - (exposure time >12 minutes)

**Low-Level Disinfection**
- PDI super Sani-Cloth
  - (exposure time = 2 minutes)
- Clorox Wipes
  - (exposure time = 5 minutes)
Antiseptics vs. Disinfectants

Antiseptics are used on living tissues to protect the spreading of germs and infection to humans.

Disinfectants are used on surfaces to disinfect items which can potentially transmit germs.
Contact Times for Surface Disinfectants

EPA-registered disinfectants

Long contact time is not practical for disinfection of environmental surfaces

Most health-care facilities utilize a disinfectant with a contact times of one to three minutes

WHAT GOES WHERE?

CLEAN AND DIRTY CAN NEVER MIX!

Dirty (examples)
- Waste receptacles
- Patient specimens
- Sharps containers
- Used linen
- Recycling
- Used instruments
- Dirty items should never be in clean storage areas

Clean (examples)
- Sterile packs
- Supplies of PPE
- Linen
- IV pumps/poles (clean)
- Other clean medical equipment and supplies
- Clean items should never be in dirty utility rooms
HBV can survive for at least one week in dried blood on environmental surfaces or on contaminated instruments and supplies.

**Hepatitis B Virus Infection Risks among Diabetic Patients Residing in Long-Term Care Facilities:**

- 30 acute HBV infections and 2 deaths
- shared equipment and lapses in aseptic technique or infection control practices.

Hepatitis B Vaccine

HBV vaccination is a safe, effective means of prevention.

Key criteria for HBV vaccination recommendation:

Advisory Committee on Immunization Practices (ACIP) recommend adults aged < 60 years w/ diabetes be vaccinated for HBV.\(^1\)

Benefit of routine vaccination for adults aged >60 years is reduced as vaccine immunogenicity appears to decrease w/ increasing age.\(^2\)

Sharing of blood glucose meters should be avoided, if possible. If shared, the device must be cleaned and disinfected after every use according to manufacturer’s instructions.

If there are no manufacturer’s instructions, the device must not be shared.¹

Blood glucose meters should be cleaned and disinfected per manufacturer’s instructions after each and every use, unless assigned to a single patient and protected by specific precautions.

FDA guidance for manufacturers:

“The disinfection solvent you choose should be effective against HIV, Hepatitis C, and Hepatitis B viruses ... Please note that 70% ethanol solutions are not effective against viral blood borne pathogens and the use of 10% bleach solutions may lead to physical degradation of your device.”

1. FDA Website. http://www.fda.gov/MedicalDevices/ProductsandMedicalProcedures/InVitroDiagnostics/ucm227935.htm
Clean glucometer surface when visible blood or bloody fluids are present by wiping with a cloth dampened with soap and water to remove any visible organic material.

If no visible organic material is present, disinfect after each use the exterior surfaces following the manufacturer’s directions using a cloth/wipe with either an EPA-registered detergent/germicide with a HBV/HIV label claim.

Remember the contact time needed for disinfection.
Test Strips

- Test strips packaged in vials can become contaminated with bacteria during routine use in the hospital.
- Studies confirm that bacterial contamination of test strips from open vials is common, and suggest that these vials can serve as reservoirs for patient-to-patient transmission of potentially pathogenic bacteria.
CDC recommends:

“Unused supplies and medications taken to a patient’s bedside during finger stick monitoring or insulin administration should not be used for another patient because of possible inadvertent contamination.”

“It is recommended that unused supplies taken to a patient’s bedside during fingerstick monitoring should not used for another patient because of possible inadvertent contamination.”

Bacterial Contamination of Glucose Test Strips

A 2011 Letter to the Editor published in the American Journal of Infection Control

Investigate bacterial contamination of glucose test strips in vials.

Performed over 6 consecutive weeks in 4 wards of 400-bed teaching hospital.

148 test strips were collected and cultured for bacterial load.

Strip contamination rate: 16.6% - 35.7%.

- Authors concluded the narrow strip vial opening requires repeated manual touching to pull a strip out, under non-sterile conditions.

- Investigators’ recommendation: “Dispense single units that can be used in a ‘no-touch’ procedure.”
Bacterial Contamination of Glucose Test Strips

A 2012 Letter to the Editor published in the Clinica Chimica Acta

“In conclusion, test strips packaged in vials can become contaminated with bacteria during routine use in the hospital.”

“... our results do confirm that bacterial contamination of test strips from open vials is common, and suggest that these vials can serve as fomites for patient-to-patient transmission of potentially pathogenic bacteria ...”
Bloody Contamination of Test Strips

81 vials in active use, with \( \leq 10 \) strips remaining, submitted by users were blood-contaminated in 2 of 3 institutions.

Blood contamination on outside (2) and inside (1) of vials confirmed by sensitive test methodologies.

Can the vials be cleaned?

Vial disinfection may expose unused test strips to bleach-based agents, add staff time.

Disinfection will also adversely affect scanning of test vial and reading expirations dates and lot numbers.

Geaghan SM, independent lab analysis sponsored by Abbott Diabetes Care
Questions for you…

Choose your response, click submit
Single-Use Supplies

Individually packaged supplies for patient safety
Pathogen
- Biological agent capable of causing disease

Reservoir
- Where infectious agent normally lives and multiplies

Susceptible Host
- Lacks effective resistance to pathogen

Mode of Transmission
- Contact, droplet, airborne, common vehicle, vector-borne

Portal of Entry
- Entry sites, mechanisms of introduction

Portal of Exit
- Mechanisms by which pathogen can leave reservoir

Breaking the Chain of Infection
<table>
<thead>
<tr>
<th>Level of Risk</th>
<th>Application</th>
<th>Process</th>
</tr>
</thead>
<tbody>
<tr>
<td>Critical</td>
<td>Entry or penetration into sterile tissue, cavity or bloodstream</td>
<td>Sterility required</td>
</tr>
<tr>
<td></td>
<td><strong>LANCET</strong></td>
<td></td>
</tr>
<tr>
<td>Semi-Critical</td>
<td>Contact with intact non sterile mucosa or non-intact skin.</td>
<td>Sterilization preferred where possible. If sterilization not possible then high-level disinfection required.</td>
</tr>
<tr>
<td></td>
<td><strong>TEST STRIP</strong></td>
<td></td>
</tr>
<tr>
<td>Non-Critical</td>
<td>Contact with intact skin</td>
<td>Clean as necessary with detergent and water and disinfect.</td>
</tr>
<tr>
<td></td>
<td><strong>GLUCOSE METER</strong></td>
<td></td>
</tr>
</tbody>
</table>
We can help reduce the risk of cross-contamination by:

- Using only single-use skin puncture/lancet devices
- Advocating for restricting point-of-care meter use to a single patient, when possible
- Properly cleaning and disinfecting meters according to manufacturer’s recommendation
- Changing gloves and perform hand hygiene between patients for each testing event
- Employ single-use packaging of glucose test strips
- Be an advocate and encourage others to break the chain of infection
Patient Safety

“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


