Infection Prevention: Reducing C.Diff and Engaging the Front Line Workforce

L. Clifford McDonald, MD, FACP, SHEA
Senior Advisor for Science and Integrity
H-CAP Board Meeting 2012
March 27, 2012

National Center for Emerging and Zoonotic Infectious Diseases
Division of Healthcare Quality Promotion
Overview

- What are *Clostridium difficile* infections?
- Why are they important?
- Where do they occur and role of hospitals?
- How can they be prevented?
- What can be done?
**Clostridium difficile** and Infection

- Anaerobic bacterium
- Not normal intestinal bacterium
- Fecal-oral spread
- Forms spores that persist
- Toxins produce colitis
  - Diarrhea
  - More severe disease, death
- 2-steps to infection
  - Antibiotics result in vulnerability
  - New acquisition via transmission

Figure courtesy of D. Gerding and S. Johnson
**Clostridium difficile** Infections (CDIs) and Deaths Reach and Remain at Historic Highs

- **CDI hospitalizations**
  - Increased 3-fold 2000-2009

- **Deaths linked to CDI**
  - 14,000 in 2007

- **$1 billion in medical costs**
  - CDIs in hospital patients only

- **Epidemic strain**
  - First emerged in 2000
  - Causes more cases and severity

Hall AJ et al. Presentation at the 49th Annual Meeting of the Infectious Disease Society of America; October 22, 2011; Boston, MA.
CDIs Largely Health Care Related: Most Develop Symptoms Outside Hospitals

- 94% health care related
- 75% of these outside hospitals
  - Nursing home patients
  - Patients in community
    - Outpatient exposures only
    - Recent inpatient exposure
- 25% hospital inpatients
- Post-discharge CDI common
  - Most potent antibiotics used in hospitals
  - Lasting effect on patients

Source: CDC, MMWR;2012;61(Early Release): 1-6
Interdependence of Hospitals and Surrounding Facilities in Preventing CDI

- 52% of the CDIs diagnosed in hospitals are present on admission
  - 36% (19% overall) recently discharged
- 48% hospital onset
  - Likely result from inpatient care
- CDIs present on admission
  - Source for intra-hospital transmission

Source: CDC, MMWR 2012;61(Early Release): 1-6
Six Steps to Prevention of CDIs

- Prescribe and use antibiotics carefully
- Focus on an early and reliable diagnosis
- Isolate patients immediately
- Wear gloves and gowns for all contact with patient and patient care environment
- Assure adequate cleaning of the patient care environment, augment with EPA-registered *C. difficile* sporicidal disinfectant
- Notify facilities upon patient transfer

Source: CDC, 2012
Role of the Frontline Staff in Infection Prevention

George, a 60-year-old man, goes to the doctor's office and is diagnosed with pneumonia. He is prescribed antibiotics, drugs that put him at risk for C. difficile infection for several months.

One Month Later
George breaks his leg and goes to the hospital. A healthcare worker spreads C. difficile to him after forgetting to wear gloves when treating a C. difficile-infected patient in the next room.

Two Days Later
George transfers to a rehabilitation facility. He gets diarrhea. He is not tested for C. difficile. The healthcare worker doesn’t wear gloves and infects other patients.

Three Days Later
George goes back to the hospital for treatment of diarrhea and tests positive for C. difficile. He is started on specific antibiotics to treat it. Healthcare workers wear gloves and do not spread C. difficile. George recovers.
Prevention is Possible

- 71 hospitals in hospital-onset CDI prevention programs of three states (IL, MA, NY)
- Engagement of hospital leadership
- Implementation of prevention strategies
- Measurement and feedback of data
- 20% overall reduction in CDIs
What Can Be Done

- **Federal Government**
  - Tracking and Reporting
  - Promoting prevention through programs and recommendations
  - Prevention expertise, outbreak and laboratory support

- **States and Communities**
  - Encourage facilities to track and share data using NHSN
  - Develop regional prevention projects across facility types
  - Technical assistance to facilities
  - Standardized patient transfer form
What Can Be Done

- **Health Care Facility Administrators**
  - Support better testing, tracking, and reporting
  - Assure adequate environmental cleaning
  - Notify other facilities on patient transfer
  - Participate in regional prevention efforts

- **Doctors and Nurses**
  - Prescribe antibiotics carefully, take an antibiotic ‘time out’
  - Order a *C. difficile* test in appropriate patient population
  - Be aware of infection rates in facility or practice, follow infection control recommendations with every patient
What Can Be Done

Patients

- Antibiotics can be lifesaving but are not without risk, use only as directed by your doctor
- Tell your doctor if you have been on antibiotics and you develop diarrhea within a few months
- Wash your hands after using the bathroom
- Try to use a separate bathroom if you have diarrhea, or be sure the bathroom is cleaned with if someone with diarrhea has used it
Role of Patient Care Area Environmental Surfaces in Healthcare-associated Infections

Source Control
Screening
Isolation

The Environment

Hand Hygiene

Infected and Colonised
Healthcare Workers
Hospital Acquired Infections

Figure Courtesy of Jon Otter
Environment Cleaning Intervention to Reduce Risk of Acquiring an MDRO from a Prior Room Occupant

Baseline:
Sept 2003 – Apr 2005
Conventional cleaning / disinfection using a QAC

Intervention:
Sept 2006 – Apr 2008
Enhanced cleaning (black-light, ‘bucket method’, education)

- 3.0% of patients acquired MRSA
- 50% reduction
  p<0.001
- 1.5% of patients acquired MRSA

- 3.0% of patients acquired VRE
- 27% reduction
  p<0.001
- 2.2% of patients acquired VRE

Environment to Hands of Healthcare Personnel

Pathogens can be transferred from hospital surfaces to HCW hands without direct patient contact\(^1-^2\)

<table>
<thead>
<tr>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>52%</strong> of 23 HCW acquired VRE on their hands(^3)</td>
</tr>
<tr>
<td><strong>45%</strong> of 50 HCW acquired MRSA on their hands(^4)</td>
</tr>
<tr>
<td>Compliance with hand hygiene: <strong>50%</strong>(^5)</td>
</tr>
<tr>
<td>Contact with patient or surface = ~10% risk of acquiring VRE</td>
</tr>
<tr>
<td><strong>40%</strong> of 50 HCW acquired MRSA on their hands(^4)</td>
</tr>
<tr>
<td>Compliance with hand hygiene: <strong>80%</strong>(^5)</td>
</tr>
</tbody>
</table>

Introduction of an Additional EVS Worker and Impact on Detectable Environmental Contamination with MRSA

Figure 1
Total weekly aerobic colony counts from 10 hand-touch sites on Wards A and B demonstrating the effect of enhanced cleaning over two 6-month periods. New cases of MRSA infections are indicated for each ward; note the cluster occurring on Ward A following withdrawal of the cleaner in the second six months and again on Ward B following completion of the study.

Dancer SJ et al. BMC Medicine 2009, 7:28
Impact of Environmental Cleaning with Bleach on *Clostridium difficile* Infections

Mayfield JL. *Clin Infect Dis* 2000;31:995–1000
Options for Evaluating Environmental Cleaning

Prepared by:
Alice Gulh, MD, MPH
Philip Carling, MD
Environmental Evaluation Workgroup

December 2010

1Division of Healthcare Quality Promotion, National Center for Emerging and Zoonotic Infectious Diseases, CDC, Atlanta, Georgia
2Carney Hospital and Boston University School of Medicine, Boston, MA; Dr. Philip Carling has been compensated as a consultant of Ecolab and Steris. He owns a patent for the fluorescent targeting evaluation system described in this document (DAZO Fluorescent Marking Gel).
3Brian Koll, Beth Israel Medical Center, New York, NY; Marion Kainer and Ellen Borchers, Tennessee Department of Health, Nashville, TN; and Brandi Jordan, Illinois Department of Public Health, Chicago, IL

http://www.cdc.gov/HAI/prevent/prevention_tools.html
### Evaluating Patient Zone Environmental Hygiene

<table>
<thead>
<tr>
<th>Method</th>
<th>Ease of Use</th>
<th>Identifies Pathogens</th>
<th>Useful for Individual Teaching</th>
<th>Directly Evaluates Cleaning</th>
<th>Published Use in Programmatic Improvement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct Practice Observation</td>
<td>Low</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>1 Hospital</td>
</tr>
<tr>
<td>Swab cultures</td>
<td>High</td>
<td>Yes</td>
<td>Not Studied</td>
<td>Potentially</td>
<td>1 Hospital</td>
</tr>
<tr>
<td>Agar slide cultures</td>
<td>Good</td>
<td>Limited</td>
<td>Not Studied</td>
<td>Potentially</td>
<td>1 Hospital</td>
</tr>
<tr>
<td>Fluorescent gel</td>
<td>High</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>49 Hospitals</td>
</tr>
<tr>
<td>ATP system</td>
<td>High</td>
<td>No</td>
<td>Yes</td>
<td>Potentially</td>
<td>2 Hospitals</td>
</tr>
</tbody>
</table>

http://www.cdc.gov/HAI/prevent/prevention_tools.html
CDC Environmental Cleaning Evaluation Toolkit

Evaluate the following priority sites for each patient room:

<table>
<thead>
<tr>
<th>High-touch Room Surfaces³</th>
<th>Cleaned</th>
<th>Not Cleaned</th>
<th>Not Present in Room</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bed rails / controls</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tray table</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IV pole (grab area)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Call box / button</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Telephone</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bedside table handle</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Date:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chair</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unit:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Room sink</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Room Number:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Room light switch</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Initials of ES staff (optional):²</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Room inner door knob</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bathroom inner door knob / plate</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bathroom light switch</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bathroom handrails by toilet</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bathroom sink</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Toilet seat</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Toilet flush handle</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

http://www.cdc.gov/HAI/prevent/prevention_tools.html
Other Ongoing Work on Environmental Infection Control

- Multistate study to better estimate true bioburden encountered in patient care

- Duke Prevention Epicenters evaluation of impact of UV radiation on environmental decontamination and infection rates
Environmental Infection Control: A Reality Check

- What is the role of the environment in HAIs?
  - Can bioburden reductions be correlated with colonization and/or infection risk?
  - How strong is such correlation over what colonization and/or infection rates?
  - What patient and pathogen factors most impact environmental infection risk?

- Are there bioburden thresholds below which further decontamination is unlikely to improve patient safety?
  - What are the usual bioburden levels encountered with specific pathogens and commensals?
  - How effectively can various methods be employed to maintain environmental bioburden below thresholds?

- Where should current prevention efforts be focused?
Summary

- *Clostridium difficile* is a problem pathogen causing infections and deaths in patients at historic highs
  - Problem across the spectrum of healthcare delivery settings

- Important role for infection control
  - Important role for front line workers especially nursing and EVS

- Although we don’t know everything about the role of the environment and best cleaning methods, we know something

- Good physical cleaning is foundational for environmental infection control
  - Assessment
  - Performance improvement
  - Professionalism
Acknowledgements

- CDC, NCEZID, Division of Healthcare Quality Promotion
  - Rosa Herrera
  - Fernanda Lessa
  - Dawn Sievert
  - Nicole Coffin
  - Matt Wise
  - Carolyn Gould
  - Paul Malpiedi
  - Maggie Dudeck
  - Arjun Srinivasan
  - Scott Fridkin
  - Abbigail Tumpey
  - Denise Cardo

- CDC, Office of the Director
  - Richard Schieber
  - Lynn Sokler