Clostridium difficile
Infection Prevention
Objectives

- Describe the cause and epidemiology of *Clostridium difficile* infection (CDI)
- Review evidence-based CDI prevention strategies
- Describe importance of adherence monitoring and feedback
**Clostridium difficile**

- An anaerobic, gram-positive, spore-forming, toxin-producing bacillus
- Transmitted among humans via the fecal-oral route
- The cause of *Clostridium difficile* infection (CDI); severity ranges from mild diarrhea to severe intestinal infection (colitis); death in up to 9% of cases
- The leading cause of antibiotic-associated colitis in adults, in both acute and long-term care settings

**Clostridium difficile** Infection (CDI)

- *C. difficile* is not part of the normal gastrointestinal flora
  - 2-7% of healthy adult population colonized with *C. difficile*
- CDI is the most common healthcare-associated infection (HAI)

U.S. CDI Burden

Figure 1. Estimated U.S. Burden of *Clostridium difficile* Infection (CDI), According to the Location of Stool Collection and Inpatient Health Care Exposure, 2011.

Of the estimated cases of community-associated CDI, 82% were estimated to be associated with outpatient health care exposure. CO-HCA denotes community-onset health care–associated infection, HO hospital onset, and NHO nursing home onset.

Healthcare-Associated CDI in California

• *C. difficile* is the most frequently reported HAI by California hospitals
  – 10,279 hospital-onset CDI reported in 2016

• Patients often cycle between multiple hospitals, long term acute care, and long term care facilities
  – 26% of CDI patients in Orange County were readmitted to another facility within 12 weeks of discharge

Huang et al., Infect Control Hosp Epidemiol, 31(11), 1160-1169, 2010
Two Preventable Events in CDI

The following events may occur separately and in any order, but both are required for infection to occur:

1. The normal intestinal flora must be compromised (e.g., due to antibiotics) allowing for *C. difficile* to establish itself and proliferate

2. *C. difficile* bacteria or spores must be ingested

**Clostridium difficile Pathogenesis**

The following events may take place separately and in any order, but both are required for CDI to occur.

**Ingest C. difficile spores** transmitted to patients via the hands of healthcare personnel and environment

Spores germinate into a growing vegetative form

Changes in lower intestinal flora due to **antimicrobial use** allows proliferation of *C. difficile* in colon

Toxin A & B production leads to colon damage

Risk Factors for CDI

- Acquisition of *C. difficile* bacteria *(Modifiable risk factor)*
- Antimicrobial exposure *(Modifiable risk factor)*
- Advanced age
- Immunosuppression
- Tube feedings
- Gastric acid suppression
- Prolonged stay in healthcare facility
- Inflammatory bowel disease
- GI surgery
CDI Diagnosis

• Presence of symptoms, usually diarrhea
  – ≥3 unformed stools over 24 hours (i.e., conforms to shape of container)
• Positive stool test for *C. difficile* or toxins
• Diagnostic imaging
  – Endoscopic or histologic (e.g., pseudomembranous disease)
• CDI relapse occurs in 10-25% cases

**CDI Testing Methods**

- Only test patients with clinically significant diarrhea without other identified causes
  - Consider alternate etiologies for diarrhea
  - Discontinue laxatives for 24-48 hours and reevaluate prior to testing
- Use laboratory-based system for **immediate notification** of positive CDI test results
- Single stool specimen at onset of symptoms is sufficient
- Repeat testing is of limited value; “test of cure” is not recommended
2020 CDI Prevention Goal for Hospitals

• National HAI Prevention Action Plan target goal:
  – 30% CDI reduction from 2015 baseline
  – Recommended by the CDPH HAI Advisory Committee for all California hospitals
Preventing CDI: The MOST Important Things

**Prevent C. difficile Acquisition / Reduce Antimicrobial Exposure**

- Isolate patients with diarrhea pending CDI confirmation
- **Lab alert system** for immediate notification of positive CDI tests
- **Contact precautions** for duration of diarrhea plus 48 hours
  - Private room, dedicated toilet
  - Gloves/gown to enter room
  - Remove gloves, perform hand hygiene prior to room exit
- **Hand hygiene** before/after patient contact & after glove removal
  - Patient hand hygiene
- **Disposable equipment**
- **Sporicidal disinfectant** for cleaning reusable equipment
- **Sporicidal disinfectant** for **terminal cleaning**
- **Quality cleaning**, daily & terminal
- **CDI-targeted antimicrobial stewardship program**
  - Improve overall prescribing, stop unnecessary antibiotics
  - Restrict high-risk antibiotics based on local epidemiology
  - Stop inciting antibiotic
Contact Precautions for CDI

Place on contact precautions for duration of diarrhea

- Extend contact precautions beyond duration of diarrhea (e.g., for 48 hours after diarrhea ceases)
- Emphasize **glove use** and removal of gloves prior to exiting room of CDI patient
  - Gloves are effective at preventing *C. difficile* contamination of hands
  - Adherence to glove use is critical to preventing *C. difficile* transmission via hands of health care providers
- Emphasize compliance with **hand hygiene**
Contact Precautions – Special Approaches

When CDI rates remain high or during an outbreak, isolate patients with diarrhea pending CDI confirmation

• Rationale: Patients with CDI may contaminate the environment and hands of health care providers before results of testing are known.

• For patients with possible recurrent CDI, isolate and test following first unformed stool
Hand Hygiene for CDI

Perform hand hygiene before and after contact with CDI patient and after removing gloves

- Routinely use alcohol hand rub or soap and water
  - *C. difficile* spores are resistant to alcohol; however, studies did not find increase in CDI with alcohol-based hand hygiene, but several did find reductions in MRSA or VRE

- Use soap and water during CDI outbreak, “hyper-endemic setting,” or fecal hand contamination
  - Be aware: Hand hygiene adherence may decrease when soap and water is only option provided
Hand Hygiene and Gloves – Special Approaches

When CDI rates remain high or during an outbreak, implement universal glove use for facilities or units with high CDI rates

- Rationale: *C. difficile* spores are difficult to remove even with hand washing.
- Asymptomatic carriers play a role in transmission (though magnitude of contribution unknown)
- Adherence to glove use with or without contact precautions is critical to preventing *C. difficile* transmission via hands of health care providers
Implement an antibacterial stewardship program

- Goal: Minimize the frequency and duration of antimicrobials and the number of antimicrobials prescribed.
- Target antimicrobials based on local epidemiology
  - Restricting fluoroquinolones, cephalosporin and clindamycin found most useful (may be used for surgical prophylaxis)
- Reduce use of broad-spectrum antibiotics
  - Enforcing a narrow-spectrum antibiotic policy with feedback to prescribing physician resulted in significant CDI reduction in 3 acute geriatric medical wards

CDI-Targeted Antimicrobial Stewardship - continued

- Increased risk of CDI has been linked to specific antibiotics

<table>
<thead>
<tr>
<th>High Risk</th>
<th>Medium Risk</th>
<th>Low Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aminopenicillins</td>
<td>Beta-lactam/beta-lactamase inhibitors</td>
<td>Macrolides</td>
</tr>
<tr>
<td>Clindamycin</td>
<td>Carbapenems</td>
<td>Trimethoprim/sulfamethoxazole</td>
</tr>
<tr>
<td>Cephalosporins</td>
<td></td>
<td>Tetracyclines</td>
</tr>
<tr>
<td>Fluoroquinolones</td>
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</tbody>
</table>

Examples of CDI-Targeted ASP Interventions

• Formulary restriction and prospective audit with feedback
  – Target antibiotic(s) most associated with CDI at your facility
  – Recommend lower-risk alternatives, and optimizing dosing, route, and duration of therapy
• Target patients with CDI diagnoses for medication review to identify and discontinue unnecessary antibiotics

ASP Interventions Reduce Risk of *C. difficile* Transmission

- Improved overall antimicrobial prescribing
- Stopping unnecessary antibiotics in patients with new CDI diagnoses

California Antimicrobial Stewardship Initiative

• CDPH HAI Program activity

• Objective: Assist California hospitals and long-term care facilities with optimizing antimicrobial use to improve patient outcomes

• CDPH Antimicrobial Stewardship Program Initiative web page:
  www.cdph.ca.gov/Programs/CHCQ/HAI/Pages/CA_AntimicrobialStewardshipProgramInitiative.aspx
Environmental Cleaning and Disinfection

- Patients with CDI can shed bacteria and spores into the environment both during and after treatment of CDI.
- Ensure thorough daily and terminal cleaning of patient care areas.
  - Focus on high-touch surfaces and the bathroom.
- Assess adequacy of cleaning.
  - Study in 3 hospitals used fluorescence to assess cleaning.
  - Only 47% high-touch surfaces cleaned.
Equipment

- Identify and **remove unnecessary** equipment that can be environmental sources of *C. difficile* transmission
  - Use **disposable** equipment when possible
  - Ensure **reusable equipment** is cleaned with a **sporicidal disinfectant**
Environmental Cleaning and Disinfection- Special Approaches

When CDI rates remain high or during an outbreak, use a **sporicidal disinfectant** for daily and terminal cleaning (e.g., bleach), in conjunction with other measures

- Limited data suggest cleaning with bleach (1:10 dilution prepared fresh daily) reduces *C. difficile* transmission
- Two before-after studies showed benefit on units with high endemic CDI rates
- Sporicidal disinfectants may be most effective in reducing burden where CDI rates high
CDI in the Hospital Environment

C. difficile Transmission from Prior Room Occupants

110% Increased risk

Shaugnessey et al. Abstract K-4194
IDSA / ICAAC. October 2008

SHEA
Version 1.0 Copyright © SHEA, March 2011

August 2, 2011
Infection Prevention Role in CDI Prevention

• Ensure policies reflect current evidence-based practice recommendations

• Ensure staff competency upon hire and at least annually (e.g., new hire orientation, annual skills fair, return demonstration to ensure competency)

• Establish **adherence monitoring program** for core care practices
  – Use available adherence monitoring tools
  – Ensure feedback provided to frontline staff

• Present adherence results and CDI incidence to leaders
Adherence Monitoring Tool - Hand Hygiene

<table>
<thead>
<tr>
<th>Discipline</th>
<th>What type of HH opportunity was observed? (select/  ✓ 1 per line)</th>
<th>✓ Successful</th>
<th>Ø Missed</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>□ entering room* □ before task □ after body fluids □ after care* ✓ leaving room</td>
<td></td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>□ entering room* □ before task □ after body fluids □ after care* □ leaving room</td>
<td></td>
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</tr>
</tbody>
</table>

*Remember: Hand hygiene should be performed before and after glove use

| Total # HH Successful ("#✓"): _________ | Total # HH Opportunities Observed: _________ | Adherence: _______%  
<table>
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<tr>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>(Total # HH Successful ÷ Total # HH Opportunities Observed x 100)</td>
</tr>
</tbody>
</table>

CDPH Adherence Monitoring tools: [http://www.cdph.ca.gov/HAI](http://www.cdph.ca.gov/HAI)
## Adherence Monitoring Tool – Contact Precautions

<table>
<thead>
<tr>
<th>Contact Precautions Practices</th>
<th>Pt/Res 1</th>
<th>Pt/Res 2</th>
<th>Adherence by Task</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gloves and gowns are available near point of use.</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Signs indicating the patient/resident is on contact precautions are clear and visible.</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>The patient/resident housed in single-room or cohorted based on a clinical risk assessment.</td>
<td></td>
<td></td>
<td>Yes</td>
</tr>
<tr>
<td>Hand hygiene is performed before entering the patient/resident care environment.</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Gloves and gowns are donned before entering the patient/resident care environment.</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Gloves and gowns are removed and discarded, and hand hygiene is performed before leaving the patient/resident care environment. <em>Soap &amp; water if C. difficile</em> infection.</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Dedicated or disposable noncritical patient-care equipment (e.g. blood pressure cuffs) is used</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

Total #Yes  Total #Observed  Total #Yes/Total #Observed =  % Adherence

CDPH Adherence Monitoring tools: [http://www.cdph.ca.gov/hai](http://www.cdph.ca.gov/hai)
### Adherence Monitoring Tool – Environmental Cleaning and Disinfection

<table>
<thead>
<tr>
<th>Environmental Cleaning Practices</th>
<th>EVS Staff 1</th>
<th>EVS Staff 2</th>
<th>Adherence by Task</th>
</tr>
</thead>
<tbody>
<tr>
<td>Detergent/disinfectant solution is mixed according to manufacturer’s instructions.</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Solution remains in wet contact with surfaces according to manufacturer’s instructions.</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>A new clean, saturated cloth is used in each room. The cloth is also changed when visibly soiled and after cleaning the bathroom.</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Environmental Services staff use appropriate personal protective equipment (<strong>e.g. Gowns and gloves are used for patients/residents on contact precautions upon entry to the contact precautions room.</strong></td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Objects and environmental surfaces in patient care areas that are touched frequently* are cleaned and then disinfected when visibly contaminated or at least daily with an EPA-registered disinfectant.</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>

CDPH Adherence Monitoring tools: [http://www.cdph.ca.gov/hai](http://www.cdph.ca.gov/hai)
Provide Feedback on Adherence Monitoring

• Share adherence monitoring results and CDI incidence with unit staff
• Present results to managers and leadership
  – Use data to focus prevention efforts
  – Use data to get needed resources
Feedback Report Sample

CDPH Contact Precautions Observations, 131 Facilities, 2016

- Single or cohorted correctly: 95%
- HH before entering room: 43%
- PPE before entering room: 78%
- PPE Removed & HH before exiting room: 68%
- Equip cleaned & disinfected: 81%

Notes:
- #Observations: CDPH Contact Precautions Observations, 131 Facilities, 2016
- Successful vs. Missed
Feedback Report Sample

CDPH Environmental Cleaning Observations, 131 Facilities, 2016

- Solution mixed to mfg instructions: 95%
- Contact time to mfg instructions: 37%
- New clean, saturated cloth used in each room: 84%
- Proper PPE: 94%
- High touch objects cleaned daily w/EPA disinfectant: 49%
Preventing CDI: The MOST Important Things

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Resources


Questions?

For more information, please contact any HAI Liaison IP Team member or email HAIProgram@cdph.ca.gov