Investigating
Clostridium difficile Infections

Erin P. Garcia, MPH, CPH
Healthcare-Associated Infections (HAI) Program
Center for Health Care Quality
California Department of Public Health
Objectives

I. Describe roles and responsibilities during healthcare-associated infections (HAI) investigations

II. Review Clostridium difficile infection (CDI) epidemiology and pathogenesis

III. Review steps for CDI cluster and outbreak response

IV. Identify CDI core and supplemental prevention strategies
I. Roles and Responsibilities During HAI Investigations
Roles and Responsibilities: Public Health Authorities

- Local health department (LHD): responsible for ensuring safety of people (and patients) within jurisdiction
- Licensing and Certification (L&C): responsible for ensuring safe care in licensed healthcare facilities
- Healthcare-Associated Infections (HAI) Program: consultative, non-regulatory
Roles and Responsibilities: L&C Program District Offices

- Ensure healthcare facilities are in compliance with applicable state and federal laws and regulations
- Receive reports of unusual occurrences and outbreaks of HAI
Roles and Responsibilities: HAI Program

- Oversee HAI prevention, surveillance, and reporting in California’s general acute care hospitals
- CDPH healthcare epidemiology and infection control subject matter experts
Roles and Responsibilities: Public Health Coordination

- HAI Program provides expert guidance to LHD
- LHD determines follow up actions at the healthcare facility
- L&C ensures facility has and follows corrective action plan that incorporates LHD recommendations
II. *Clostridium difficile* Infection
Epidemiology and Pathogenesis
**Clostridium difficile is…**

- 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 fulminant pseudomembranous colitis; death in up to 9%
**Clostridium difficile Infection Pathogenesis**

- **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.
Healthcare Worker Hands are a Source for *C. difficile* Spores

- 24% of healthcare workers who cared for a patient with CDI had *C. difficile* spores on their hands; spores found on
  - 44% of nursing assistants’ hands
  - 19% of nurses’ hands
  - 23% of physicians’ hands
The Environment is an Important Source of *C. difficile* Transmission

- *C. difficile* spores shed in high numbers, are resistant to desiccation and some disinfectants, and can live on surfaces for up to 5 months
- Admission to a room previously occupied by a patient with CDI is a significant risk factor for *C. difficile* acquisition
Antibiotic Exposure is the Major Risk Factor for CDI when a Patient is also Exposed to C. difficile Spores

- Increases in CDI risk are observed with increased cumulative dose, number of antibiotics, and days of antibiotic therapy.
C. difficile Infection in California

- C. difficile is the most frequently reported healthcare-associated pathogen in hospitals
  - 10,771 healthcare facility-onset CDI cases reported to National Healthcare Safety Network (NHSN) in CA in 2015
  - 8% increase since 2011
Estimated CDI Burden Across the Continuum of Care, California, 2015

Sources: National Healthcare Safety Network (NHSN) and CDC Emerging Infections Program (EIP)

- Community-associated: ~33,500 cases
- Hospital-onset: 10,771 cases
- Nursing home-onset: ~13,200 cases
- Community-onset with recent inpatient exposures: ~16,000 cases
Estimated CDI Burden Across the Continuum of Care, California, 2015, cont’d

Sources: National Healthcare Safety Network (NHSN) and CDC Emerging Infections Program (EIP)

- Community-associated: ~33,500 cases
- Hospital-onset: 10,771 cases
- Nursing home-onset: ~13,200 cases
- Community-onset with recent inpatient exposures: ~16,000 cases
III. Response to Clusters and Outbreaks in Healthcare Settings
HAI Program Assistance to LHD, 2015-2016

- 61 of 97 (63%) consultations for one of three pathogen types
  - Multidrug resistant organisms (MDRO), including C. *difficile*
  - Legionella
  - Hepatitis B and C viruses (HBV, HCV)
HAI Program Assistance by Pathogen, 2015-2016, cont’d

- Legionella: 25%
- Multidrug Resistant Organisms: 25%
- Hepatitis B or C: 13%
- Other: 37%
HAI Program Assistance to LHD for Investigations of Multidrug Resistant Pathogens, 2015-Present

Number of Investigations

<table>
<thead>
<tr>
<th>Pathogen</th>
<th>Number of Investigations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Klebsiella pneumoniae</td>
<td>8</td>
</tr>
<tr>
<td>C. difficile</td>
<td>6</td>
</tr>
<tr>
<td>MRSA</td>
<td>3</td>
</tr>
<tr>
<td>Pseudomonas aeruginosa</td>
<td>3</td>
</tr>
<tr>
<td>Acinetobacter baumanii</td>
<td>2</td>
</tr>
<tr>
<td>E. coli</td>
<td>2</td>
</tr>
<tr>
<td>Enterobacter spp.</td>
<td>1</td>
</tr>
</tbody>
</table>
CDI Outbreak Definition

- An increase in CDI incidence may be an outbreak and warrants public health investigation
- Can be facility wide, unit specific, or occurring within the community and diagnosed upon admission to healthcare facilities
CDI Outbreak Response: Summarize Patient Information

- Develop and summarize patient information in a line list format
- Collect relevant information, including:
  - Date(s) of admission
  - Locations (e.g. wards, units, wings)
  - Symptoms (diarrhea, vomiting, nausea, abdominal pain/cramping, fever)
  - Symptom onset date
  - Antibiotic use within the past 90 days
  - Stool collection date
  - Lab test type(s) and results
### CDI Outbreak Response: Example Line List Template

<table>
<thead>
<tr>
<th>Demographic Information</th>
<th>Admission Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Name</td>
<td>Date of Birth</td>
</tr>
<tr>
<td>Jane</td>
<td>1/1/1900</td>
</tr>
</tbody>
</table>

### Epidemiologic Information

<table>
<thead>
<tr>
<th>Unit/Ward/Wing</th>
<th>Room #</th>
<th>Date(s)</th>
<th>Symptoms</th>
<th>Date(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wing A</td>
<td>214</td>
<td>04/18/2016-05/31/2016</td>
<td>diarrhea</td>
<td></td>
</tr>
<tr>
<td>Wing A</td>
<td>215</td>
<td>05/31/2016-Present</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
CDI Outbreak Response: Review Collected Information

- Assess clinical features to determine whether symptoms are consistent with CDI
- Consider other etiologies
  - Colonization with *C. difficile* can be common in long-term care facilities
  - Positive *C. difficile* toxin tests might reflect colonization rather than infection
- Viral testing can be arranged with the HAI Program if not available at the local public health laboratory
CDI Outbreak Response: Report Appropriately

- All outbreaks must be reported to the LHD
- Outbreaks in licensed healthcare facilities must also be reported to [CDPH Licensing and Certification District Office](https://www.cdph.ca.gov/certlic/facilities/Pages/LCDistrictOffices.aspx)
CDI Outbreak Response: Provide Guidance

• Assess and recommend infection prevention measures to the healthcare facility to minimize transmission
• Consult with the CDPH HAI Program as needed
IV. Core and Supplemental CDI Prevention Strategies
<table>
<thead>
<tr>
<th>Core Prevention Strategies</th>
<th>Supplemental Prevention Strategies</th>
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<tbody>
<tr>
<td>Contact precautions for duration of diarrhea</td>
<td>Extend contact precautions beyond duration of symptoms (e.g., 48 hours); presumptive isolation</td>
</tr>
<tr>
<td></td>
<td>for patient with diarrhea pending confirmation of CDI</td>
</tr>
<tr>
<td>Hand hygiene before, during, and after care of patient</td>
<td>Hand washing (soap and water) before exiting room of CDI patient; universal glove use on units</td>
</tr>
<tr>
<td></td>
<td>with high CDI rates (e.g., in an outbreak setting)</td>
</tr>
<tr>
<td>Cleaning and disinfection of equipment and environment</td>
<td>Use sporicidal agents for environmental cleaning (as adjunct to core)</td>
</tr>
<tr>
<td>Laboratory-based alert system for immediate notification of</td>
<td>Evaluate and optimize testing for CDI</td>
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<td>positive test results</td>
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<tr>
<td>Implement an antimicrobial stewardship program</td>
<td>Track use of antibiotics associated with CDI in the facility</td>
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<tr>
<td>Education of healthcare workers, housekeeping, administration,</td>
<td></td>
</tr>
<tr>
<td>patients, families</td>
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<tr>
<td>Perform CDI surveillance, analysis and reporting</td>
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</tbody>
</table>
Monitor Adherence to CDI Prevention Practices

• Measure adherence to and provide feedback regarding:
  • Contact precautions
  • Hand hygiene
  • Environmental cleaning and disinfection
• **Adherence monitoring tools** are available on the HAI Program website: http://www.cdph.ca.gov/programs/hai/Pages/AdherenceMonitoringTools.aspx
Adherence Monitoring and Feedback

Healthcare-Associated Infections Program Adherence Monitoring
Hand Hygiene

Regular monitoring with feedback of results to staff can improve hand hygiene adherence. Use this tool to identify gaps and opportunities for improvement. Monitoring may be performed in any type of patient care location.

Instructions: Observe at least 10 hand hygiene (HH) opportunities per unit. Observe a staff member and record his/her discipline. Check the box for each hand hygiene opportunity you are observing. Indicate if HH was performed. Record the total number of successful HH opportunities and calculate the hand hygiene adherence rate.

<table>
<thead>
<tr>
<th>HH Opportunity</th>
<th>Discipline</th>
<th>What type of HH opportunity was observed? (select/ 1 per line)</th>
<th>W/ opp</th>
<th>HH1.</th>
<th>HH2.</th>
<th>HH3.</th>
<th>HH4.</th>
<th>HH5.</th>
<th>HH6.</th>
<th>HH7.</th>
<th>HH8.</th>
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<tbody>
<tr>
<td>Example</td>
<td>N</td>
<td>□ before care/entering room* □ before task □ after body fluids □ after care* □ upon leaving room</td>
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</table>

*Remember: Hand hygiene should be performed before and after glove use.
Perform Hand Hygiene Before, During, and After Patient Care

• Proper hand hygiene and glove wearing reduce carriage of \textit{C. difficile} spores on healthcare worker hands

• As a supplemental measure, perform hand washing (soap and water) before exiting room of patient with CDI

• Consider universal glove use for patient care units with high CDI rates
Use Contact Precautions for the Duration of Diarrhea

• Don gowns and gloves for all contact with patients with CDI and environmental surfaces in the patient room
• Use disposable or dedicated patient care equipment
• Clearly communicate contact precautions status at room entrance, at handoff, and during transfers (e.g. with signs)
Contact Precautions - Continued

- Place patients in single occupancy room; if unavailable, cohort with other patients with CDI
  - Presumptively isolate patients with diarrhea pending confirmation of CDI
- Extend use of contact precautions beyond duration of symptoms (e.g. 48 hours) as a supplemental measure
Ensure Thorough Cleaning and Disinfection of CDI Patient Care Areas

- Focus on **high-touch surfaces** and bathrooms
- Ensure terminal cleaning after discontinuation of contact precautions
- Environmental Protection Agency (EPA) list of alternate disinfectants with a label claim for killing *C. difficile* spores: http://www.epa.gov/oppad001/chemregindex.htm
### Target Antimicrobials with High Risk of CDI; Promote Use of Lower Risk Antimicrobials

<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><strong>Fluoroquinolones</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- Stop unnecessary antibiotics in patients with new CDI diagnosis
Ensure Diagnostic Specimens are Properly Collected

- Focus on testing patients with clinically significant diarrhea without other identified causes, e.g., laxative use
  - ≥3 liquid bowel movements in 24 hours
- Ensure specimens are collected and transported promptly to the laboratory
  - Stool conforms to shape of container
- Assure that the laboratory immediately notifies clinicians of positive test results
Collecting a Single Specimen at Onset of Symptoms is Sufficient

- Repeat testing (i.e. as a test of cure) is **not** recommended
- Routine screening of asymptomatic carriers is **not** recommended
Enhance Communication Between Facilities

- CDI status must be communicated to the receiving facility ahead of time to ensure appropriate care is maintained after transfer.
- Patients should not be denied admission into a healthcare facility based on CDI status.
- LHD can set and communicate expectations for facilities to effectively communicate infection control considerations when patients transfer.
**INFECTION CONTROL TRANSFER FORM**

This form should be sent with the patient/resident upon transfer. It is NOT meant to be used as criteria for admission, only to foster the continuum of care once admission has been accepted.

### Demographics

<table>
<thead>
<tr>
<th>Patient/Resident (Last Name, First Name):</th>
<th>Date of Birth: / /</th>
<th>MRN:</th>
<th>Transfer Date: / /</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Sending Facility Name:</th>
<th>Receiving Facility Name:</th>
</tr>
</thead>
</table>

| Contact Name: | Contact Phone: ( ) - |

### Currently in Isolation Precautions?

- □ Yes
- □ No

If Yes, check:
- [ ] Contact
- [ ] Droplet
- [ ] Airborne
- [ ] Other: ________________

- □ No isolation precautions

### Did or does have (send documentation, e.g. culture and antimicrobial susceptibility test results with applicable dates):

<table>
<thead>
<tr>
<th>Organisms</th>
<th>Current (or previous) infection or colonization, or ruling out *</th>
</tr>
</thead>
<tbody>
<tr>
<td>MRSA</td>
<td>□</td>
</tr>
<tr>
<td>VRE</td>
<td>□</td>
</tr>
<tr>
<td><em>Acinetobacter</em> resistant to carbapenem antibiotics</td>
<td>□</td>
</tr>
<tr>
<td><em>E. coli, Klebsiella or Enterobacter</em> resistant to carbapenem antibiotics (CRE)</td>
<td>□</td>
</tr>
<tr>
<td><em>E. coli or Klebsiella</em> resistant to expanded-spectrum cephalosporins (ESBL)</td>
<td>□</td>
</tr>
<tr>
<td><em>C. difficile</em></td>
<td>□</td>
</tr>
<tr>
<td>Other*: ________________</td>
<td>□ (current or ruling out*)</td>
</tr>
</tbody>
</table>

*Additional information if known:

- *e.g. lice, scabies, disseminated shingles, norovirus, flu, TB, etc*

### Symptoms

- □ Cough/uncontrolled respiratory secretions
- □ Incontinent of urine
- □ Vomiting
- □ Acute diarrhea or incontinent of stool
- □ Draining wounds
- □ Other uncontained body fluid/drainage
- □ Concerning rash (e.g.: vesicular)

- □ No symptoms / PPE not required as “contained”

**NOTE: Appropriate PPE required ONLY if incontinent/drainage/rash NOT contained.**
Overview: Responding to CDI Outbreaks

• Assess and recommend key CDI prevention strategies:
  – Regular adherence monitoring with feedback
  – Antimicrobial stewardship targeting CDI
  – Environmental cleaning and disinfection

• Ensure continued CDI surveillance

• Implement a coordinated approach
  – E.g. ensure communication of CDI status for patients being transferred/discharged to other healthcare facilities
Summary

• Public health departments can assist facilities with CDI prevention and control
  – Confirm CDI diagnosis and gather information to focus infection control assessment
  – Recommend strategies to prevent transmission
  – Ensure appropriate notification and reporting
Questions?

For more information or consultation, contact HAIProgram@cdph.ca.gov or (510) 412-6060.
HAI Program Resources

- **CDI Resources Page**
  - CDI Quicksheet
  - Adherence monitoring tools
  - Environmental cleaning and disinfection information
  - Antimicrobial stewardship program examples
  - Interfacility transfer communication tool
  - Additional CDI education and resources
Additional Resources

• **Antibiotic Stewardship for Outpatient Setting:** [https://www.cdc.gov/getsmart/community/improving-prescribing/core-elements/core-outpatient-stewardship.html](https://www.cdc.gov/getsmart/community/improving-prescribing/core-elements/core-outpatient-stewardship.html)

• **Alliance Working for Antibiotic Resistance Education (AWARE):** [http://www.thecmafoundation.org/Programs/AWARE](http://www.thecmafoundation.org/Programs/AWARE)