

# Investigating *Clostridium difficile* Infections

---

---

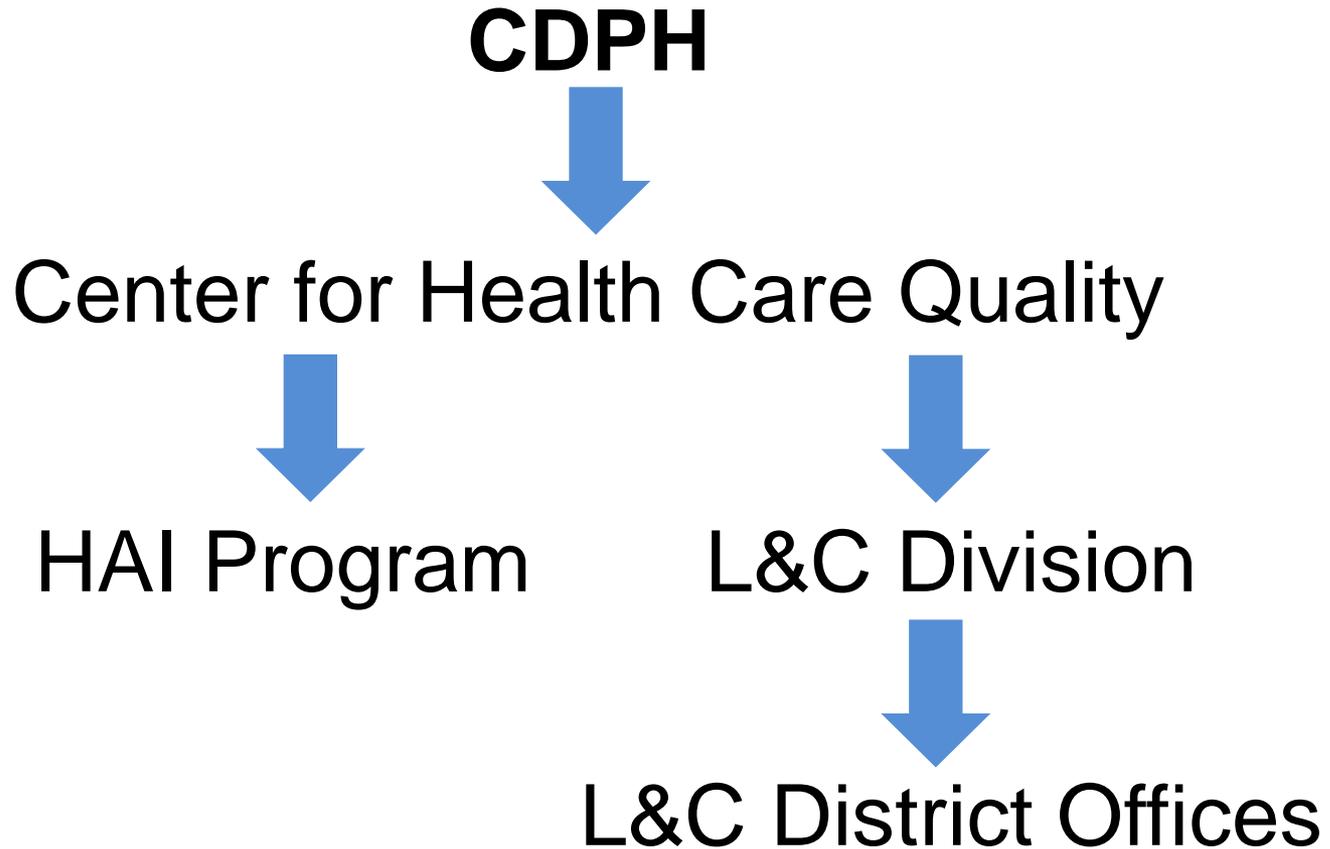
Erin P. Garcia, MPH, CPH  
Healthcare-Associated Infections (HAI) Program  
Center for Health Care Quality  
California Department of Public Health

# 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

# CDPH Structure



# 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

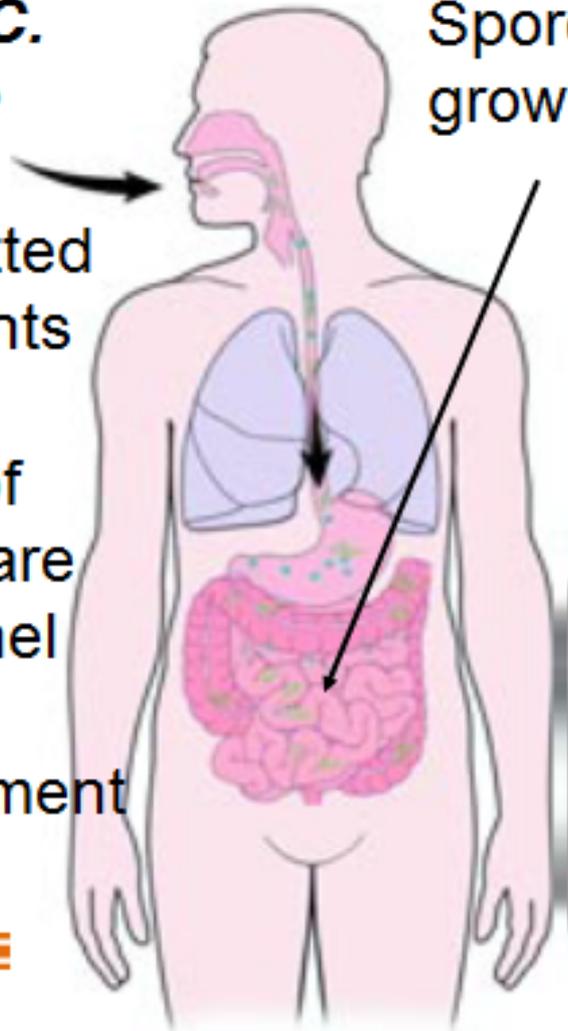
## II. *Clostridium difficile* Infection Epidemiology and Pathogenesis

# *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%

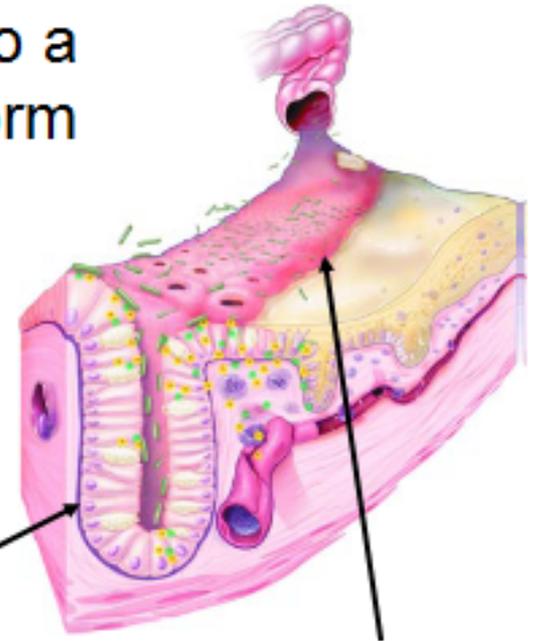
# *Clostridium difficile* Infection Pathogenesis

**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**

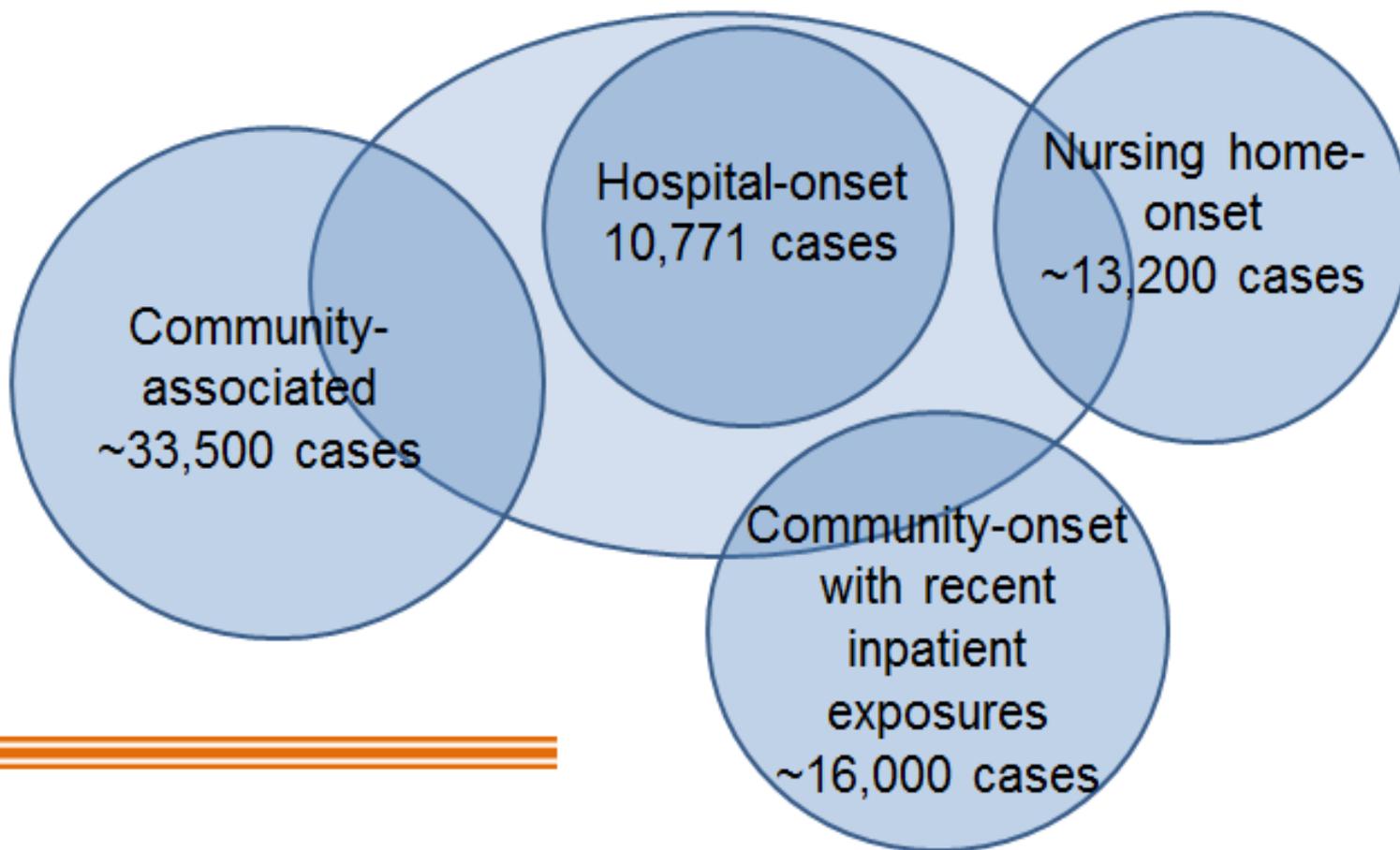
	Days of antibiotics		
	4-7	8-18	>18
Risk of CDI compared to patient on antibiotics <4 days	1.4 times higher	3.0 times higher	7.8 times higher

# *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

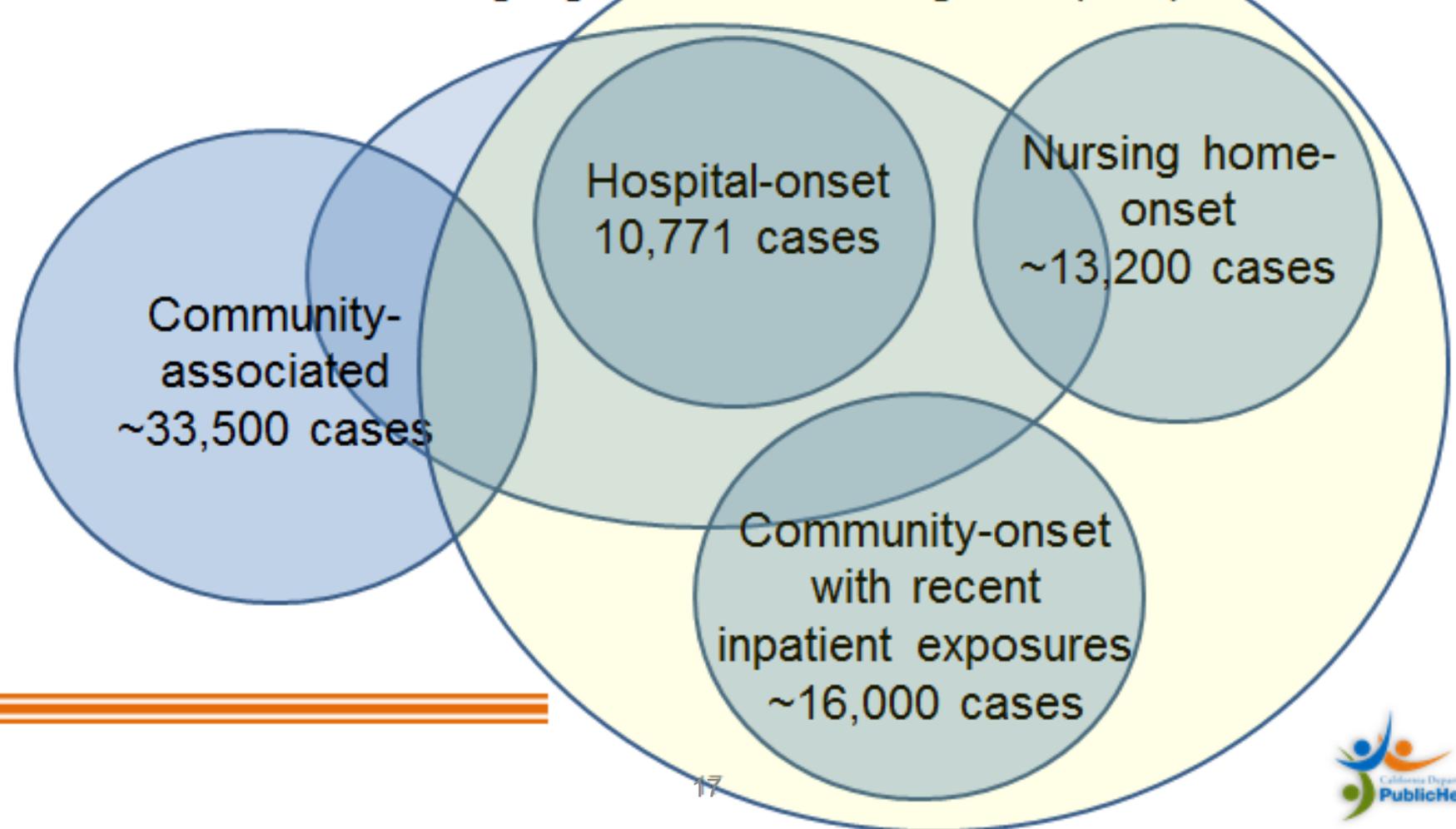
# Estimated CDI Burden Across the Continuum of Care, California, 2015

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



# Estimated CDI Burden Across the Continuum of Care, California, 2015, cont'd

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

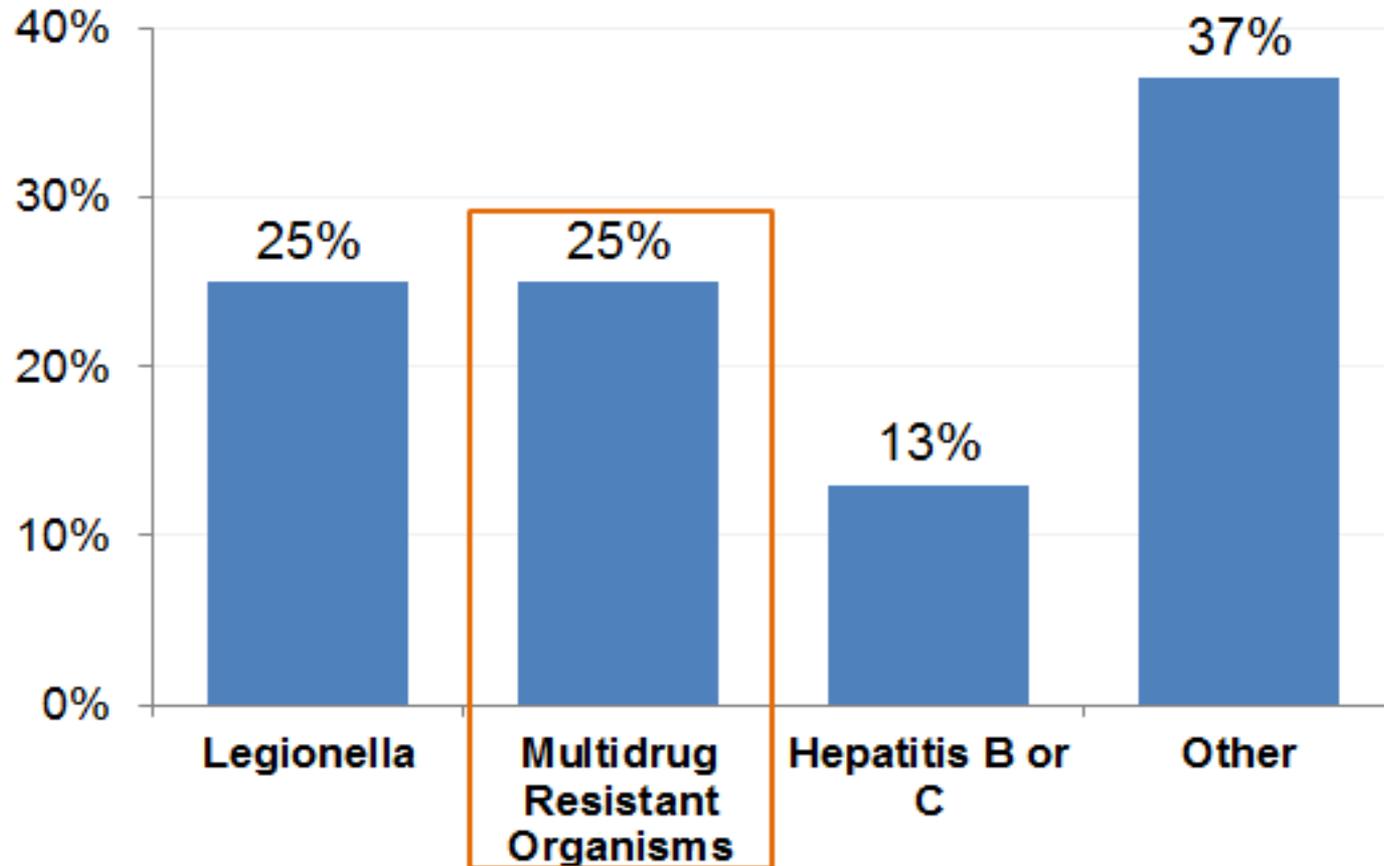


# III. Response to Clusters and Outbreaks in Healthcare Settings

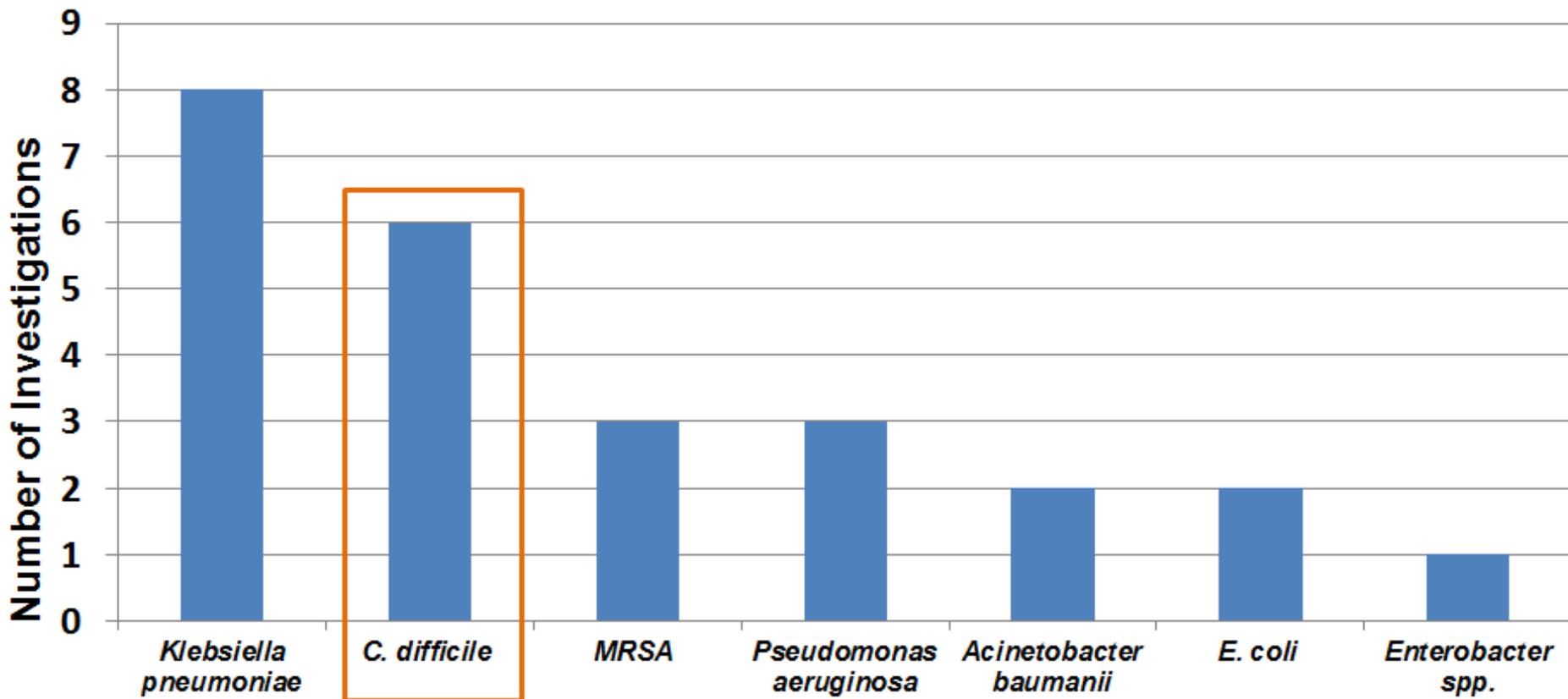
# HAI Program Assistance to LHD, 2015-2016

- 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



# HAI Program Assistance to LHD for Investigations of Multidrug Resistant Pathogens, 2015-Present



# 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

Demographic Information				Admission Information	
First Name	Date of Birth	Sex	Admission Source	Date(s) of Admission	
Jane	1/1/1900	F	acute care	4/18/2016	
Epidemiologic Information					
Unit/Ward/Wing	Room #	Date(s)	Symptoms	Date of Symptom Onset	
<i>list all locations where patient/resident resided in facility</i>					
Wing A	214	04/18/2016-05/31/2016	diarrhea	7/14	
Wing A	215	05/31/2016-Present			

# 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):  
<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

Core Prevention Strategies	Supplemental Prevention Strategies
<b>Contact precautions</b> for duration of diarrhea	<b>Extend contact precautions</b> beyond duration of symptoms (e.g. 48 hours); <b>presumptive isolation</b> for patient with diarrhea pending confirmation of CDI
<b>Hand hygiene</b> before, during, and after care of patient	<b>Hand washing (soap and water)</b> before exiting room of CDI patient; <b>universal glove use</b> on units with high CDI rates (e.g. in an outbreak setting)
<b>Cleaning and disinfection</b> of equipment and environment	Use <b>sporicidal agents</b> for environmental cleaning (as adjunct to core)
Laboratory-based alert system for <b>immediate notification of positive test results</b>	<b>Evaluate and optimize testing</b> for CDI
Implement an <b>antimicrobial stewardship</b> program	<b>Track use of antibiotics associated with CDI</b> in the facility
<b>Education</b> of healthcare workers, housekeeping, administration, patients, families	
Perform <b>CDI surveillance</b> , analysis and reporting	29

# Monitor Adherence to CDI Prevention Practices

- Measure adherence to and provide feedback regarding:
  - Contact precautions
  - Hand hygiene
  - Environmental cleaning and disinfection
- [Adherence monitoring tools](http://www.cdph.ca.gov/programs/hai/Pages/AdherenceMonitoringTools.aspx) 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

Assessment completed by \_\_\_\_\_  
Date: \_\_\_\_\_  
Unit: \_\_\_\_\_

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 the type of hand hygiene opportunity you are observing. Indicate if HH was performed. Record the total number of successful HH opportunities and calculate the adherence percentage.

HH Opportunity	Discipline	What type of HH opportunity was observed? (select/ <input checked="" type="checkbox"/> 1 per line)	Was HH performed?
<i>Example</i>	N	<input type="checkbox"/> before care/entering room* <input type="checkbox"/> before task <input type="checkbox"/> after body fluids <input type="checkbox"/> after care* <input checked="" type="checkbox"/> upon leaving room *Remember: Hand hygiene should be performed before <u>and</u> after glove use	
HH1.		<input type="checkbox"/> before care/entering room <input type="checkbox"/> before task <input type="checkbox"/> after body fluids <input type="checkbox"/> after care <input type="checkbox"/> upon leaving room	
HH2.		<input type="checkbox"/> before care/entering room <input type="checkbox"/> before task <input type="checkbox"/> after body fluids <input type="checkbox"/> after care <input type="checkbox"/> upon leaving room	
HH3.		<input type="checkbox"/> before care/entering room <input type="checkbox"/> before task <input type="checkbox"/> after body fluids <input type="checkbox"/> after care <input type="checkbox"/> upon leaving room	
HH4.		<input type="checkbox"/> before care/entering room <input type="checkbox"/> before task <input type="checkbox"/> after body fluids <input type="checkbox"/> after care <input type="checkbox"/> upon leaving room	
HH5.		<input type="checkbox"/> before care/entering room <input type="checkbox"/> before task <input type="checkbox"/> after body fluids <input type="checkbox"/> after care <input type="checkbox"/> upon leaving room	
HH6.		<input type="checkbox"/> before care/entering room <input type="checkbox"/> before task <input type="checkbox"/> after body fluids <input type="checkbox"/> after care <input type="checkbox"/> upon leaving room	
HH7.		<input type="checkbox"/> before care/entering room <input type="checkbox"/> before task <input type="checkbox"/> after body fluids <input type="checkbox"/> after care <input type="checkbox"/> upon leaving room	
HH8.		<input type="checkbox"/> before care/entering room <input type="checkbox"/> before task <input type="checkbox"/> after body fluids <input type="checkbox"/> after care <input type="checkbox"/> upon leaving room	

# Perform Hand Hygiene Before, During, and After Patient Care

- Proper hand hygiene and glove wearing reduce carriage of *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/chemreg/index.htm)  
<http://www.epa.gov/oppad001/chemreg/index.htm>

# Target Antimicrobials with High Risk of CDI; Promote Use of Lower Risk Antimicrobials

<u>High Risk</u>	<u>Medium Risk</u>	<u>Low Risk</u>
<u>Aminopenicillins</u>	Beta-lactam/beta-lactamase inhibitors	Macrolides
Clindamycin	<u>Carbapenems</u>	Trimethoprim/ <u>sulfamethoxazole</u>
<u>Cephalosporins</u>		<u>Tetracyclines</u>
<u>Fluoroquinolones</u>		

- 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
  - $\geq 3$  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.

Affix any patient labels here.

<b>Demographics</b>	<b>Patient/Resident (Last Name, First Name):</b>		
	<b>Date of Birth:</b> /    /	<b>MRN:</b>	<b>Transfer Date:</b> /    /
	<b>Sending Facility Name:</b>		
	<b>Contact Name:</b>	<b>Contact Phone:</b> (    )    -	
	<b>Receiving Facility Name:</b>		

	<b>Currently in Isolation Precautions?</b> <input type="checkbox"/> Yes <b>If Yes, check:</b> <input type="checkbox"/> Contact <input type="checkbox"/> Droplet <input type="checkbox"/> Airborne <input type="checkbox"/> Other: _____	<input type="checkbox"/> <b>No</b> isolation precautions
--	--	--

<b>Organisms</b>	<b>Did or does have</b> (send documentation, e.g. culture and antimicrobial susceptibility test results with applicable dates):	Current (or previous) infection or colonization, or ruling out *	<input type="checkbox"/> <b>No</b> known MDRO or communicable diseases
	MRSA	<input type="checkbox"/>	
	VRE	<input type="checkbox"/>	
	<i>Acinetobacter</i> resistant to carbapenem antibiotics	<input type="checkbox"/>	
	<i>E. coli, Klebsiella</i> or <i>Enterobacter</i> resistant to carbapenem antibiotics (CRE)	<input type="checkbox"/>	
	<i>E. coli</i> or <i>Klebsiella</i> resistant to expanded-spectrum cephalosporins (ESBL)	<input type="checkbox"/>	
	<i>C. difficile</i>	<input type="checkbox"/>	
	Other^: _____ ^e.g. lice, scabies, disseminated shingles, norovirus, flu, TB, etc	<input type="checkbox"/> <b>(current or ruling out*)</b>	
<b>*Additional information if known:</b>			

<b>Symptoms</b>	<b>Check yes to any that <u>currently</u> apply**:</b> <input type="checkbox"/> Cough/uncontrolled respiratory secretions <input type="checkbox"/> Acute diarrhea or incontinent of stool <input type="checkbox"/> Incontinent of urine <input type="checkbox"/> Draining wounds <input type="checkbox"/> Vomiting <input type="checkbox"/> Other uncontained body fluid/drainage <input type="checkbox"/> Concerning rash (e.g.; vesicular)	<input type="checkbox"/> <b>No</b> symptoms / PPE not required as "contained"
<b>**NOTE: Appropriate PPE required ONLY if incontinent/drainage/rash NOT contained.</b>		

# 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](mailto:HAIProgram@cdph.ca.gov) or (510) 412-6060.

# HAI Program Resources

- [CDI Resources Page](http://www.cdph.ca.gov/programs/hai/Pages/CDIresistancePage.aspx)

<http://www.cdph.ca.gov/programs/hai/Pages/CDIresistancePage.aspx>

- 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>