



# Preventing *Clostridium difficile* Infection (CDI)

All Hands on Deck to Reduce CDI  
Skill Nursing Facility Conference  
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# Learning Objectives

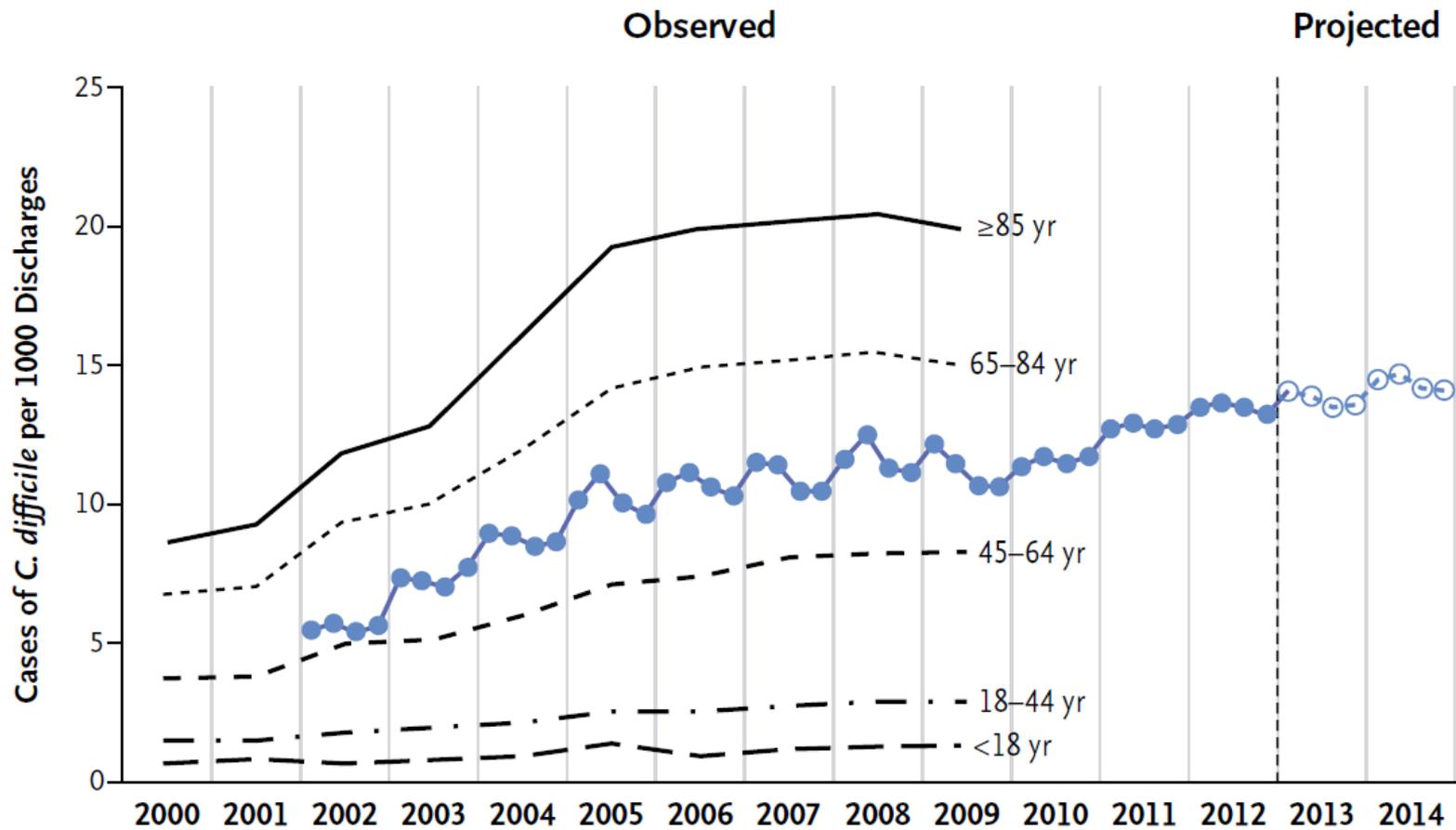
1. Review the evidence for the pathogenesis, epidemiology, incubation period, and transmission of CDI
2. Describe core strategies for the prevention of CDI, including
  - Minimizing the likelihood of transmission by assuring HCW **adherence to contact precautions, hand hygiene, notification and prompt isolation**
  - Ensuring removal of C difficile spores from the environment with **thorough, effective cleaning**
  - Adopting **antimicrobial stewardship** practices that have the greatest CDI impact

# CDI is a Substantial and Increasing Public Health Problem

- *Clostridium difficile* caused an estimated 450,000 illnesses and 29,000 deaths in the US in 2011 (CDC, 2015)
- 10,771 hospital-onset CDI cases reported by California hospitals in 2015
  - 8% increase since 2011



<http://www.cdph.ca.gov/programs/hai/Documents/2015-HAI-in-CA-Hospitals-Annual-Report-2015.pdf>

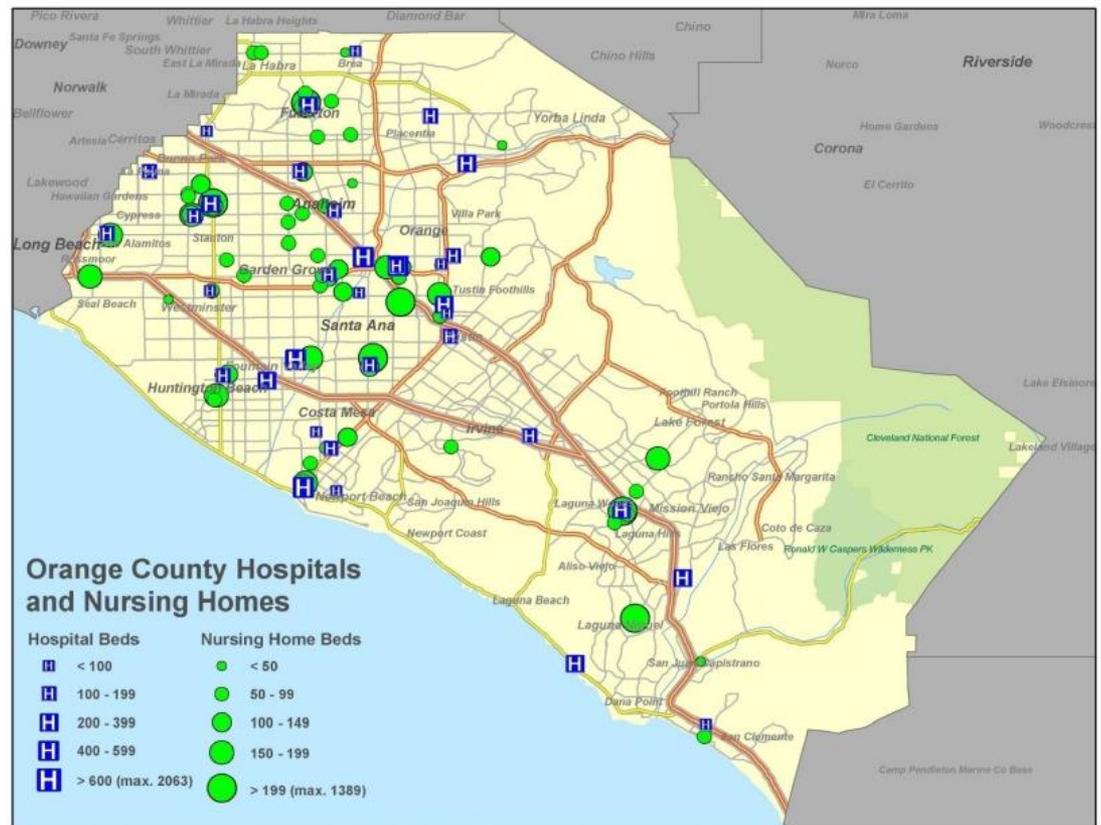


**Figure 2.** Incidence of Nosocomial *Clostridium difficile* Infection.

The overall incidence of nosocomial *C. difficile* infection is shown by year (blue), as is the incidence according to patient age (black). Data are from Steiner et al.<sup>18</sup> and Lessa et al.<sup>24</sup>

# CDI Patients Cycle Among Regional Hospitals and Long-Term Care Facilities

In Orange County, 26% of CDI patients were found to be readmitted to another hospital within 12 weeks of discharge



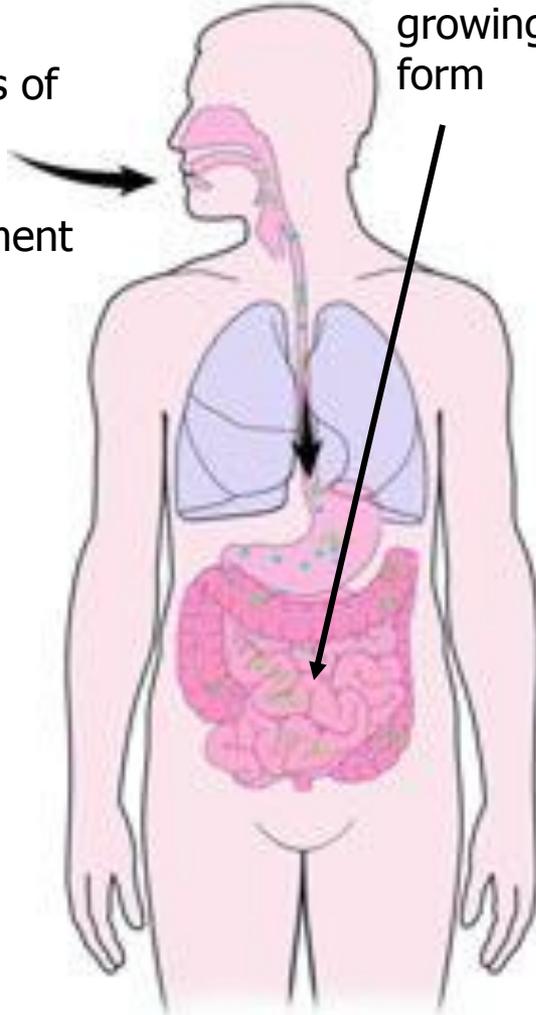
# *Clostridium difficile*



- An anaerobic, gram-positive, spore-forming, toxin-producing bacillus
- Transmitted among humans via fecal-oral route
- The leading cause of antibiotic-associated colitis in hospitals and long term care facilities
  - Severity of CDI ranges from mild to moderate diarrhea to fulminant pseudomembranous colitis
  - Death in up to 9% of CDI cases

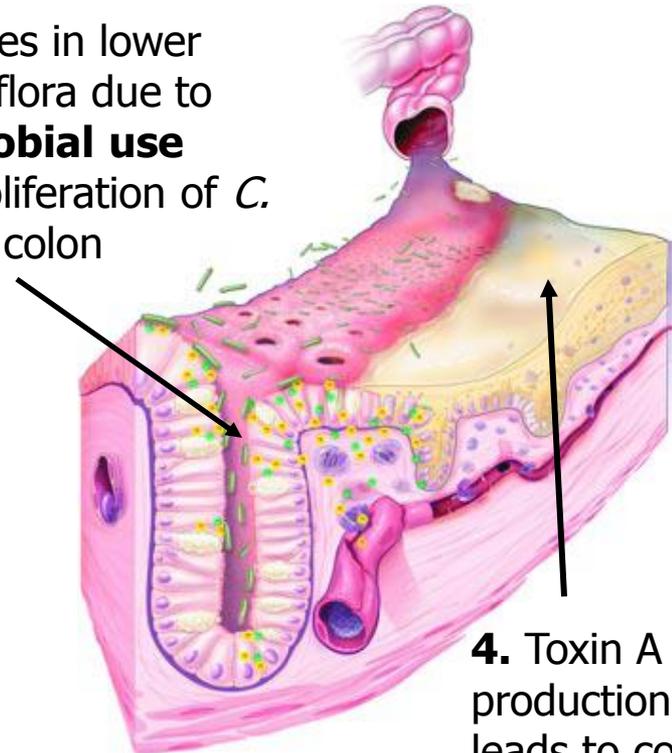
# *Clostridium difficile* Pathogenesis

**1. Ingestion of spores** transmitted to patients via the hands of healthcare personnel and environment



**2. Germination into growing (vegetative) form**

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



**4. Toxin A & B production leads to colon damage**

# CDI Requires a 2-Step Process

- The following events may occur separately and in any order, but **both are required for infection to occur:**
  1. The ***C. difficile* bacterium or spore must be ingested**
  2. The normal **intestinal flora must be compromised** allowing for *C. difficile* to establish itself and proliferate

# How *C. difficile* Spreads -1



George, a 68-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 CDI for several months.

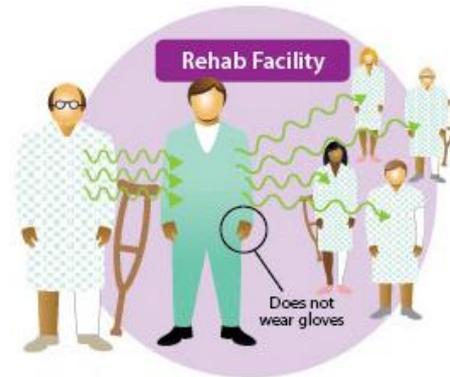
## How *C. difficile* Spreads - 2



One month later -

George breaks his leg and goes to a 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.

## How C. difficile Spreads - 3



Two days later -

George transfers to a rehabilitation facility for improving his leg strength and functionality. He begins to have diarrhea. He is not tested for CDI. The healthcare worker caring for George doesn't wear gloves and infects other rehab patients.

## CDI Incubation Period is Brief

- Incubation period between exposure to *C. difficile* and occurrence of CDI has been estimated in multiple studies to be a **median of 2–3 days**
  - Molecular typing suggests incubation periods are most commonly a few days to 4 weeks
- **Increased risk of CDI can persist many weeks after cessation of predisposing antimicrobial therapy**, resulting from prolonged perturbation of normal intestinal flora



Cohen et al. *Infect Contr Hosp Epidemiol.* 2010;31(5):431-55

Walker et al. *PLoS Medicine.* 2012;9(2):e1001172

# Most “Community-onset” CDI is Related to Prior Hospitalization

- In a prospective study at a university hospital, of 136 patients with CDI, 28% had onset in the community, however **87% were previously hospitalized**

Johal et al. Gut. 2004;53(5):673-77

- In a multicenter study, the **81% of community-onset CDI was associated with a previous hospital stay**

Dubberke et al. Infect Contr Hosp Epidemiology.  
2010;31(10):1030-7

## *Clostridium difficile* is **NOT** a Common Inhabitant of the Healthy Adult GI Tract

- **Only 2–7% of the healthy adult population** have been found to be colonized with *C. difficile*



Cohen et al. *Infect Contr Hosp Epidemiol.* 2010;31(5):431-55  
Gladys et al. *J Clin Microbiol.* 2014;52(7):2406-9

## *C. Difficile* Colonization is Common Among Healthcare Facility Patients; Increases with Prior Healthcare Exposure

- **10% of asymptomatic adult patients upon admission** to a tertiary care hospital were positive for toxigenic *C. difficile*; colonized patients were significantly more likely to have had a recent hospitalization

Leekha, et al. Am J Infect Contr. 2013;41(5):390-3

- **15% of asymptomatic adult patients upon admission** to a large teaching hospital (with or without prior healthcare exposure)

Alasmari, et al. Clin Infect Dis. 2014;59(2):216-222

- **Up to 30% of asymptomatic residents of long-term care facilities;** higher in facilities with a prior CDI outbreak

Laffan, et al. J Am Geriatr Soc 2006;54(7):1068-73

Ziakas, et al. PLoS One 2015;10(2),e0117195.

# Person-to-Person Transmission Within Healthcare Facilities is Well-Documented

- Up to 37% of CDI resulted from **in-ward patient-to-patient transmission**
  - Transmissions most commonly observed during the 1<sup>st</sup> week following the first *C. difficile* positive sample collected from a newly diagnosed patient
- **Both symptomatic CDI patients and asymptomatic *C.difficile*-colonized patients can spread *C.difficile*** to other patients through direct or indirect contact via hands of healthcare workers or the environment



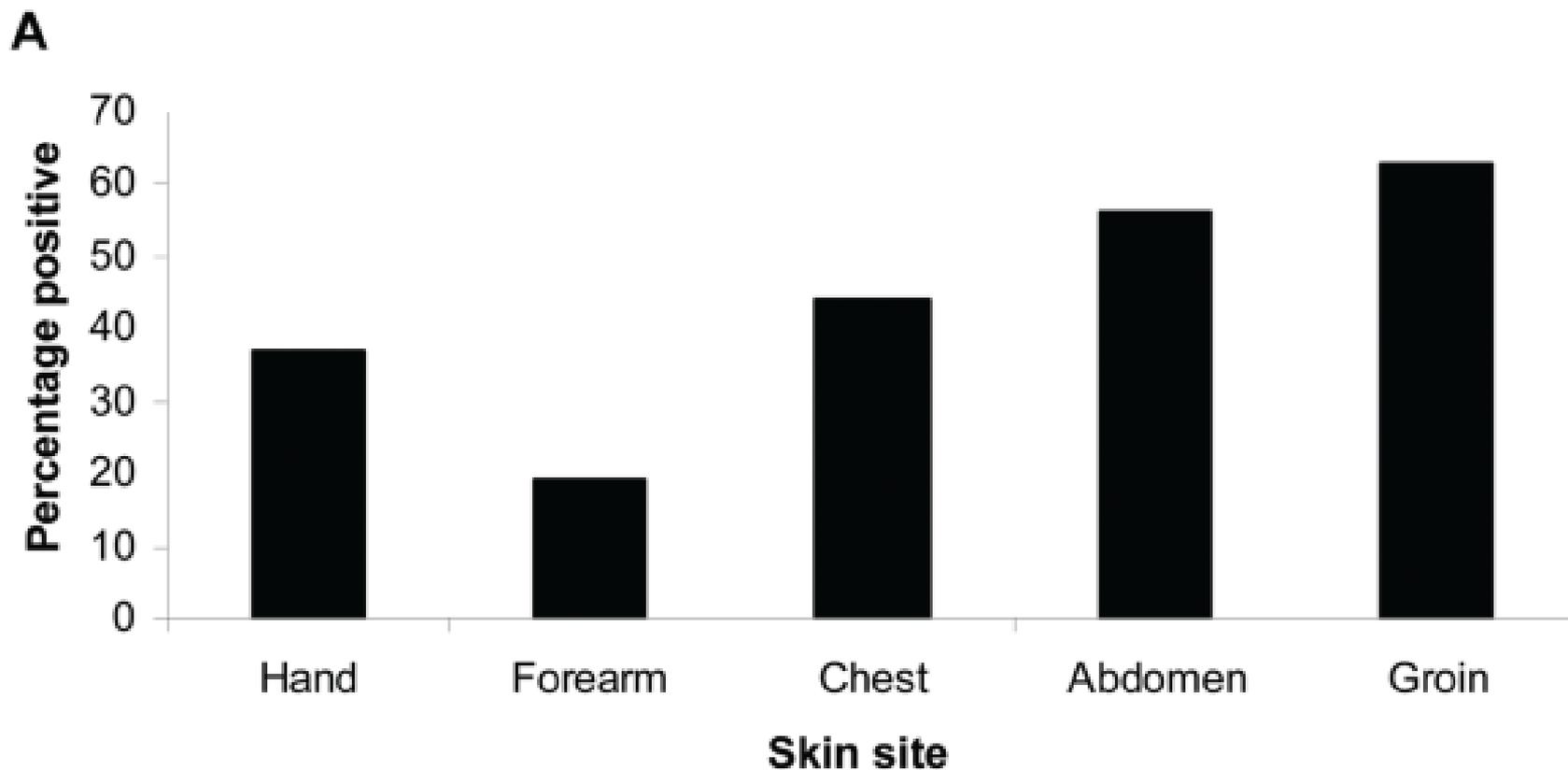
Curry, et al. Clin Infect Dis. 2013;57(8):1094-102.

Walker et al. PLoS Medicine. 2012;9(2):e1001172

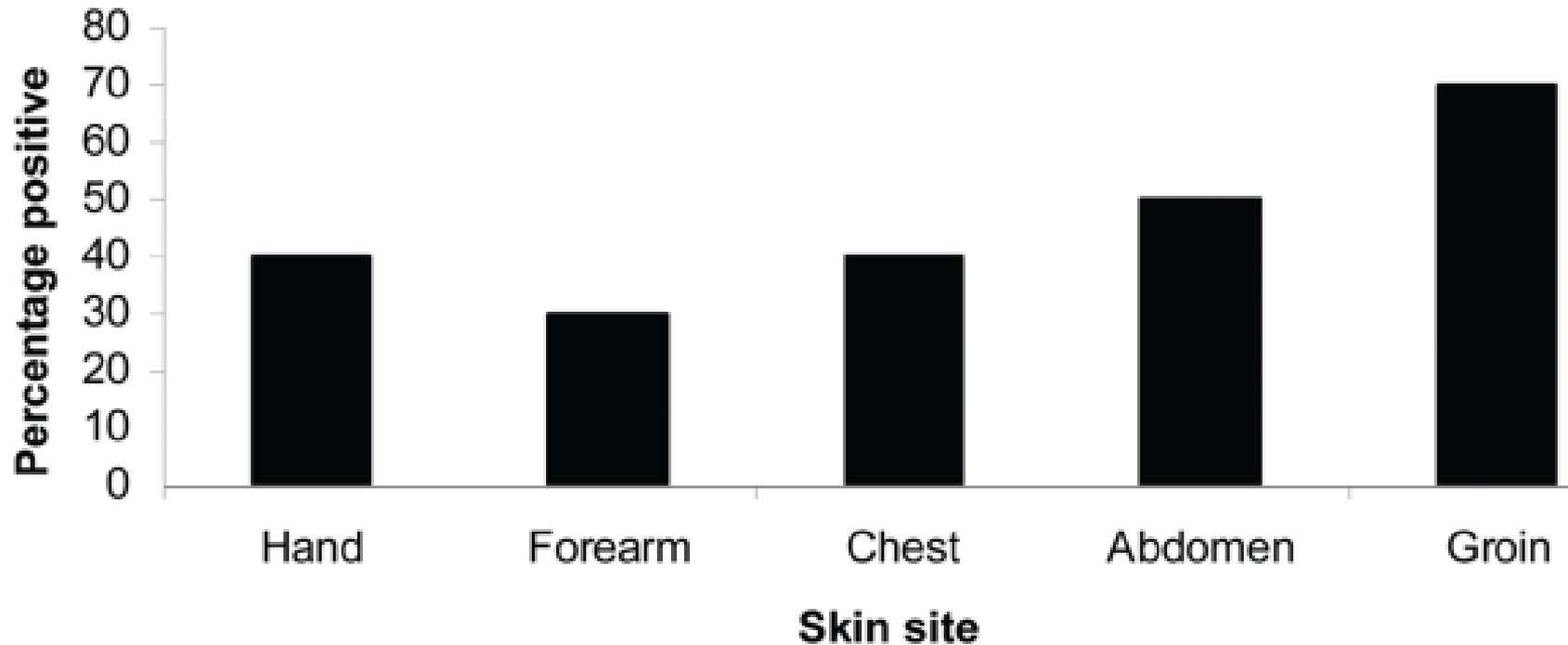
# Hand Hygiene for CDI

- *C. difficile* spores are resistant to alcohol
- **During outbreaks or in settings with hyper endemic CDI, hand hygiene with soap and water is preferred**
  - Be aware that hand hygiene adherence may decrease when soap and water is preferred
  - Clinical studies have not found increase in CDI with alcohol-based hand hygiene products, but several did find reductions in MRSA or VRE
  - Gloves are effective at preventing *C. difficile* contamination of hands





A. Frequency of *C. difficile* contamination of skin sites of patients with CDI

**B**

B. Frequency of *C. difficile* acquisition on sterile gloves after contact with skin sites of patients with CDI

C



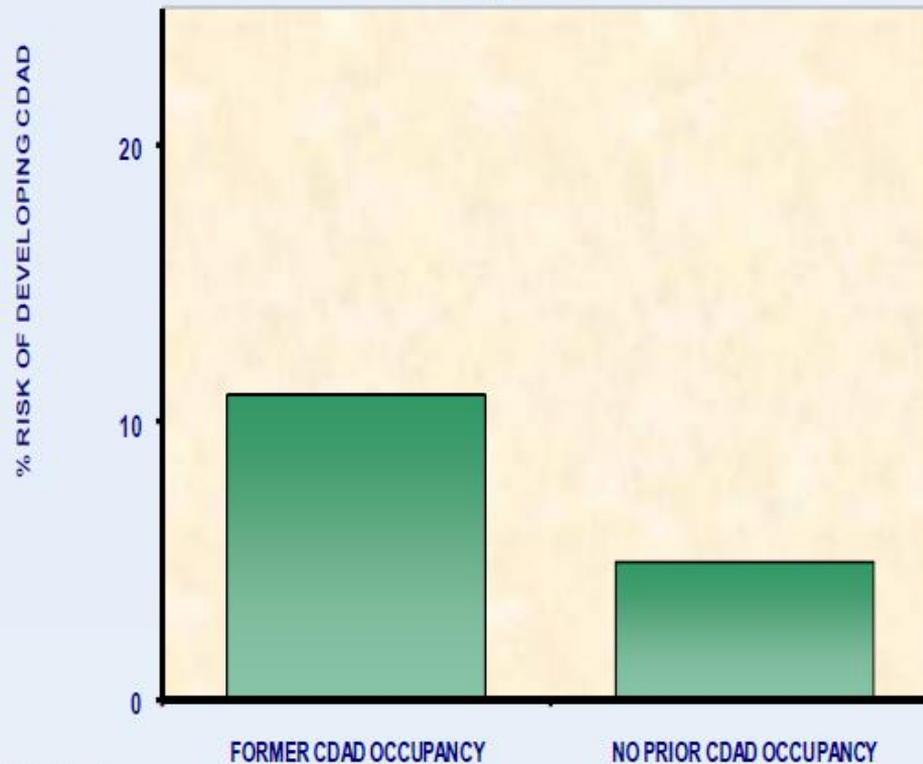
C. Typical illustration of acquisition of *C. difficile* on sterile gloves after contact with a CDI-affected patient's groin.

*Of note, the patient had showered one hour before collection of the specimen.*

# Perform Hand Hygiene to Prevent Carriage of *C. difficile* spores

- **24% of healthcare workers who cared for a CDI patient had *C.difficile* spores on their hands;** spores found on
  - 44% of nursing assistants' hands
  - 19% of nurses' hands
  - 23% of physicians' hands
- **High-risk contact** (i.e., exposure to fecal soiling) and **at least one contact without the use of gloves** were significantly associated with healthcare worker hand contamination with *C.difficile* spores

## *C. difficile* Transmission from Prior Room Occupants



110%  
Increased  
risk

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

# Environmental Cleaning and Disinfection

- Facilities should have clear policies on who is responsible for cleaning each equipment used by HCW
- Provide additional cleaning of “near touch” surfaces
  - HCW disinfection of side rails, over bed tables, IV poles and touch screens
  - Encourage removal of clutter which makes cleaning difficult
- Ensure dedicated non-critical, non-disposable items are cleaned and disinfected following the facility policies
  - Clean and contaminated equipment should be clearly identified

# Why is bleach or a disinfectant with a sporicidal claim used to clean CDI patient rooms?

- ***C. difficile* spores are difficult to kill and adhere to environmental surfaces for extended periods**
- Use of a **1:10 dilution of bleach** (500 ppm) for cleaning of the environment **reduces surface contamination** and is instrumental in **outbreak control**
- Environmental Protection Agency (EPA) provides a list of alternate disinfectants with a label claim for killing *C. difficile* spores at

<http://www.epa.gov/oppad001/chemregindex.htm>



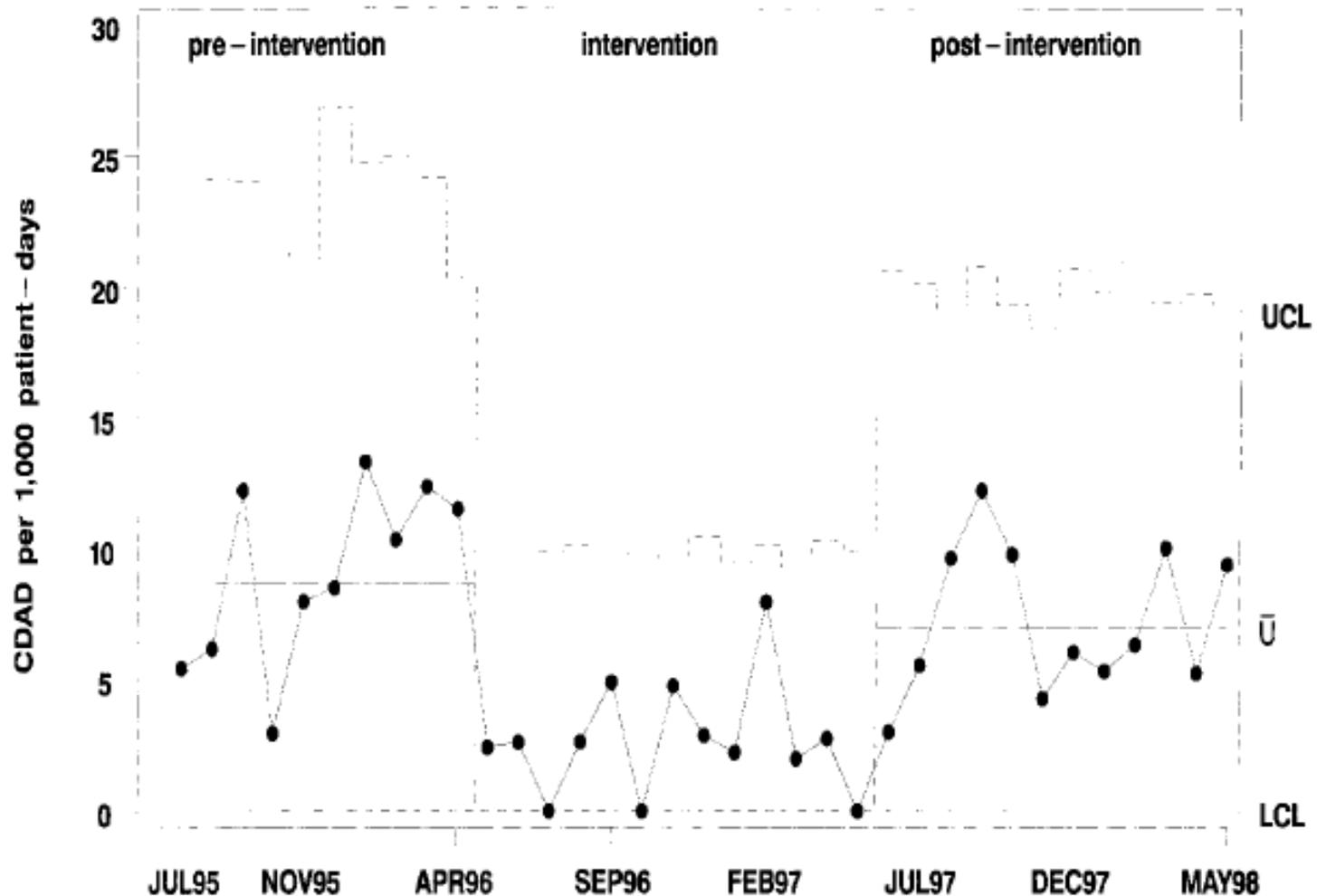
Hota. CID. 2004.

CDC. MMWR. Dec 19, 2003

Rutala et al. Clinical Microbiology Review. Oct 1997

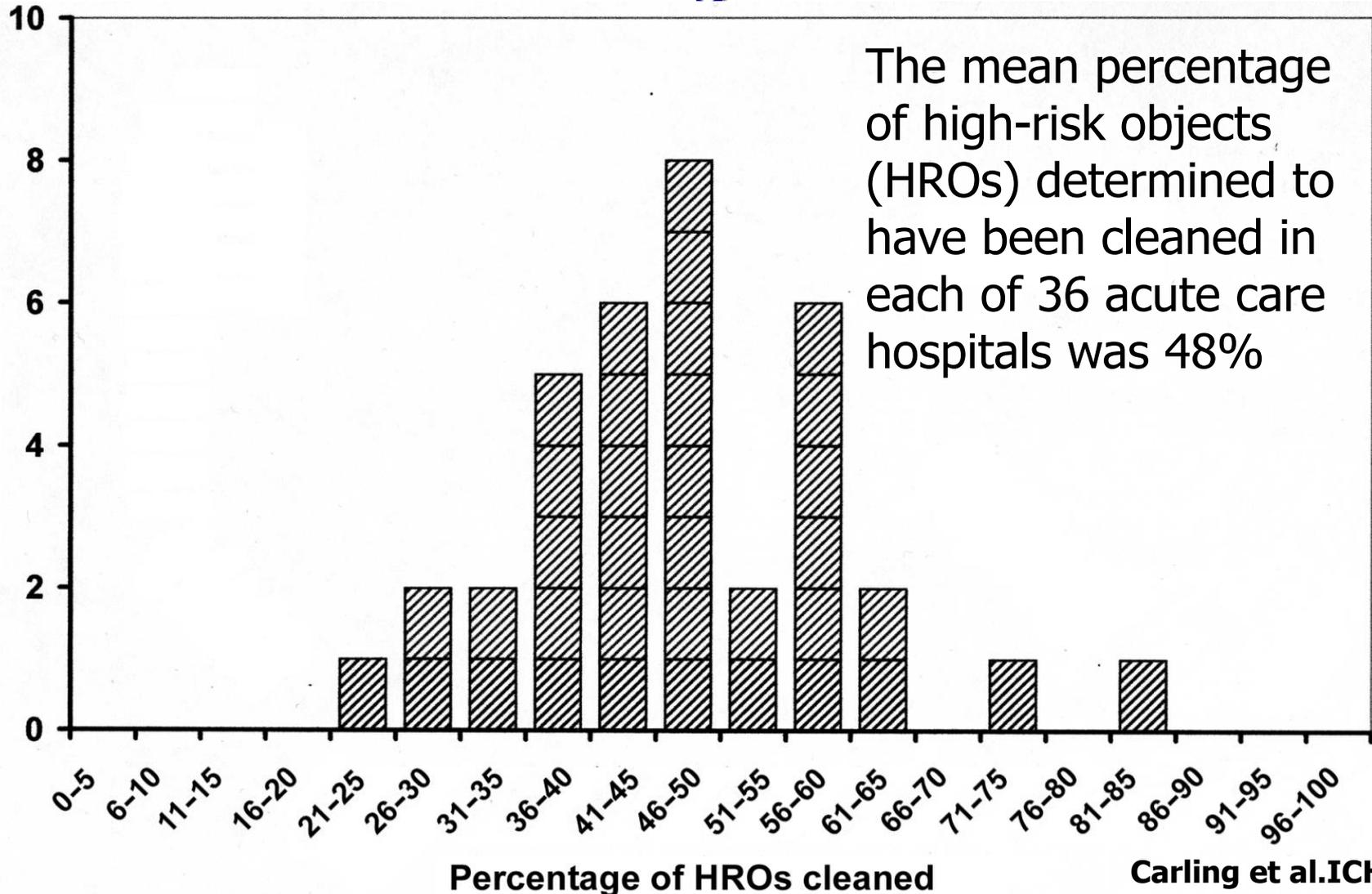
HICPAC /CDC 2008

# Is there evidence that environmental cleaning with bleach can reduce CDI rates on high-incidence units?

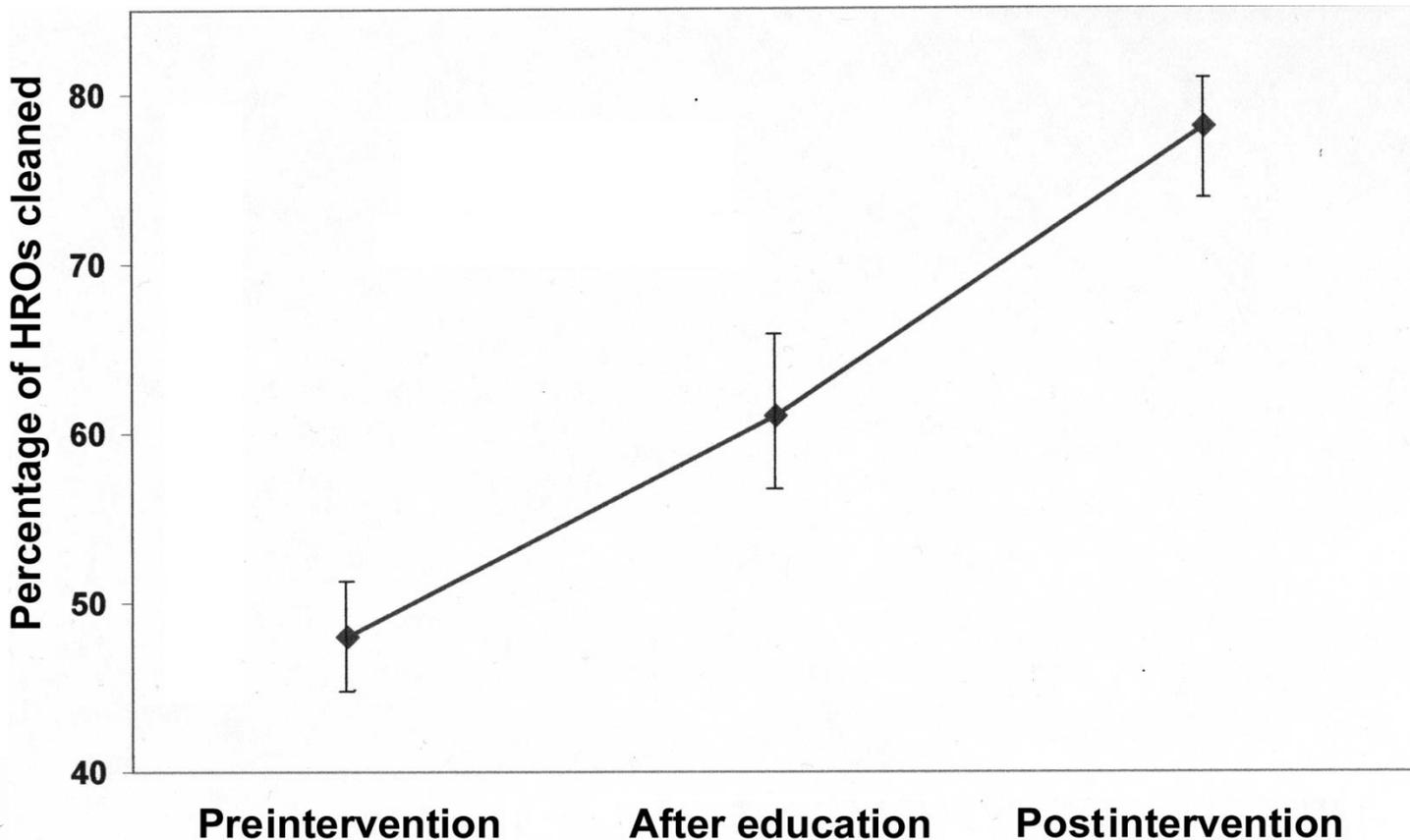


Mayfield et al. Clin Infect Dis. 2000

# Why should we assess adequacy of environmental cleaning?



# Can the use of monitoring technology help improve adequacy of room cleaning?



# Antibiotic exposure is the major risk factor for CDI when a patient is also exposed to the *C. difficile* bacterium or spores

- Increases in CDI risk are observed with **increased cumulative dose, number of antibiotics, and days of antibiotic therapy**

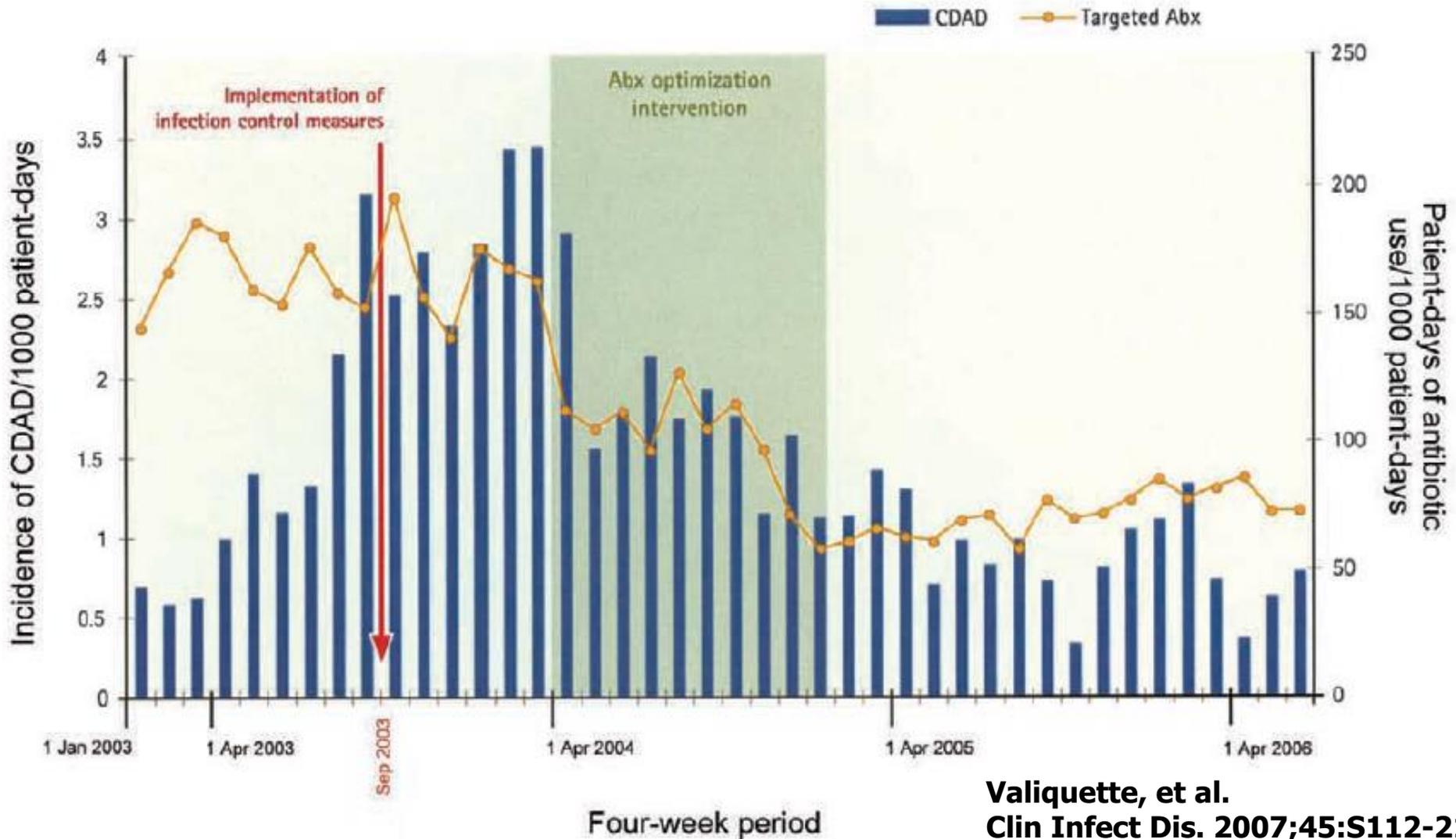
	Number of antibiotics		
	2	3-4	5+
Risk of CDI compared to patient on <b>1 antibiotic</b>	<b>2.5</b> times higher	<b>3.3</b> times higher	<b>9.6</b> times higher
	Days of antibiotics		
	4-7	8-18	>18
Risk of CDI compared to patient on <b>antibiotics &lt;4 days</b>	<b>1.4</b> times higher	<b>3.0</b> times higher	<b>7.8</b> times higher

# Antimicrobial Stewardship Interventions to Address CDI incidence

- **Improved overall antimicrobial prescribing**
  - Fewer patients on antimicrobials →  
Fewer patients develop CDI →  
Fewer CDI patients contribute to transmission
- **Stopping unnecessary antibiotics in patients with new CDI diagnoses**
  - Improves clinical response of CDI to treatment and reduces the risk of recurrent CDI →  
Fewer CDI patients contribute to transmission



# Antimicrobial stewardship targeting antimicrobials associated with CDI can reduce CDI incidence



# Recognize CDI Signs and Symptoms

- Assess for diarrhea symptoms and duration
- Review recent history of healthcare exposure, hospitalization, clinic visits, long term care stay, history of recent antibiotics
- Collect stool samples for testing that meet laboratory requirements
  - See Bristol Stool Chart for an example of stool quality to be submitted
- Communicate and document test results

# Enhance Communication Between Facilities

- Each facility has a key role in communicating CDI status for patients being transferred/discharged to other health care facilities
  - Work with discharge planners and case management to communicate CDI onset, treatment, diarrhea status
  - Provide nursing report/handoff including CDI history, date of onset, current/past treatment, diarrhea status
- Improve coordination to ensure patients with CDI continue appropriate treatment and that appropriate infection control precautions for CDI patients are maintained

### 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.

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

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

Organisms	Did or does have (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"/> No 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</i> , <i>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^: _____	<input type="checkbox"/> (current or ruling out*)		
^e.g. lice, scabies, disseminated shingles, norovirus, flu, TB, etc			
*Additional information if known:			

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

PPE	PERSONAL PROTECTIVE EQUIPMENT CONSIDERATIONS
	  
CHECK ALL PPE TO BE CONSIDERED AT RECEIVING FACILITY	
ANY YES → Answers to sections above ALL NO → Person completing form: _____ Date: __/__/__ Role: _____	

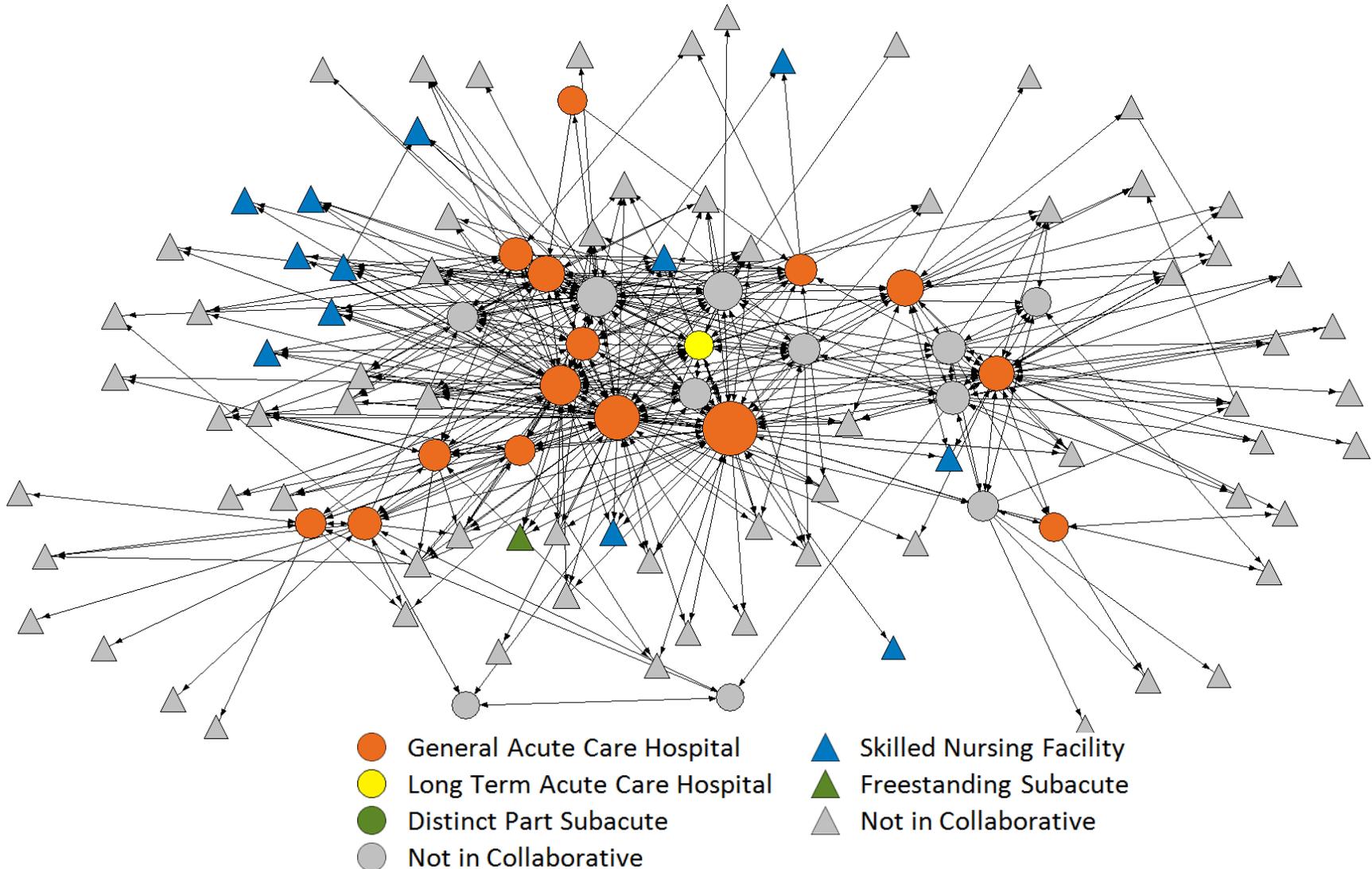
Other MDRO Risk Factors	Is the patient <u>currently</u> on antibiotics? <input type="checkbox"/> Yes <input type="checkbox"/> No				
	Antibiotic	Dose, Frequency	Treatment for:	Start date:	Stop date:

Does the patient <u>currently</u> have any of the following devices? <input type="checkbox"/> Yes <input type="checkbox"/> No	
<input type="checkbox"/> Central Line/ PICC, Date inserted: __/__/__	<input type="checkbox"/> Subrapubic catheter
<input type="checkbox"/> Hemodialysis Catheter	<input type="checkbox"/> Percutaneous gastrostomy tube
<input type="checkbox"/> Urinary Catheter, Date inserted: __/__/__	<input type="checkbox"/> Tracheostomy
	<input type="checkbox"/> Fecal management system

IZ	Were immunizations received at sending facility? <input type="checkbox"/> Yes <input type="checkbox"/> No
	If yes, specify: _____ Date(s): _____



# Participate in Local and Regional CDI Prevention Activities



# Framework for a Regional Approach to CDI Prevention

A network of healthcare facilities with a shared patient population address CDI prevention across the continuum of care through:

- 1. Monitoring adherence** to CDI prevention practices in hospitals and long-term care facilities
  - Hand hygiene
  - Contact precautions
  - Inter-facility communication
- 2. Starting or enhancing an Antimicrobial stewardship program** with particular attention to CDI
- 3. Performing thorough Environmental Cleaning - evaluating and enhancing**

# Regional CDI Prevention Collaborative - Objectives

- **Strengthen *Clostridium difficile* infection (CDI) prevention practices** in healthcare facilities
- **Enhance communication and coordination** among healthcare facilities across the continuum of care
- **Reduce CDI in vulnerable populations and our community**

# Facilities work together to protect patients.

## Common Approach *(Not enough)*

- Patients can be transferred back and forth from facilities for treatment without all the communication and necessary infection control actions in place.

## Independent Efforts *(Still not enough)*

- Some facilities work independently to enhance infection control but are not often alerted to antibiotic-resistant or *C. difficile* germs coming from other facilities or outbreaks in the area.
- Lack of shared information from other facilities means that necessary infection control actions are not always taken and germs are spread to other patients.

## Coordinated Approach *(Needed)*

- Public health departments track and **alert** health care facilities to antibiotic-resistant or *C. difficile* germs coming from other facilities and outbreaks in the area.
- Facilities and public health authorities share information and implement shared infection control actions to stop spread of germs from facility to facility.



Figure from CDC Vital Signs:

<http://www.cdc.gov/vitalsigns/stop-spread/index.html>

# Summary: 6 Steps to CDI Prevention

1. Prescribe and use antibiotics carefully.
  - About 50% of all antibiotics given are not needed, unnecessarily raising the risk of CDI.
2. Test for *C. difficile* when patients have diarrhea while on antibiotics or within several months of taking them.
3. Isolate patients with *C. difficile* immediately.

# Summary: 6 Steps to CDI Prevention

(continued)

4. Wear gloves and gowns when treating patients with *C. difficile*, even during short visits. Hand sanitizer does not kill *C. difficile*, and hand washing may not be sufficient.
5. Clean room surfaces with bleach or another EPA-approved, spore-killing disinfectant after a patient with *C. difficile* has been treated there.
6. When a patient transfers, notify the new facility if the patient has CDI or was found to be colonized with *C.*

*difficile.*



# Questions?

For more information, please contact  
The HAI Program at  
[HAIProgram@cdph.ca.gov](mailto:HAIProgram@cdph.ca.gov)

Thank you

