
Oregon *Clostridium Difficile* Initiative

from spores to sporicidals

Healthcare-Associated Infections Program
Acute and Communicable Disease Prevention
Oregon Public Health Division

Ohd.acdp@state.or.us

971-673-1111, #3

Oregon
Health
Authority



(Enter) DEPARTMENT (ALL CAPS)
Current as of 12/1/2015

Overview

- Biology and human disease
- Why is it an healthcare-associated infection (HAI)?
- What is the burden of CDI?
- What we can do? How?
 - Prepare infrastructure, capacity, and processes
 - Early Recognition and Detection
 - Infection control: contact precautions and hand hygiene
 - Infection control: environmental cleaning
 - Antibiotic stewardship
 - Treatment
 - Surveillance
 - Interfacility communication
- What are you doing now?

BIOLOGY & HUMAN DISEASE

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Let's begin at the beginning

- *Clostridium* spp. are ancient **spore-forming anaerobes**
- Soil, water, food, bodies, waste
- Long-time human **toxin-producing** pathogens:
 - *Clostridium tetani*.....tetanus
 - *Clostridium botulinum*.....botulism
 - *Clostridium septicum*.....fatal sepsis
 - *Clostridium difficile*.....colitis



Clostridium difficile infection

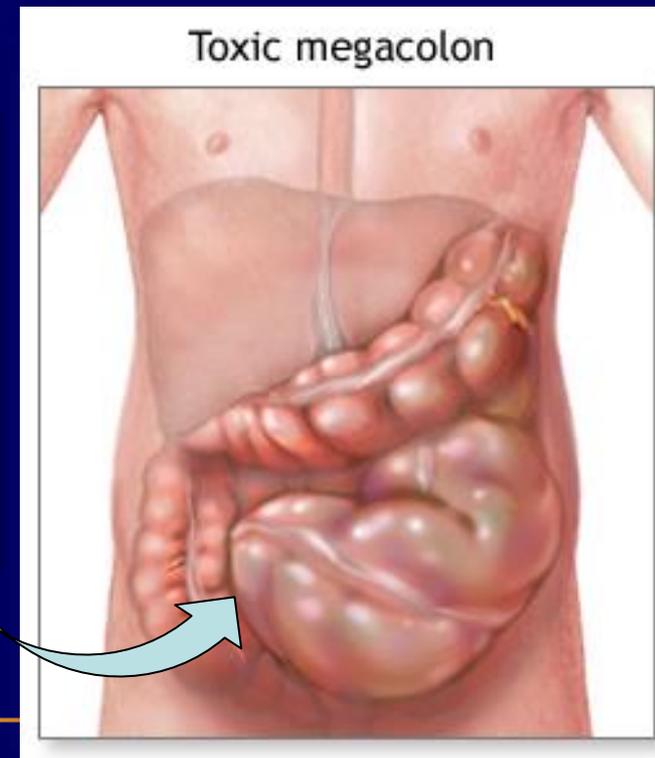
- Fecal-oral transmission of hardy spores
 - Environment
 - Hands of healthcare workers caring for CDI-positive patients
 - CDI-positive persons
 - Asymptomatic carriers
- Spores germinate (vegetative form)
- Make **toxins A & B**
- Incubation: median <7 days



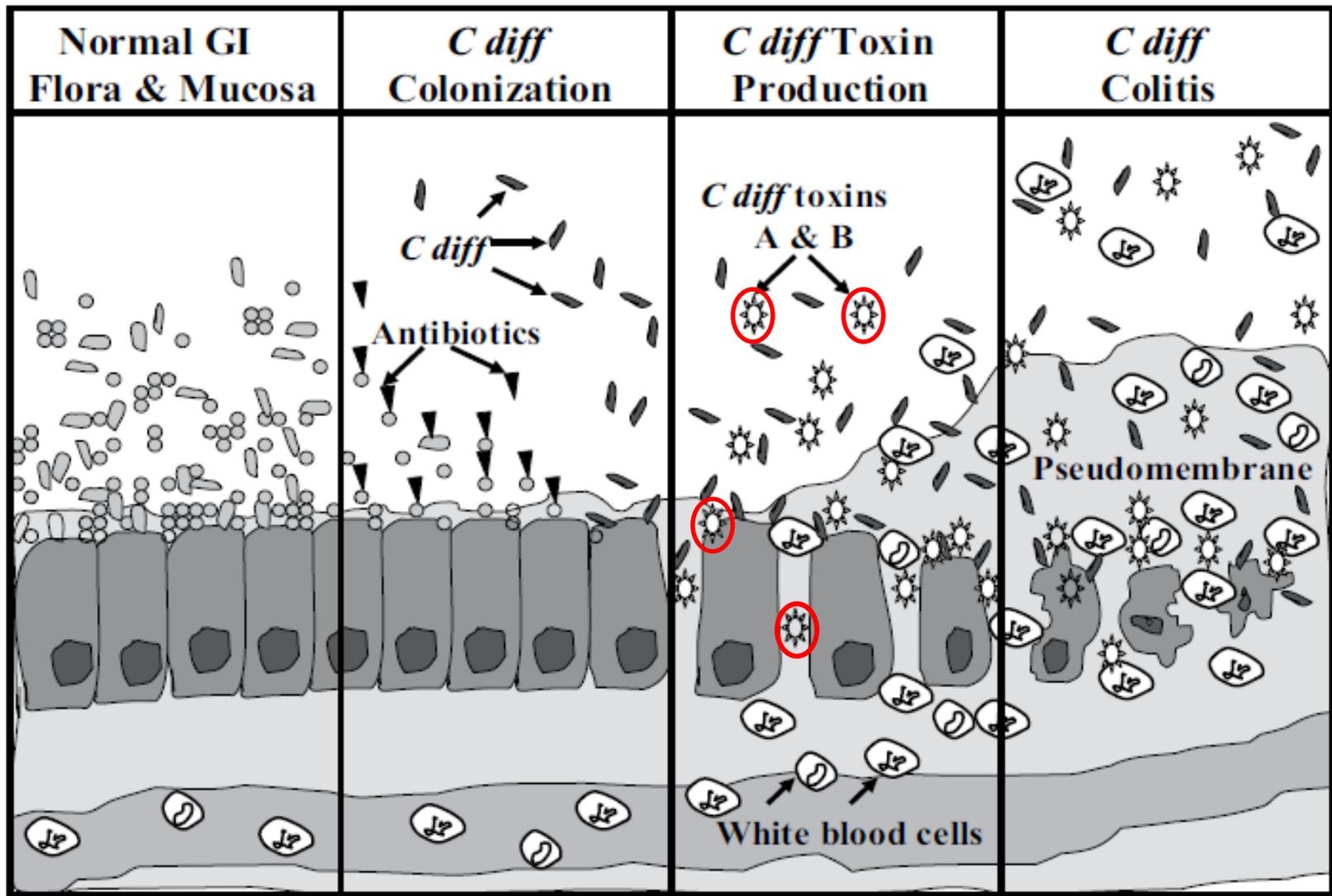
Gram-positive rods of *C. difficile*

Clostridium difficile disease

- No disease: asymptomatic carrier, antibodies
- Diarrhea with recovery: colitis, develop antibodies
- Diarrhea with recurrence: colitis, no antibodies
- **Diarrhea with severe disease: pseudomembranous colitis, toxic megacolon, sepsis, death**



Phase A → Phase B → Phase C → Phase D



Phases of pathogenesis of *C. difficile* colitis. APIC, 2013: Figure 10.1

Epidemic strain of *C. difficile*

- B1/NAP1/027, toxinotype III
- Epidemic since 2000; out of eastern Canada
- More resistant to fluoroquinolones
 - Higher MICs
- More virulent
 - Increased toxin A and B production
 - Polymorphisms in binding domain of toxin B
 - Increased sporulation
- Some testing algorithms include this strain
- Oregon: 16% (11 of 68) strains with PFGE performed

McDonald et al. *N Eng J Med* 2005;353:2433–41.

Wary et al. *Lancet* 2005;366:1079–84.

Stabler et al. *J Med Micro* 2008;57:771–5.

Akerlund et al. *J Clin Microbiol* 2008;46:1530–3.

EIP Oregon data, 2010–2013, partial data.

WHY IS CDI AN HAI?

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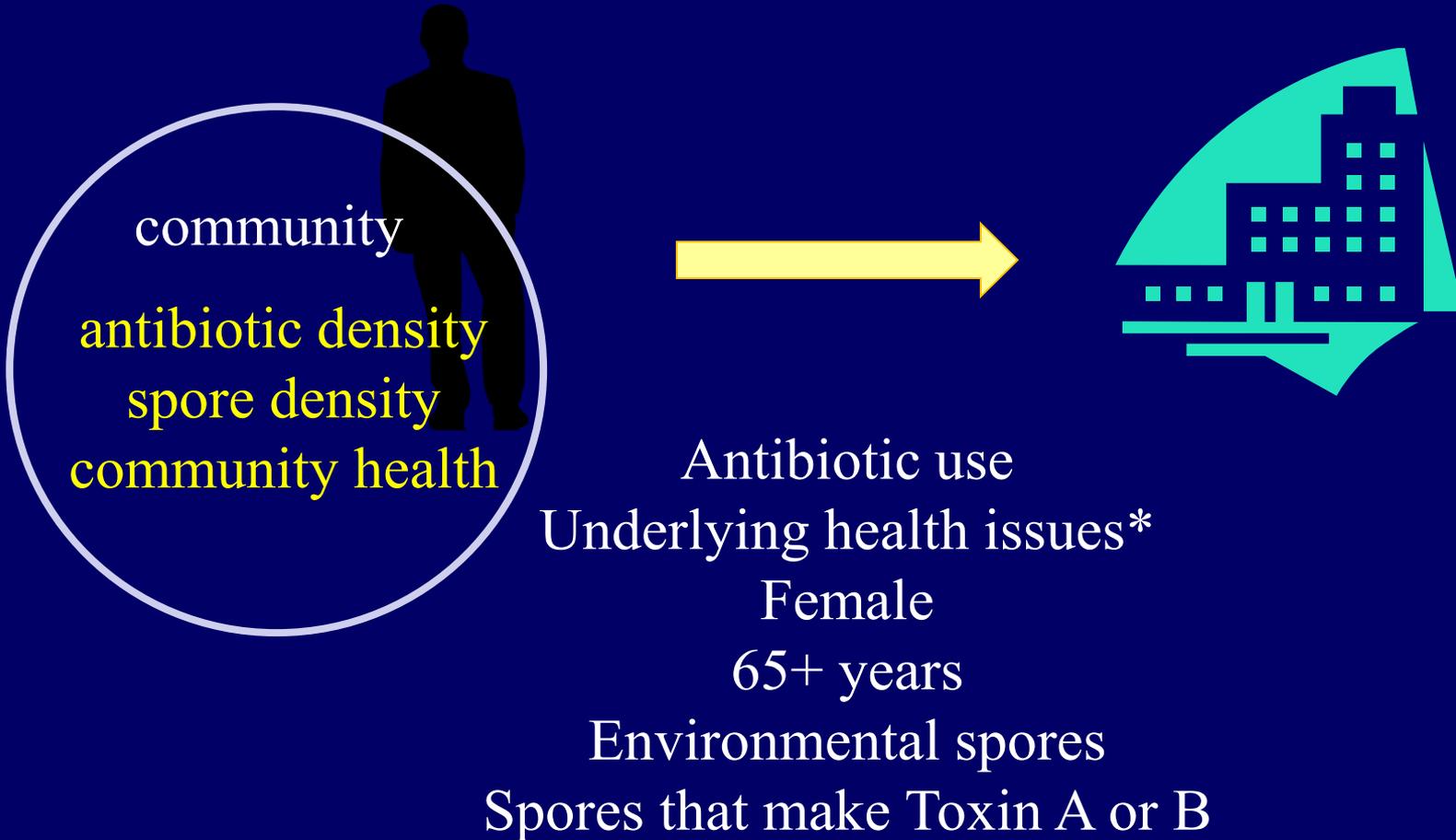
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Why does CDI occur?

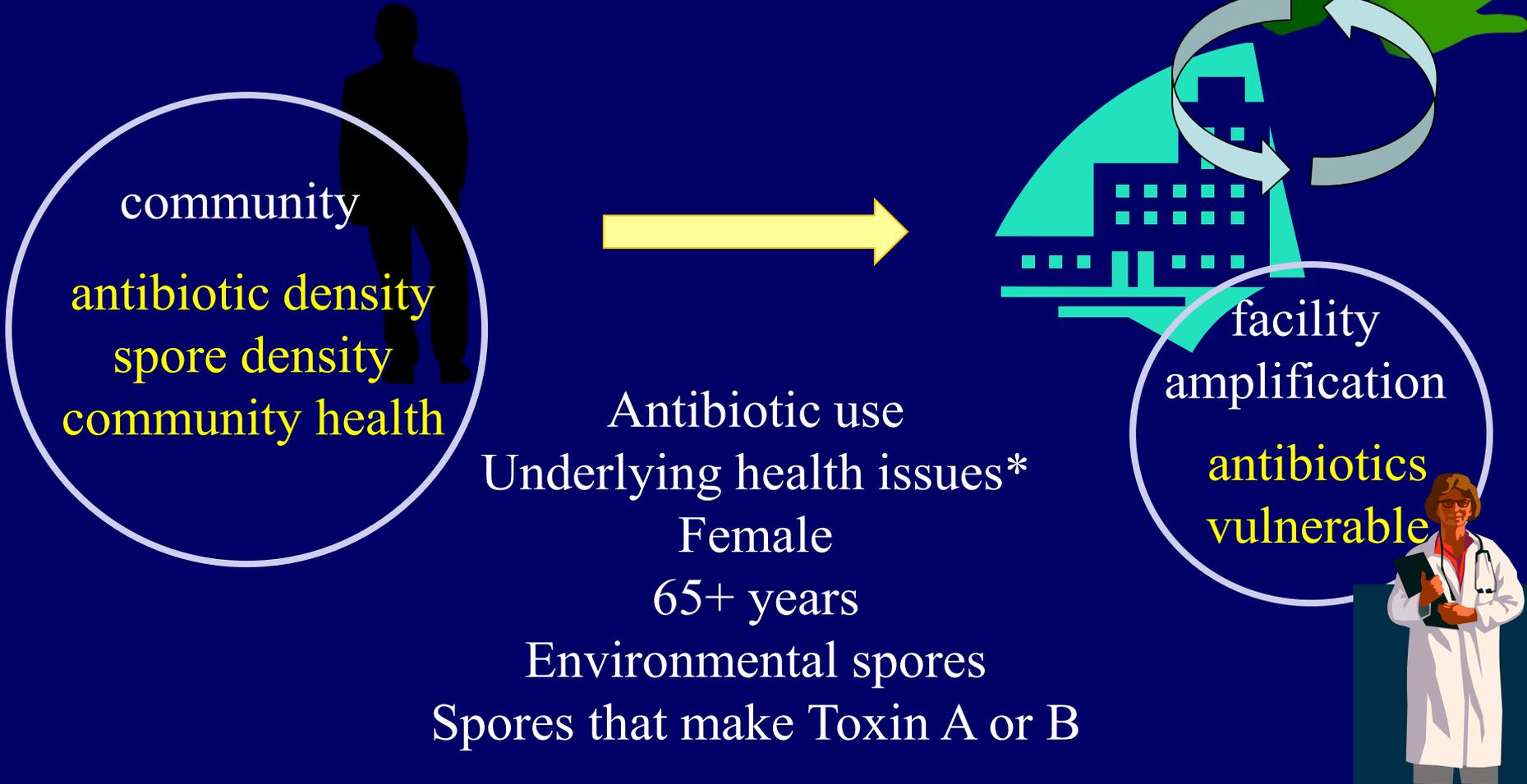


Antibiotic use
Underlying health issues*
Female
65+ years
Environmental spores
Spores that make Toxin A or B

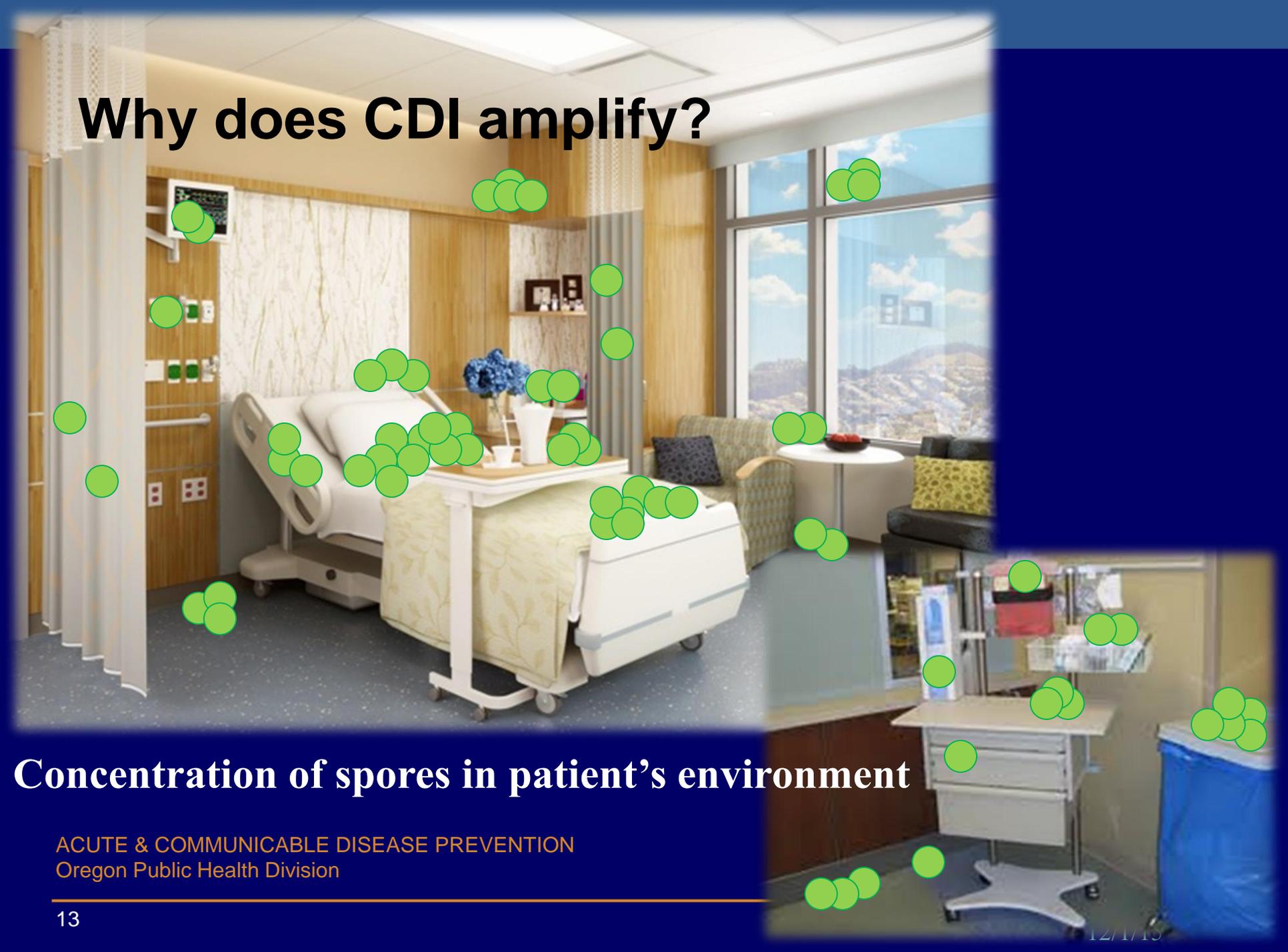
Why does CDI occur?



Why is CDI considered an HAI?



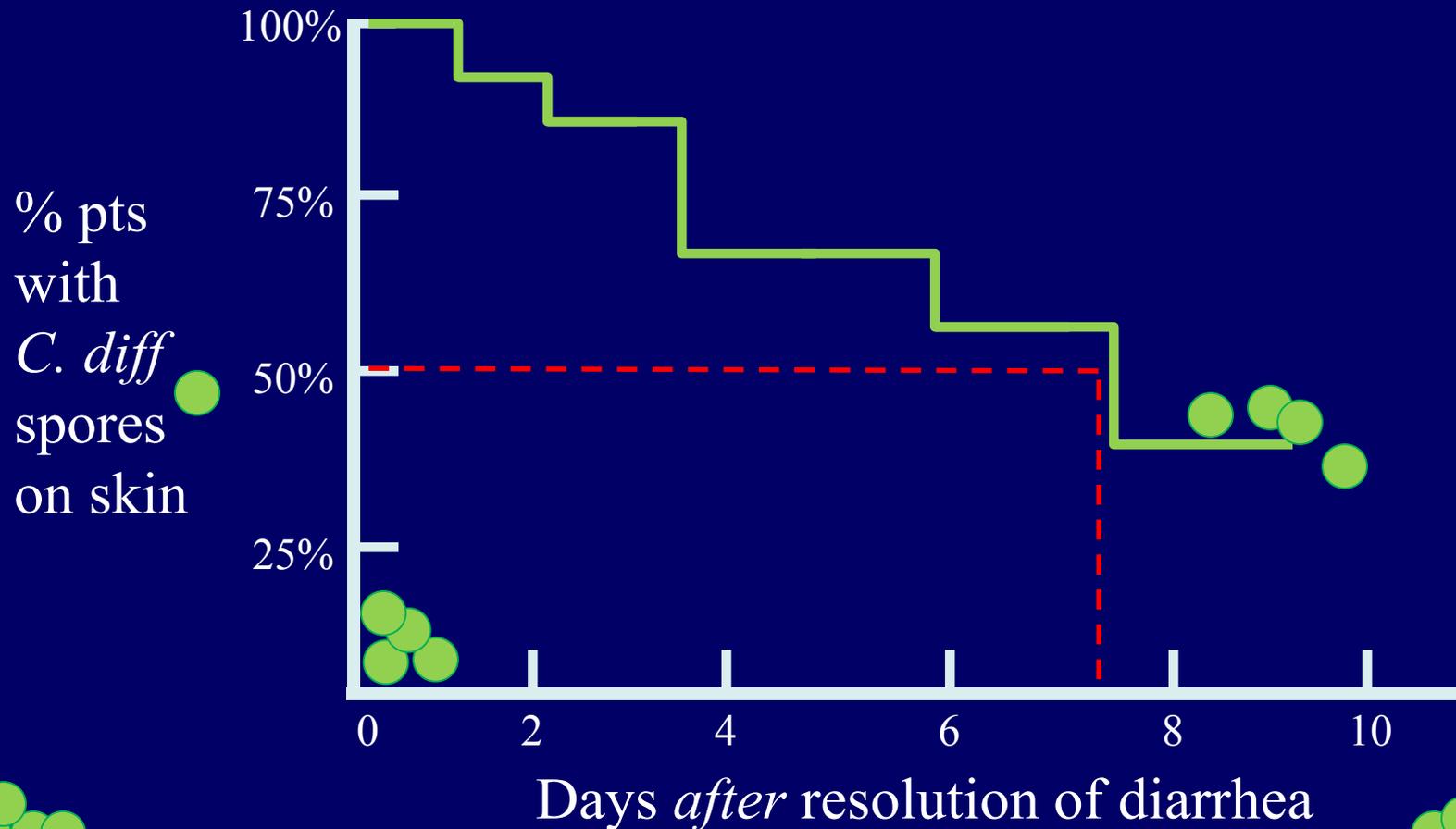
Why does CDI amplify?



Concentration of spores in patient's environment

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Why extend gloves and gowns after diarrhea has ended?



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Cleaning Tactics

- Bleach kills spores, whereas other standard disinfectants do not
- Limited data suggest bleach (1:10 dilution) reduces *C. difficile* transmission
 - Prepare fresh daily
 - If commercial, EPA-label as “sporicidal” (List K)



July 8, 2014

LIST K: EPA's Registered Antimicrobial Products Effective against *Clostridium difficile* Spores

EPA Reg. No.	Primary Registered Product Name
777-83	LYSOL BRAND DISINFECTANT BLEACH PLUS
1043-124	HASTE-SSD-COMPONENT B
1043-125	HASTE-SSD-COMPONENT A
1672-65	AUSTIN A-1 ULTRA DISINFECTING BLEACH
1672-67	AUSTIN'S A-1 CONCENTRATED BLEACH 8.25%



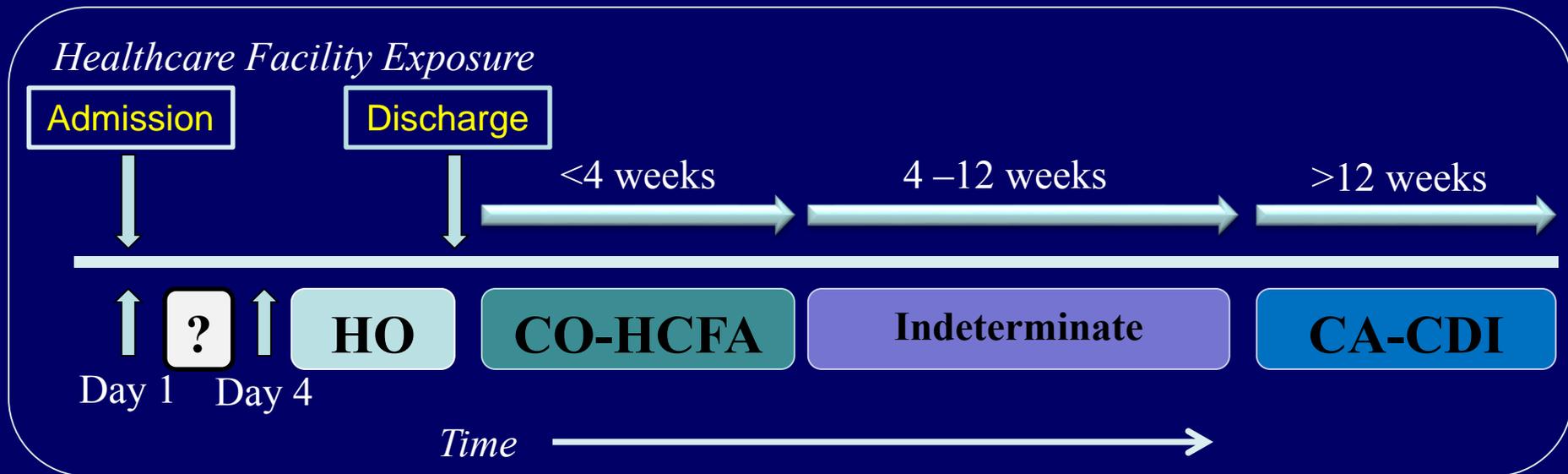
WHAT IS THE BURDEN OF CDI?

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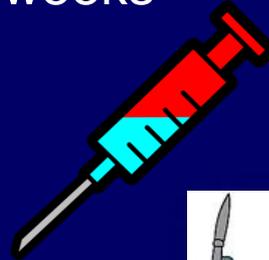
Quick Primer on CDI Surveillance

- Surveillance categorizes CDI by where *presumably* acquired
 - HO: Healthcare-Onset (hospital or LTCF)
 - CO-HCFA: Community-Onset, Healthcare Facility Associated
 - CA: Community-Associated



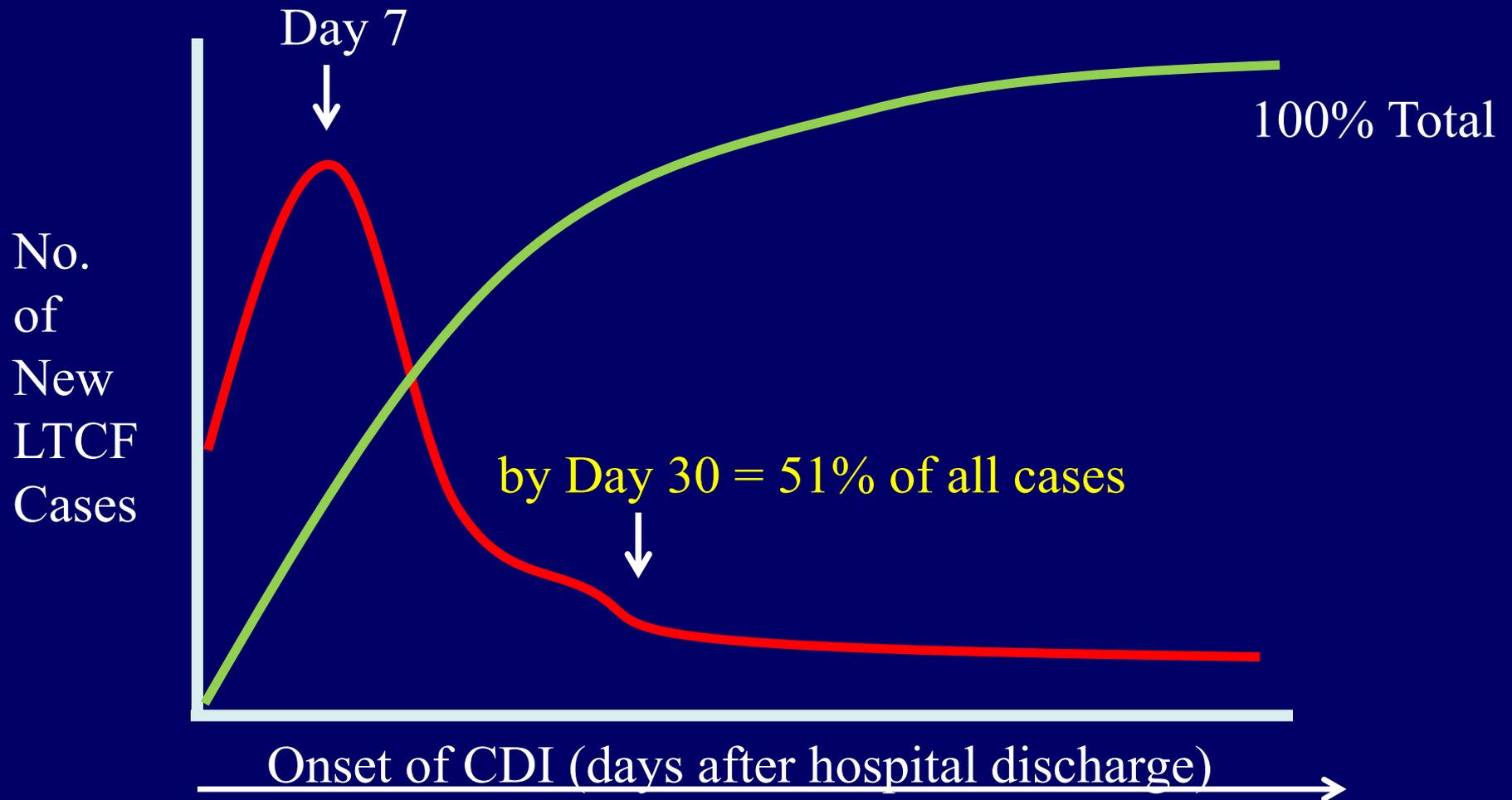
LTCF-onset CDI closely related to Hospital rates over time

- NYC CDI Surveillance
- Reviewed 425 LTCF patients diagnosed with CDI
- 64% (272/425) of new (incident) LTCF residents with CDI had acute care exposure in prior 12 weeks
 - 88% received antibiotics
 - 28% had surgery



Yikes!

Onset of CDI after Hospital Discharge



Burden of CDI in United States, 2011

- 34 counties across U.S.; 1 rural Oregon county (pop 66,299)
- 15,461 CDI cases onset 2011
- 66% Healthcare-associated; 24% HO

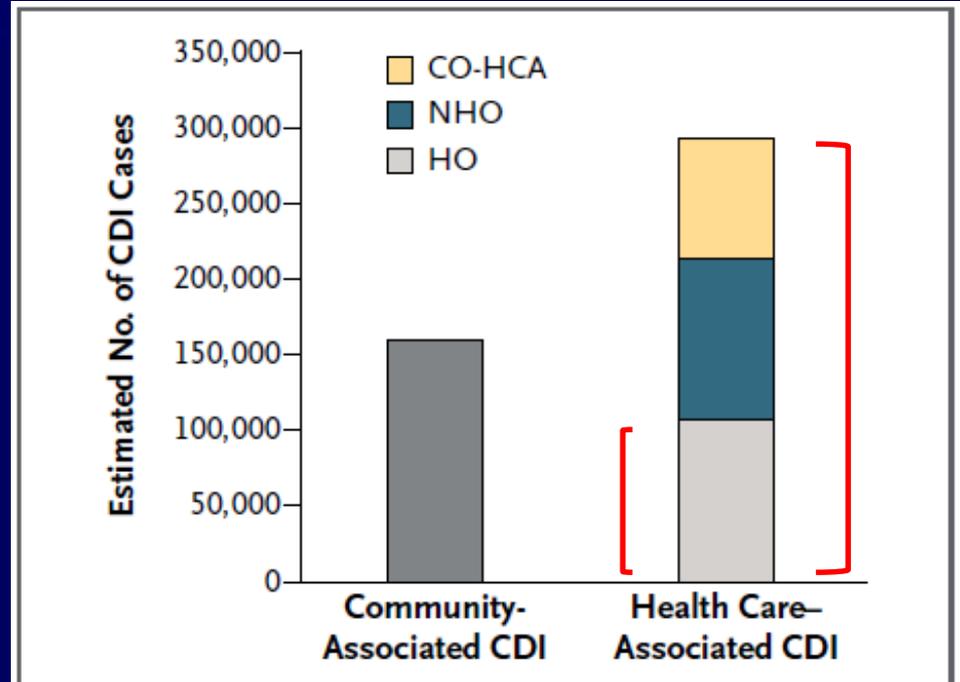
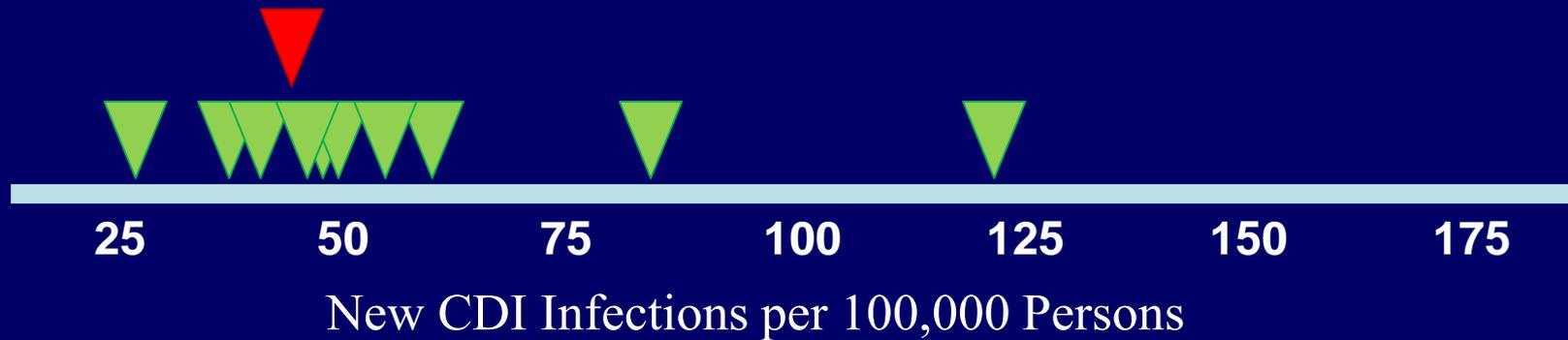


Figure 1. Estimated U.S. Burden of *Clostridium difficile* Infection (CDI), According to the Location of Stool Collection and Inpatient Health Care Exposure, 2011.

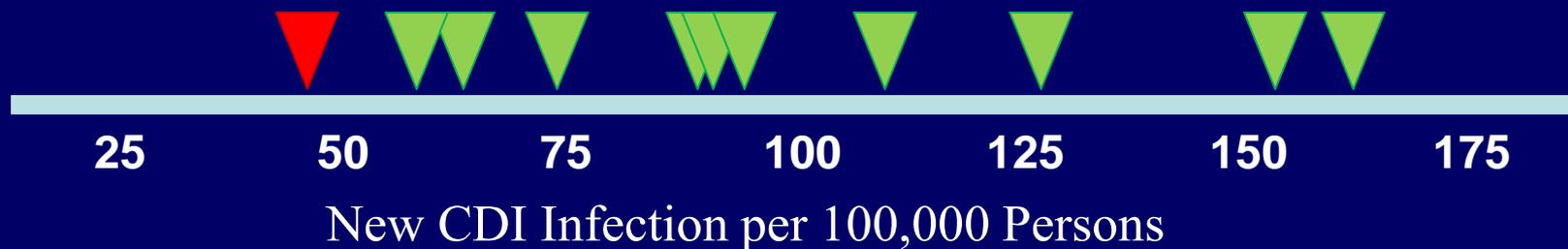
Of the estimated cases of community-associated CDI, 82% were estimated to be associated with outpatient health care exposure.¹¹ CO-HCA denotes community-onset health care-associated infection, HO hospital onset, and NHO nursing home onset.

New CDI Infections, by state

Community-Associated (no healthcare contact in >12 weeks)



Healthcare-Associated (short- or long-term healthcare contact)



Estimated Burden of CDI in Oregon

Community-Associated

- U.S.: 51.9 cases per 100,000 persons (range: 26.7–123.7)
- Oregon: 2,060 persons*

Healthcare-Associated

- U.S.: 95.3 cases per 100,000 persons (range: 47.3–159.1)
- Oregon: 3,783 persons*

WHAT CAN WE DO ABOUT CDI?

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Five Moments of CDI Prevention

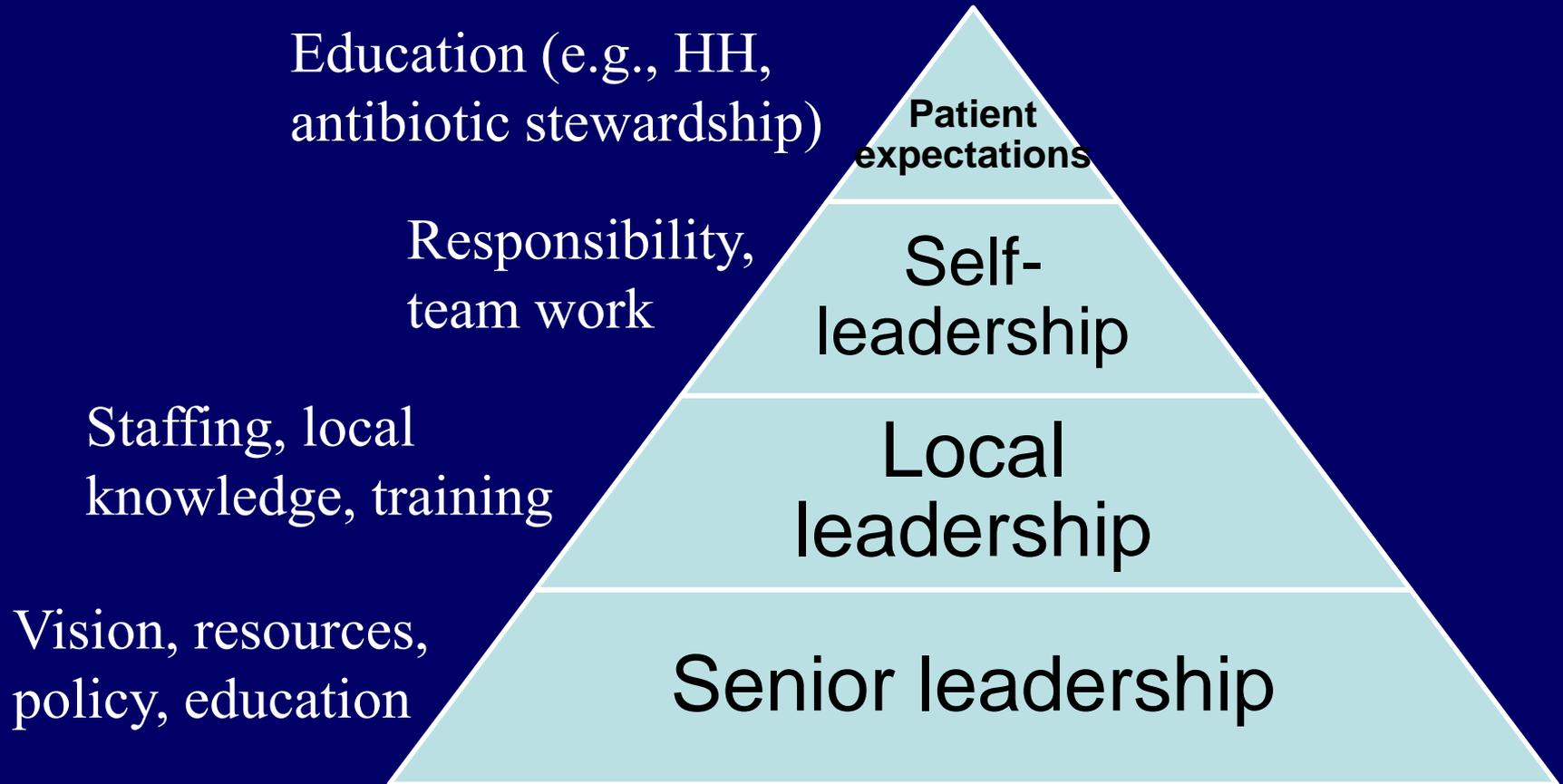
- Surveillance
- Best practice infection control implementation and competency
- Environmental Hygiene
- Antibiotic Stewardship
- Interfacility Transfer



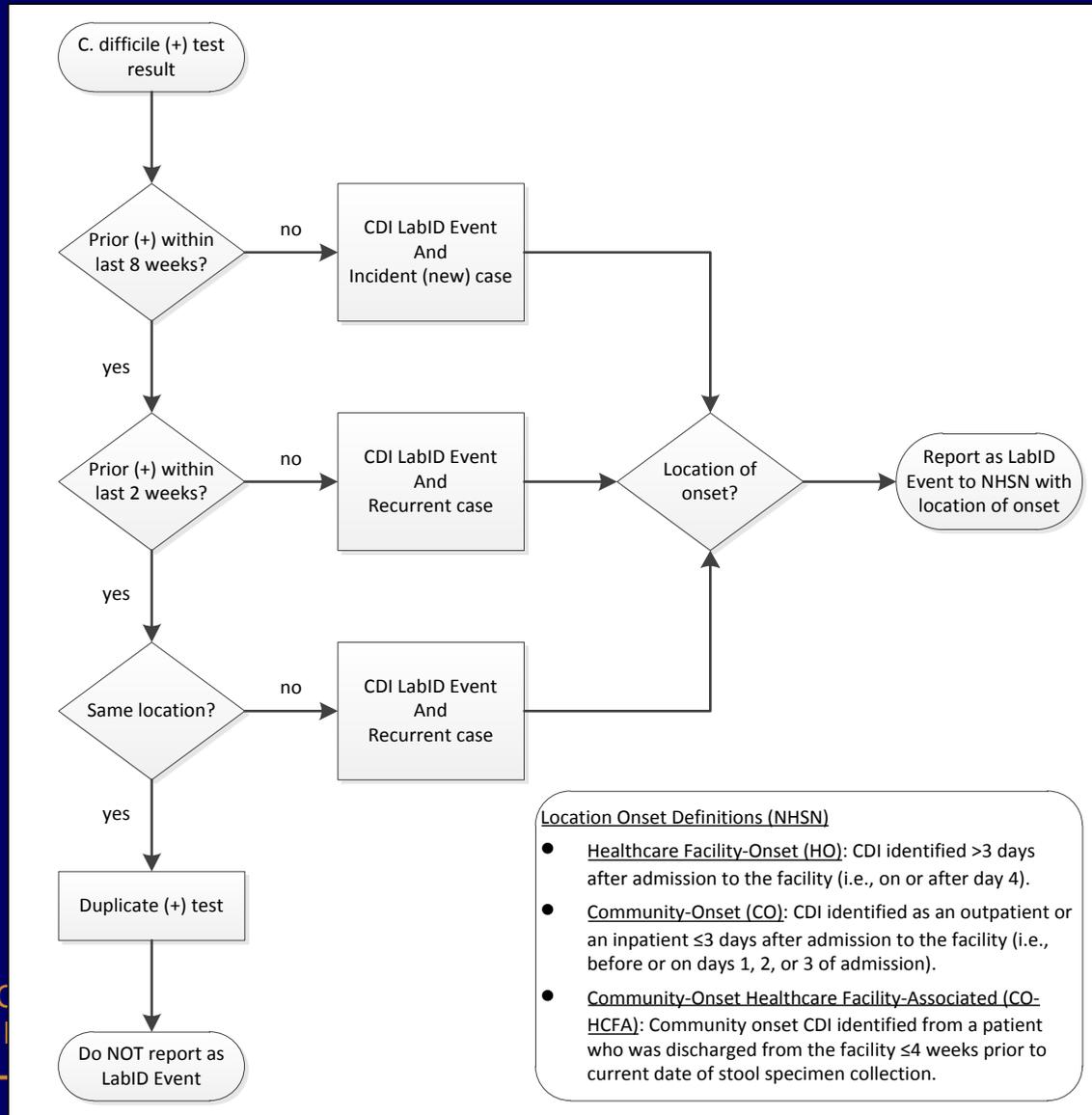
What now?

- What we can do? How?
 - Prepare infrastructure, capacity, and processes
 - Surveillance
 - Core vs. Supplemental Prevention Strategies
 - Early Recognition and Detection
 - Infection control: contact precautions and hand hygiene
 - Infection control: environmental cleaning
 - Antibiotic stewardship
 - Treatment
- Interfacility Communication

Prepare the Groundwork



Surveillance...know the burden

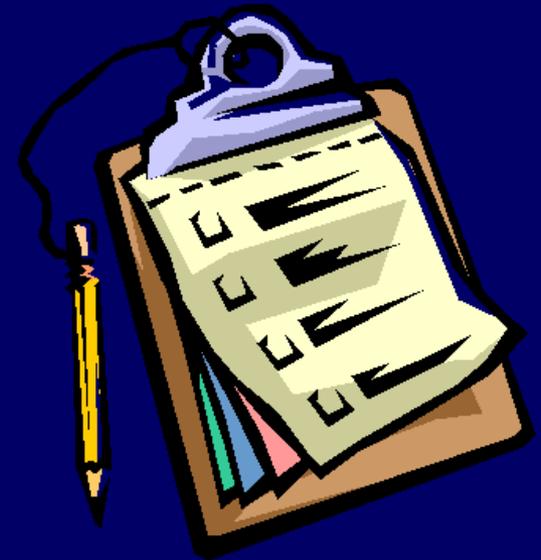


What we count matters

- National Health Safety Network (NHSN)
 - National healthcare-associated infection surveillance system
 - Required for hospitals and LTACHs
 - Optional for LTCFs, but highly recommended
 - More information: <http://www.cdc.gov/nhsn/>
 - HAI Program can help your facility enroll! hai.comments@state.or.us
- Visualize trends
- Show improvement over time, after intervention
 - *C. difficile*
 - *Catheter-associated urinary tract infections*
 - *Hand hygiene and PPE use over time*

Implement and Verify Best Infection Control Practices

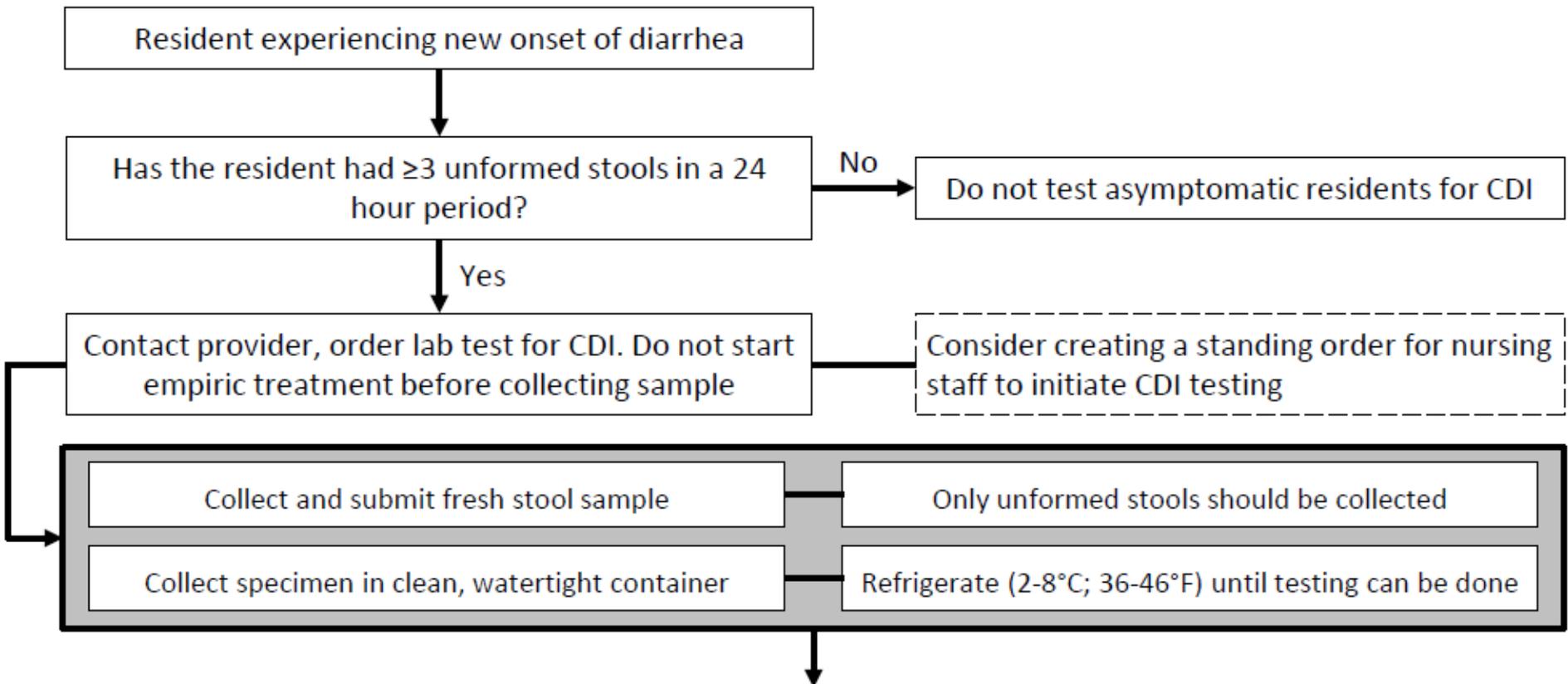
- Make it easy to do the right thing
 - Policy that matches best practices
 - Procedures that work with the work flow
 - Best “environment” for success
 - Competency checks after learning



- **Teach**
 - The difference between cleaning and disinfection
 - Staff about disinfecting high-touch areas
 - Staff how to correctly and safely prepare of bleach or EPA sporidicidal solutions
- **Define** who cleans and disinfections what
- **Monitor** adherence with checklists or spot fluorescence checks
- **Troubleshoot** barriers with frontline staff

Early Recognition and Detection

A1. Early Recognition and Testing



Testing

Diagnostic test	Advantages	Disadvantages	Performance
Nucleic acid amplification (including polymerase chain reaction (PCR))	Excellent sensitivity Excellent specificity Rapid	Expensive Infrastructure for PCR	Direct Sensitivity ≈97% Specificity≈80% PPV ≈81% NPV ≈97%
Toxin enzyme immunoassay (EIA)	Inexpensive Rapid	Very poor sensitivity Poor specificity	Direct Sensitivity ≈47% Specificity ≈87% PPV ≈76% NPV ≈65%
Glutamate dehydrogenase	Inexpensive Rapid Good sensitivity Good negative predictive value	Very poor specificity Requires use of a second-line test for toxin detection	Indirect, followed by direct
Toxigenic (cytotoxic) culture	Excellent sensitivity Good specificity	Requires second-line test for toxin detection 3- to 4-day turnaround time Requires expertise in culturing C. difficile	Indirect, followed by direct Considered gold- standard in most comparison studies
Cell cytotoxicity	Good sensitivity	2-day turnaround time Requires tissue culture capacity	Indirect

While test results are pending:

- Discontinue all non-essential antibiotics
- Discontinue all anti-peristaltic medications
- Initiate fluid replacement if not contraindicated
- Initiate pre-emptive Contact Precautions (gowns, gloves) A2

Positive ← Test results → Negative

Contact provider regarding treatment
(see IDSA Guidelines) T

Place resident in appropriate room A3

Do not perform a "test of cure" or re-test
if resident is responding to treatment

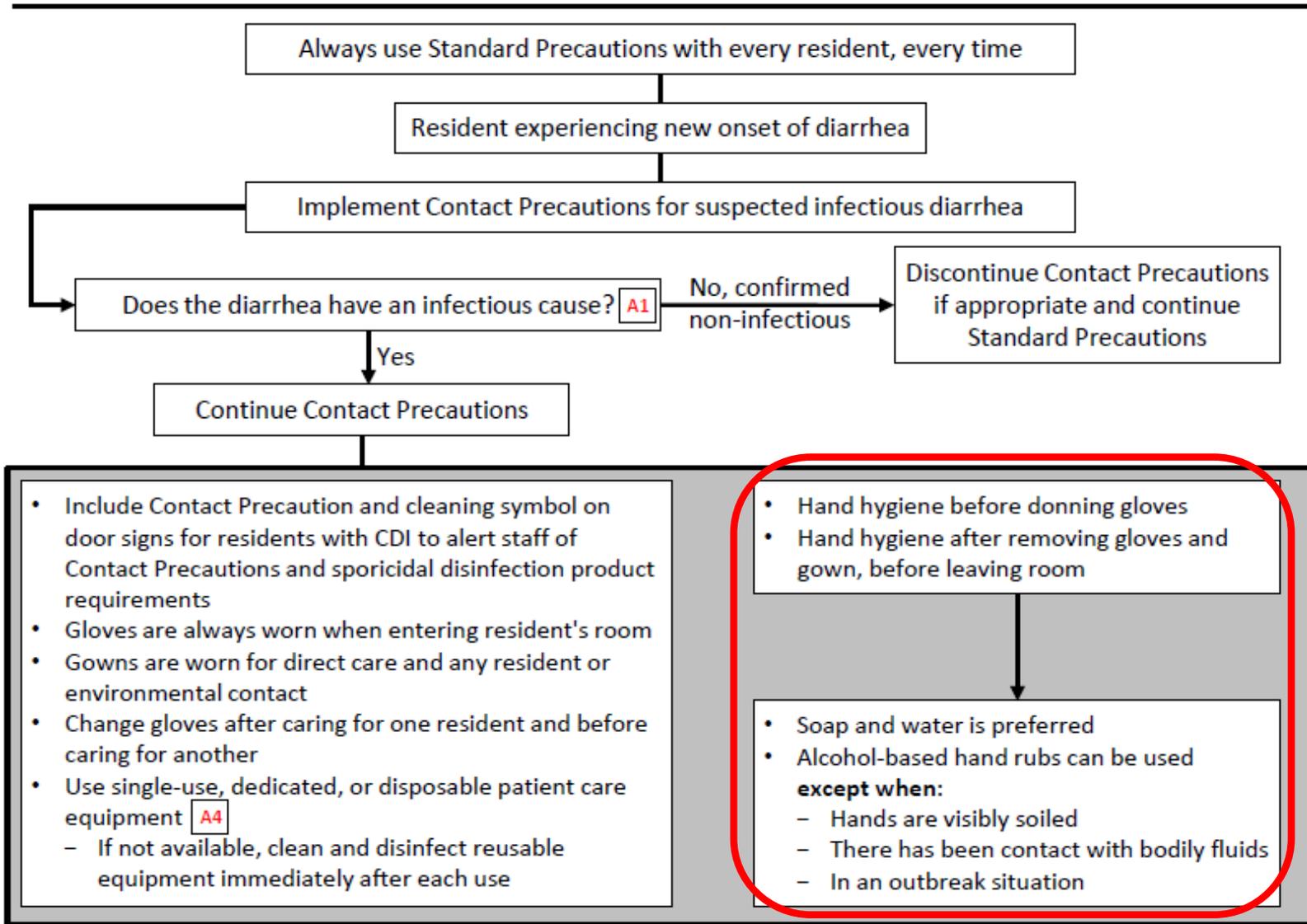
Consider other causes of diarrhea, perform testing
for other enteric pathogens

If all testing is negative **and** symptoms continue

Clinically reassess resident. If PCR was initial testing
method, do not re-test for *C. diff*. If initial *C. diff*
testing method was relatively insensitive (e.g., EIA)
and no other cause of diarrhea is found, consider
performing additional diagnostic testing for *C. diff* as
clinically indicated T

Contact Precautions

A2. Contact Precautions



Hand hygiene and *C. difficile*

- Spores may be difficult to eradicate even with excellent hand hygiene
- Adherence to GLOVE USE & Contact Precautions is fundamental!

Hand Hygiene Product	Log ₁₀ Reduction
Tap water	0.76
4% CHD antimicrobial hand wash	0.77
Non-antimicrobial hand wash	0.78
Non-antimicrobial body wash	0.86
0.3% triclosan antimicrobial hand wash	0.99
Heavy duty hand cleaner used in manufacturing environments	1.21*

*statistically better



Consider universal glove use on units with high CDI rates

- Maximize all other CDI prevention strategies
- Spores may be difficult to remove from hands
- Asymptomatic carriers may have a role in transmission, although the magnitude of their contribution is uncertain
- Practical screening tests are not available
- Use in addition to Contact Precautions for CDI-positive patients
- Change between patients & perform hand hygiene
- Consider on units with longer lengths of stay
- Enhance environmental cleaning
- Avoid shared medical equipment



The Great Debate

USE Both!

Soap & Water

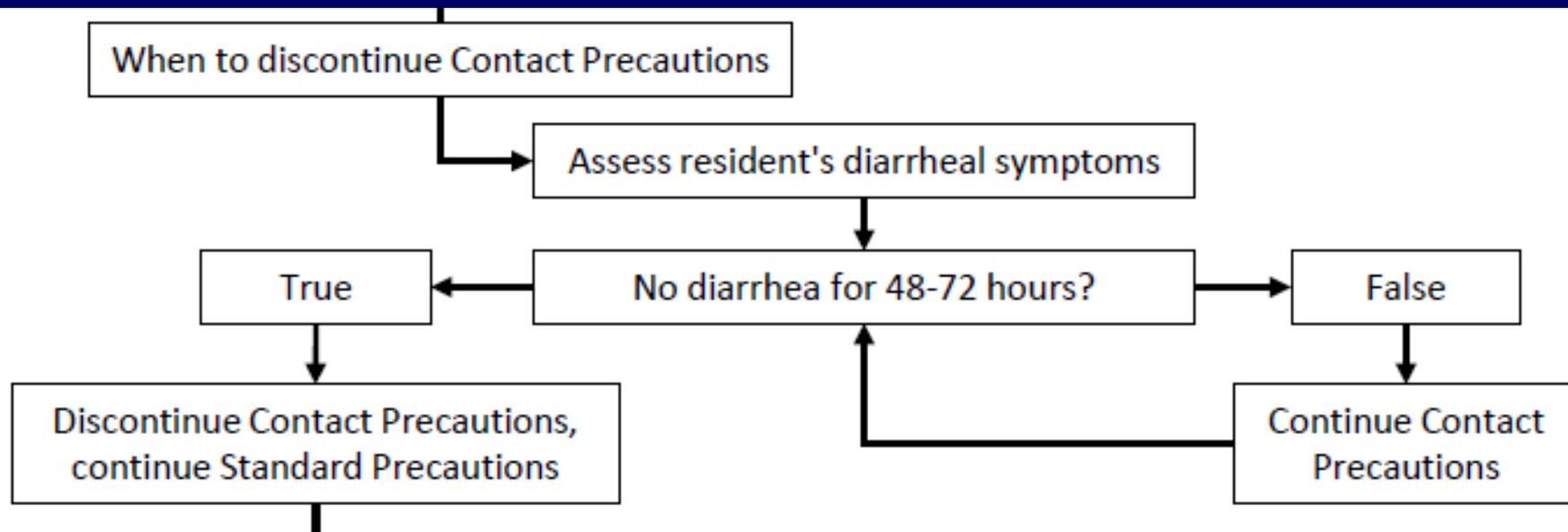
- Detergent
 - Better for biofilms, visible dirt
- Needs access to sink
- No residual activity
- Bacteria, viruses

Alcohol Hand Gel

- Disinfectant
- Easy to use
- Residual activity
- Bacteria, viruses
- NOT norovirus
- NOT sporocidal

Discouraging alcohol use may undermine overall hand hygiene program with poor consequences for HAIs

When to discontinue Contact Precautions?



- Consider continuing Contact Precautions until CDI treatment is complete, even if diarrhea has resolved
- Continue gown and glove use beyond 72 hours for residents who are incontinent or need significant assistance with ADLs, due to the risk of prolonged shedding of *C. difficile* bacteria and spore survival

Room Placement for Residents with CDI

Private room, toilet, and shower/bath are recommended and preferred whenever possible

1st Choice

Private (single) room with **private** bathroom

- Move resident to private (single) room
- Resident should use only the private bathroom while on Contact Precautions

2nd Choice

Private (single) room with **shared** bathroom

- Move resident to private room
- Resident with active CDI should use a separate toilet (e.g., dedicated commode) while on Contact Precautions

3rd Choice

Shared room with **shared** bathroom

Cohort with resident with active *C. diff* diarrhea

No resident meets criteria

Move to room with another resident with active diarrhea

Move to room with a resident at **lower risk** for CDI **A3.1**

- Perform HH and change PPE between each resident
- Keep a minimum 3 foot barrier between living spaces
- Use privacy curtain or tape on floor to emphasize separation
- Resident(s) with active CDI should use a separate toilet (e.g., dedicated commode) while either resident in the room is on Contact Precautions

How to choose a “lower” risk resident:

Primary considerations

Not currently taking antibiotics (1st choice)

or has not taken antibiotics in previous 4 weeks (2nd choice)

or has not taken antibiotics in previous 12 weeks (3rd choice)

No history of prior CDI (1st choice)

or has no CDI in previous 4 weeks (2nd choice)

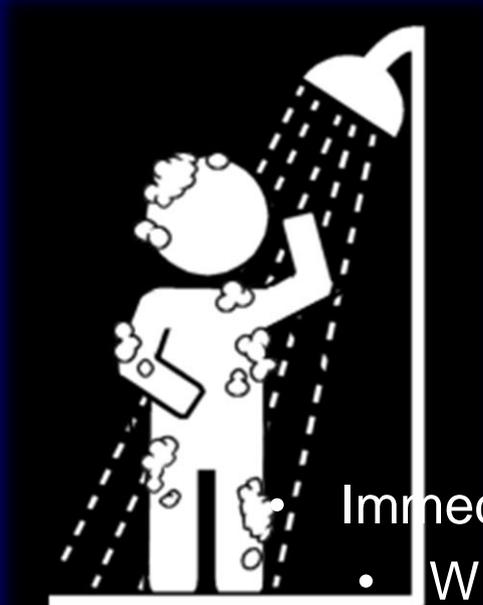
or has no CDI in previous 12 weeks (3rd choice)

Secondary considerations

- Not currently on proton pump inhibitors (PPIs)
- No GI/bowel condition comorbidities (diverticular disease, inflammatory bowel disease, Crohn's, peptic ulcer disease)
- No PEG/PEJ tube (no tube feeds)
- Not severely immunocompromised (cancer, chemotherapy, or solid organ transplant)
- Not bedbound/heavily dependent on healthcare workers for ADLs

Housekeeping considerations

- Use commode liners, whenever possible
 - Absorbent liners decrease spillage & splash!
- Immediately clean and disinfect commode/toilet and arm rests/grab bars after each use.



Immediately clean and disinfect shower area after every use

- Whenever possible, have residents with CDI shower last

- Use the shower, avoid baths

Environmental Cleaning & Disinfection

A4. Environmental Cleaning and Disinfection

Resident(s) with CDI

Select proper cleaning and disinfection products. Always follow manufacturer's instructions regarding proper storage, shelf life, contact time, dilution, application, and surface appropriateness

Clean first: Use a hospital-grade, EPA-registered cleaner to mechanically remove visible debris

Disinfect second: Must use a hospital-grade product with a sporicidal claim or a 10% bleach solution T

Every Shift

High-Touch Areas:

- Door handles
- Bed rails
- Chairs
- Call buttons
- Toilet seats
- Grab bars
- Light switches
- Telephones
- TV remotes
- Sink/faucet
- Toilet flush handle

Horizontal Surfaces:

- Bedside tables
- Tray tables
- Counters
- Floors

Dedicated Equipment:

- Thermometers
- Stethoscopes
- Blood pressure cuffs
- Oximeters
- Glucometers

Terminal

Target all areas of the room, including all daily areas, plus:

- Bed frames
- Curtains
- Walls
- Mattresses
- Pillows
- Other furniture

Bathroom cleaning

- Use commode liners whenever possible; if not using, empty commode in resident's toilet (never in the sink)
- Immediately clean and disinfect commode/toilet (including seat, flush handle, arm rests/grab handles) after each use and/or emptying
- Use a separate cloth for cleaning only the commode/toilet
- Always clean bathroom last, and clean from least contaminated (e.g., doorknobs, light switches, handrails) to most contaminated (e.g., sink handles, seat, flush handle)

- Always clean from clean to dirty and from high to low
- Microfiber cloths are preferred over cotton cloths
- Cloths should not be pre-soaked or re-dipped in an open bucket system
- Discard facility items that cannot be disinfected (bag personal items)
- Clean rooms of residents with active CDI last
- Change cleaning solution, mop, bucket, and cloths after cleaning each room

Is resident continent or can diarrhea be contained with incontinence products?

Yes

Resident has mental and physical ability to follow instructions and perform appropriate HH (or can be assisted by staff)?

No

No

Can my resident with a history of CDI go to social activities?

Yes

Consider letting resident enter common areas and participate in social activities

Ensure resident has clean clothing, a clean, dry incontinence product (if worn), and washes hands with soap and water prior to leaving room

In case of accident(s):

- Clean/disinfect any bodily fluid accidents immediately **A4**
- Return resident to room
- Shower/bathe resident as needed **A3**
- Change clothes/incontinence products as needed

No

Consider restricting activities, keeping resident in room unless medically necessary

Staff assist resident with HH and resident has clean clothes prior to moving. Staff should wear clean PPE prior to assisting resident with transport

Receiving unit or facility should be notified of CDI status and staff should wear PPE

“Lower” risk vs. “Higher” risk residents

- Is the resident currently having diarrhea?

If so, shouldn't mingle until starts to resolve infection and symptoms

- 3 C's

- Clean

- Can the resident maintain hand hygiene?
- Can the resident change into clean clothes before leaving room?

- Contained

- Is the resident continent?
- If in continent, can it be contained?
- Is the resident on treatment?

- Coherent

- Can the resident follow instructions, perform hand hygiene, stay out of others' rooms/personal space?

Antibiotic Stewardship

ADVANCING
EXCELLENCE

IN AMERICA'S
NURSING HOMES

<https://www.nhqualitycampaign.org/>

SEARCH ▾ SIGN IN



PARTICIPANTS ▾

PROGRESS

RESOURCES ▾

GOALS ▾

ABOUT ▾

CONTACT US

INFECTIONS

FOLLOW THESE SEVEN SIMPLE STEPS TO SUCCESS



EXPLORE A DIFFERENT GOAL



EXPLORE
GOAL



IDENTIFY
BASELINE



EXAMINE
PROCESS



CREATE
IMPROVEMENT



LEADERSHIP &
STAKEHOLDERS



MONITOR &
SUSTAIN



CELEBRATE
SUCCESS

AWARE, Oregon Public Health

Antibiotic Resistance (AWARE)

Health Professionals

Educators

Child Care

AWARE Coalition

AWARE Partners

AWARE Materials



Public Health > Prevention and Wellness > Safe Living > Antibiotic Resistance (AWARE) > Resources for Health Professionals



Resources for Health Professionals

Google: AWARE Oregon



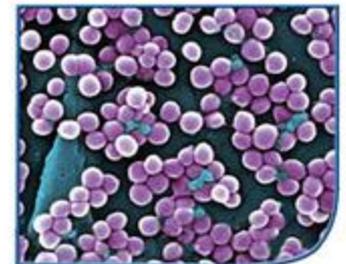
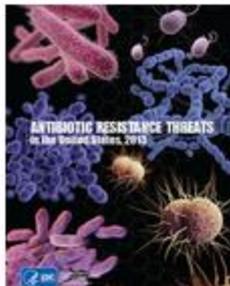
Oregon Alliance Working for Antibiotic Resistance Education (**AWARE**) is dedicated to reducing the problem of antibiotic-resistant bacteria in Oregon. Clearly, health care professionals have an important role in this initiative.

Research shows that adverse health outcomes are rare when providers are conservative in their prescribing of antibiotics.

Research also shows that patient satisfaction increases in direct proportion to the health care provider's commitment to educating patients about self-care and symptom management for conditions where antibiotics are unnecessary. Evidence shows that patient satisfaction does not increase by fulfilling a patient's or parent's expectation of receiving an antibiotics prescription when requested.

The following are resources for health care professionals to support the judicious use of antibiotics.

Hot Topics



For the Public

[Información en Español](#)

[Safe Antibiotic Use](#)

[Get Smart Week](#)

Contact Us

[AWARE Program](#)

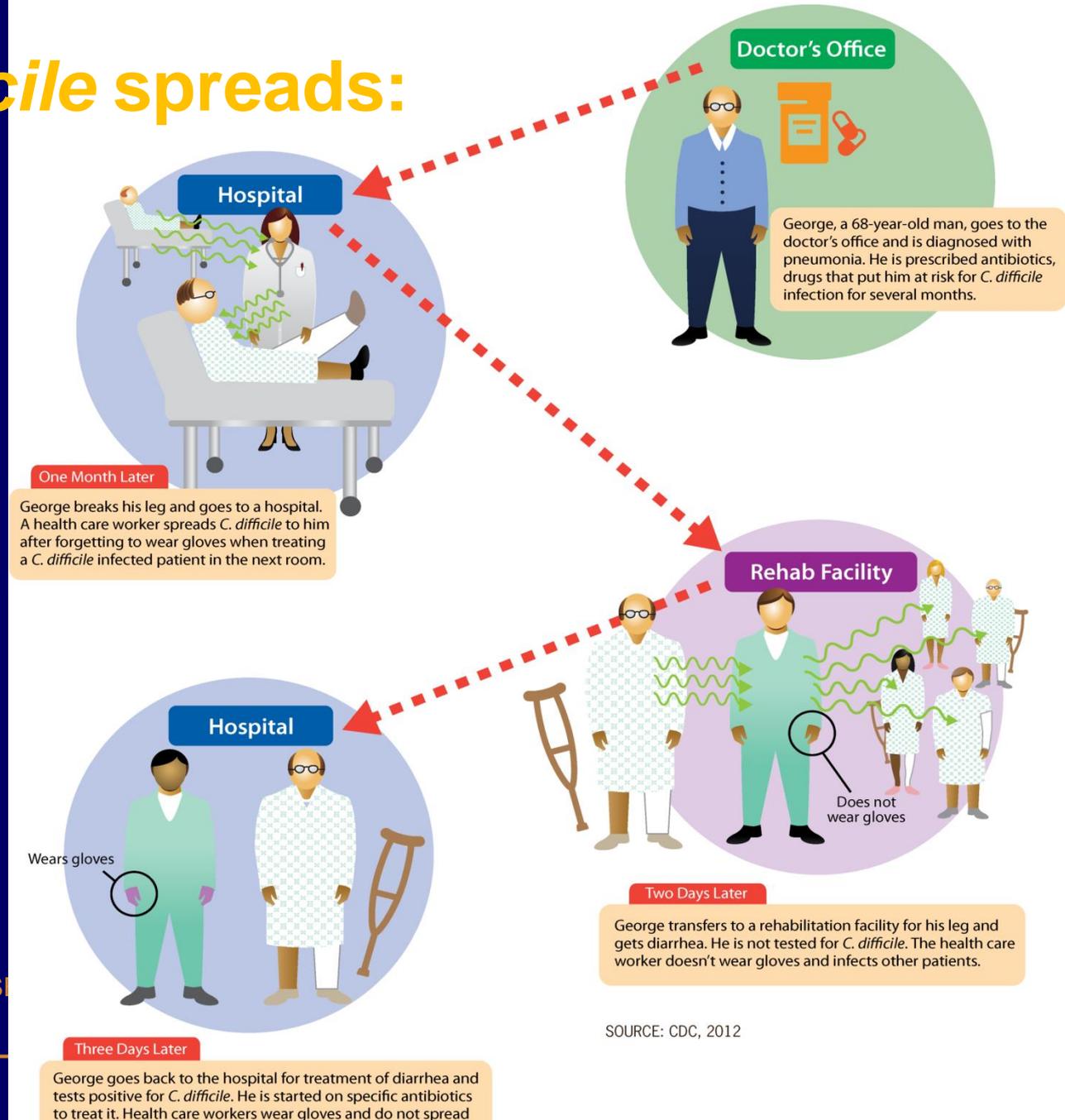
Common Medications used for CDI

	Route	Dose	Pros/Cons
Metronidazole	PO IV	500 mg TID, 10–14d 500 mg q8h	Metallic taste Medication interactions IV for severe infections with vanco
Vancomycin	PO	125 mg QID, 10–14d	Frequent dosing Expensive
Fidoxomicin	PO	200 mg BID, 10d	Newly approved; may be related to increased recurrence
Nitazoxanide	PO	500 mg BID, 10d	Cheap Evidence pending to prove non-inferior to metronidazole and vancomycin
Stool transplant	NG or rectal	per protocol	Specialty centers Donor screening FDA special license New adverse effects appearing
Probiotics	PO	per product	Adjunct; may decrease risk of primary infection. Not for use in immunocompromised patients or neonates.

Interfacility Transfer Communication

- **Inadequate precautions** spread MDROs
- Awareness of MDRO or other pathogens **before and at time of transfer allows receiving facility to prepare**
- Information available across **multiple types of health care facilities**
 - Need same information even if different actions
 - E.g., MRSA colonization in a hospital vs. LTCF
- **Medical transport** needs high-level information
 - E.g., type of precautions

How *C. difficile* spreads:



Rule 333-019-0052

1. When a referring facility transfers or discharges a patient who is infected or colonized with a multidrug-resistant organism (MDRO) or pathogen which warrants Transmission-based Precautions, it must include written notification of the infection or colonization to the receiving facility in transfer documents. The referring facility must ensure that the documentation is readily accessible to all parties involved in patient transfer (for example, referring facility, medical transport, emergency department, receiving facility).

Rule 333-019-0052

2. When a facility becomes aware that it received in transfer one or more patients with an MDRO or pathogen that warrants Transmission-based Precautions, and that was isolated from a patient specimen collected within 48 hours after transfer, it must notify the referring facility.
3. When a facility becomes aware that it transferred or discharged one or more patients who have an MDRO or pathogen that warrants Transmission-based Precautions, the referring facility must notify the receiving facility.

Rule 333-019-0052

4. If a facility transfers or discharges a patient with *laboratory-confirmed, carbapenemase-producing Enterobacteriaceae*^{**}, the facility must notify the local health department communicable disease staff within one working day of the date and destination of the transfer or discharge.

****NOTE:** only 9 identified since 2010

Inter-facility Infection Control Transfer Form

SENDING FACILITY TO COMPLETE FORM and COMMUNICATE TO ACCEPTING FACILITY

Please attach copies of latest culture reports with susceptibilities, if available

Patient/Resident Last Name	First Name	Date of Birth
<i>Print or place Patient Label</i>		
Sending Facility Name	Sending Facility Unit	Sending Facility Phone #

Is the patient/resident currently on antibiotics? NO YES DX: _____

Does the patient/resident have pending cultures? NO YES

Is the patient/resident currently on precautions? NO YES

Type of Precautions (check all that apply) Contact Droplet Airborne Other: _____

Does patient currently have an infection, colonization OR a history of a multidrug-resistant organism (MDRO)?	Colonization or history <i>Check if YES</i>	Active infection on treatment <i>Check if YES</i>
MRSA (methicillin-resistant <i>Staphylococcus aureus</i>)	<input type="checkbox"/>	<input type="checkbox"/>
VRE (Vancomycin-resistant <i>Enterococcus</i>)	<input type="checkbox"/>	<input type="checkbox"/>
<i>C. diff</i> (<i>Clostridium difficile</i> , CDI)	<input type="checkbox"/>	<input type="checkbox"/>
<i>Acinetobacter</i> spp., multidrug-resistant	<input type="checkbox"/>	<input type="checkbox"/>
Gram-negative organism resistant to multiple antibiotics* (e.g., <i>E. coli</i> , <i>Klebsiella</i> , <i>Proteus</i> etc.)	<input type="checkbox"/>	<input type="checkbox"/>
CRE (carbapenem-resistant <i>Enterobacteriaceae</i>)	<input type="checkbox"/>	<input type="checkbox"/>
Other**:	<input type="checkbox"/>	<input type="checkbox"/>

*Culture report with multiple antibiotics marked resistant (R); send copy of report with susceptibilities.

**Other: lice, scabies, shingles, norovirus, influenza, tuberculosis, etc.

Does the patient/resident currently have any of the following?

- | | |
|---|--|
| <input type="checkbox"/> Cough or requires suctioning
<input type="checkbox"/> Diarrhea
<input type="checkbox"/> Vomiting
<input type="checkbox"/> Incontinent of urine or stool
<input type="checkbox"/> Open wounds or wounds requiring dressing change
<input type="checkbox"/> Drainage (source) _____ | <input type="checkbox"/> Central line/PICC
<input type="checkbox"/> Hemodialysis catheter
<input type="checkbox"/> Urinary catheter
<input type="checkbox"/> Suprapubic catheter
<input type="checkbox"/> Percutaneous gastrostomy tube
<input type="checkbox"/> Tracheostomy |
|---|--|

Notes:

Printed Name of Person completing form:	Signature:	Date:	Name and phone of individual at receiving facility who received information:

Patient/Resident Last Name	First Name	Date of Birth
<i>Print or place Patient Label</i>		

Sending Facility Name	Sending Facility Unit	Sending Facility Phone #

Is the patient/resident currently on antibiotics? NO YES **DX:** _____

Does the patient/resident have pending cultures? NO YES

Is the patient/resident currently on precautions? NO YES

Type of Precautions (check all that apply) Contact Droplet Airborne Other: _____

Does patient currently have an infection, colonization OR a history of a multidrug-resistant organism (MDRO)?	Colonization or history <i>Check if YES</i>	Active infection on treatment <i>Check if YES</i>
MRSA (methicillin-resistant <i>Staphylococcus aureus</i>)	<input type="checkbox"/>	<input type="checkbox"/>
VRE (Vancomycin-resistant <i>Enterococcus</i>)	<input type="checkbox"/>	<input type="checkbox"/>
<i>C. diff</i> (<i>Clostridium difficile</i> , CDI)	<input type="checkbox"/>	<input type="checkbox"/>
<i>Acinetobacter</i> spp., multidrug-resistant	<input type="checkbox"/>	<input type="checkbox"/>
Gram-negative organism resistant to multiple antibiotics* (e.g., <i>E. coli</i> , <i>Klebsiella</i> , <i>Proteus</i> etc.)	<input type="checkbox"/>	<input type="checkbox"/>
CRE (carbapenem-resistant <i>Enterobacteriaceae</i>)	<input type="checkbox"/>	<input type="checkbox"/>
Other**:	<input type="checkbox"/>	<input type="checkbox"/>

*Culture report with multiple antibiotics marked resistant (R); send copy of report with susceptibilities.

**Other: lice, scabies, shingles, norovirus, influenza, tuberculosis, etc.

Does the patient/resident currently have any of the following?

- | | |
|--|--|
| <input type="checkbox"/> Cough or requires suctioning | <input type="checkbox"/> Central line/PICC |
| <input type="checkbox"/> Diarrhea | <input type="checkbox"/> Hemodialysis catheter |
| <input type="checkbox"/> Vomiting | <input type="checkbox"/> Urinary catheter |
| <input type="checkbox"/> Incontinent of urine or stool | <input type="checkbox"/> Suprapubic catheter |
| <input type="checkbox"/> Open wounds or wounds requiring dressing change | <input type="checkbox"/> Percutaneous gastrostomy tube |
| <input type="checkbox"/> Drainage (source) _____ | <input type="checkbox"/> Tracheostomy |

Sample IFT form

SENDING FACILITY TO COMPLETE FORM and COMMUNICATE TO ACCEPTING FACILITY

Please attach copies of latest culture reports with susceptibilities, if available

Patient/Resident Last Name	First Name	Date of Birth
<i>Print or place Patient Label</i>		

Sending Facility Name	Sending Facility Unit	Sending Facility Phone #

Is the patient/resident currently on antibiotics? NO YES DX: _____

Does the patient/resident have pending cultures? NO YES

Is the patient/resident currently on precautions? NO YES

Type of Precautions (check all that apply) Contact Droplet Airborne Other: _____

Sample IFT form

Does patient currently have an infection, colonization OR a history of a multidrug-resistant organism (MDRO)?	Colonization or history <i>Check if YES</i>	Active infection on treatment <i>Check if YES</i>
MRSA (methicillin-resistant <i>Staphylococcus aureus</i>)	<input type="checkbox"/>	<input type="checkbox"/>
VRE (Vancomycin-resistant <i>Enterococcus</i>)	<input type="checkbox"/>	<input type="checkbox"/>
C. diff (<i>Clostridium difficile</i> , CDI)	<input type="checkbox"/>	<input type="checkbox"/>
Acinetobacter spp. , multidrug-resistant	<input type="checkbox"/>	<input type="checkbox"/>
Gram-negative organism resistant to multiple antibiotics* (e.g., E. coli, Klebsiella, Proteus etc.)	<input type="checkbox"/>	<input type="checkbox"/>
CRE (carbapenem-resistant <i>Enterobacteriaceae</i>)	<input type="checkbox"/>	<input type="checkbox"/>
Other**:	<input type="checkbox"/>	<input type="checkbox"/>

*Culture report with multiple antibiotics marked resistant (R); send copy of report with susceptibilities.

**Other: lice, scabies, shingles, norovirus, influenza, tuberculosis, etc.

For a copy of the form, go to:

<https://public.health.oregon.gov/DiseasesConditions/CommunicableDisease/HAI/Prevention/Pages/Interfacility-Communication.aspx>

Sample IFT form

Does the patient/resident currently have any of the following?

- | | |
|--|--|
| <input type="checkbox"/> Cough or requires suctioning | <input type="checkbox"/> Central line/PICC |
| <input type="checkbox"/> Diarrhea | <input type="checkbox"/> Hemodialysis catheter |
| <input type="checkbox"/> Vomiting | <input type="checkbox"/> Urinary catheter |
| <input type="checkbox"/> Incontinent of urine or stool | <input type="checkbox"/> Suprapubic catheter |
| <input type="checkbox"/> Open wounds or wounds requiring dressing change | <input type="checkbox"/> Percutaneous gastrostomy tube |
| <input type="checkbox"/> Drainage (source) _____ | <input type="checkbox"/> Tracheostomy |

Notes:

Printed Name of Person completing form:	Signature:	Date:	Name and phone of individual at receiving facility who received information:

For a copy of the form, go to:

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Summary of Prevention Strategies

*High level of scientific evidence
Demonstrated feasibility*

CORE

- Contact Precautions for duration of diarrhea
- Hand hygiene per CDC/WHO guidelines
- Clean & disinfect of equipment & environment
- Lab-based notification
- CDI Surveillance
- Education: Everyone!

*Some scientific evidence
Variable feasibility*

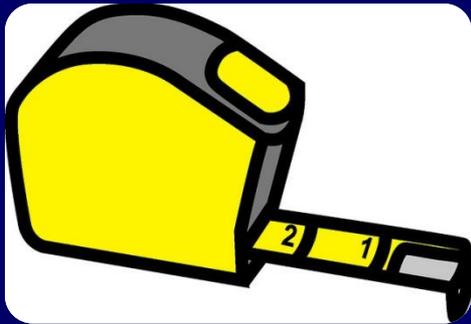
SUPPLEMENTAL

- Contact Precautions beyond diarrhea
- Presumptive precautions for suspect CDI patients
- Add soap & water for hand hygiene leaving CDI
- Universal glove use on units with high CDI rates
- Use bleach to disinfect
- Antimicrobial Stewardship

How to measure progress?

CORE

- Measure compliance with CDC/WHO hand hygiene and Contact Precautions
- Assess adherence to environmental cleaning



SUPPLEMENTAL

- Track use of antibiotics in the facility
 - Associated with CDI
 - Most frequent indications (e.g., urinary tract infections)
- Intensify assessment with process measures

WHAT IS YOUR FACILITY DOING?

ACUTE & COMMUNICABLE DISEASE PREVENTION
Oregon Public Health Division

Oregon
Health
Authority

Five Moments of CDI Prevention

- Surveillance
- Best practice infection control implementation and competency
- Environmental Hygiene
- Antibiotic Stewardship
- Interfacility Transfer



WHAT IS YOUR 1ST GOAL?

CDC CDI Infections Toolkit, ELC 2009

EXTRA SLIDES

Impact of *C. difficile*

- Hospital-acquired, hospital onset:
 - 165,000 cases
 - \$1.3 billion in excess costs
 - 9,000 deaths annually
- Hospital acquired, post-discharge (up to 4 weeks):
 - 50,000 cases
 - \$0.3 billion in excess costs
 - 3,000 deaths annually
- Nursing home onset:
 - 263,000 cases
 - \$2.2 billion in excess costs
 - 16,500 deaths annually

Campbell et al. ICHE 2009;30:523-33.

Dubberke et al. CID 2008;46:497-504.

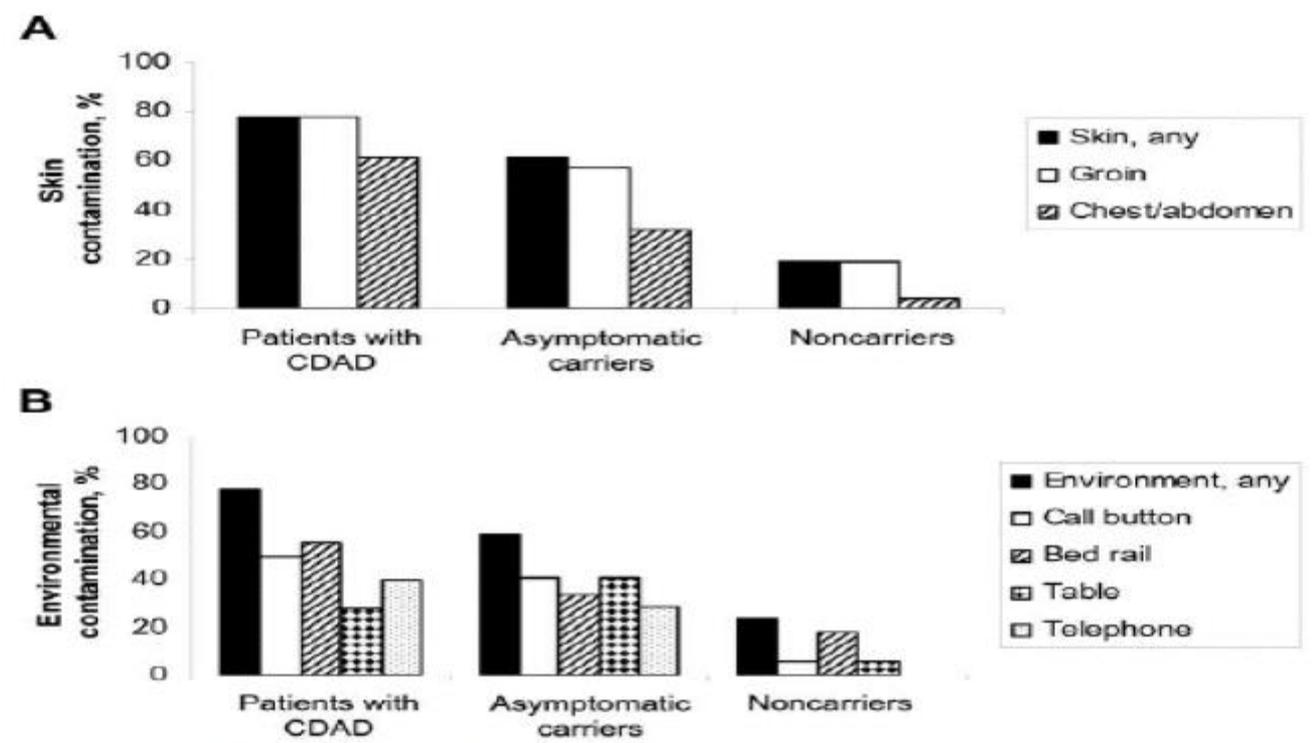
Dubberke et al. EID 2008;14:1031-8.

Elixhauser et al. HCUP Statistical Brief #50, 2008.

Supplemental Prevention Strategies: Universal Glove Use

Role of asymptomatic carriers?

Rationale for universal glove use on units with high CDI rates



Riggs et al. Clin Infect Dis 2007;45:992-8.



Supplemental Prevention Strategies:



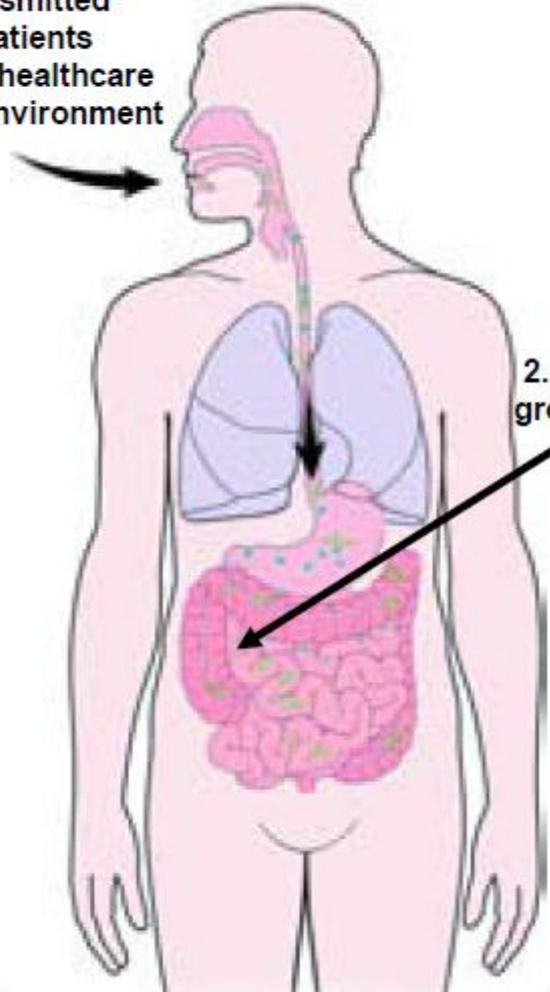
Rationale for Soap and Water: Lack of efficacy of alcohol-based handrub against *C. difficile*

Interventions compared		Mean log reduction (95% CI), log ₁₀ CFU/mL
Intervention 1	Intervention 2	
Warm water and plain soap	No hand hygiene	2.14 (1.74–2.54)
Warm water and plain soap	Alcohol-based handrub	2.08 (1.69–2.47)
Cold water and plain soap	No hand hygiene	1.88 (1.48–2.28)
Cold water and plain soap	Alcohol-based handrub	1.82 (1.43–2.22)
Warm water and plain soap	Antiseptic hand wipe	1.57 (1.18–1.96)
Warm water and antibacterial soap	No hand hygiene	1.51 (1.12–1.91)
Warm water and antibacterial soap	Alcohol-based handrub	1.46 (1.06–1.85)
Cold water and plain soap	Antiseptic hand wipe	1.31 (0.92–1.71)
Warm water and antibacterial soap	Antiseptic hand wipe	0.94 (0.55–1.34)
Warm water and plain soap	Warm water and antibacterial soap	0.63 (0.23–1.02)
Antiseptic hand wipe	No hand hygiene	0.57 (0.17–0.96)
Antiseptic hand wipe	Alcohol-based handrub	0.51 (0.12–0.91)
Cold water and plain soap	Warm water and antibacterial soap	0.37 (–0.03 to 0.76)
Warm water and plain soap	Cold water and plain soap	0.26 (–0.14 to 0.66)
Alcohol-based handrub	No hand hygiene	0.06 (–0.34 to 0.45)

Oughton et al. Infect Control Hosp Epidemiol 2009;30:939-44.

Background: Pathogenesis of CDI

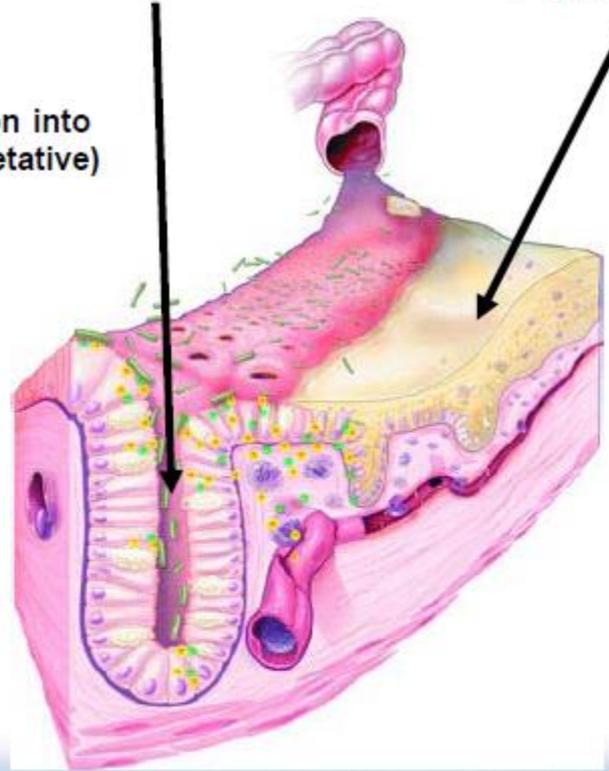
1. Ingestion of spores transmitted from other patients via the hands of healthcare personnel and environment



2. Germination into growing (vegetative) form

3. Altered lower intestine flora (due to antimicrobial use) allows proliferation of *C. difficile* in colon

4. Toxin A & B Production leads to colon damage +/- pseudomembrane



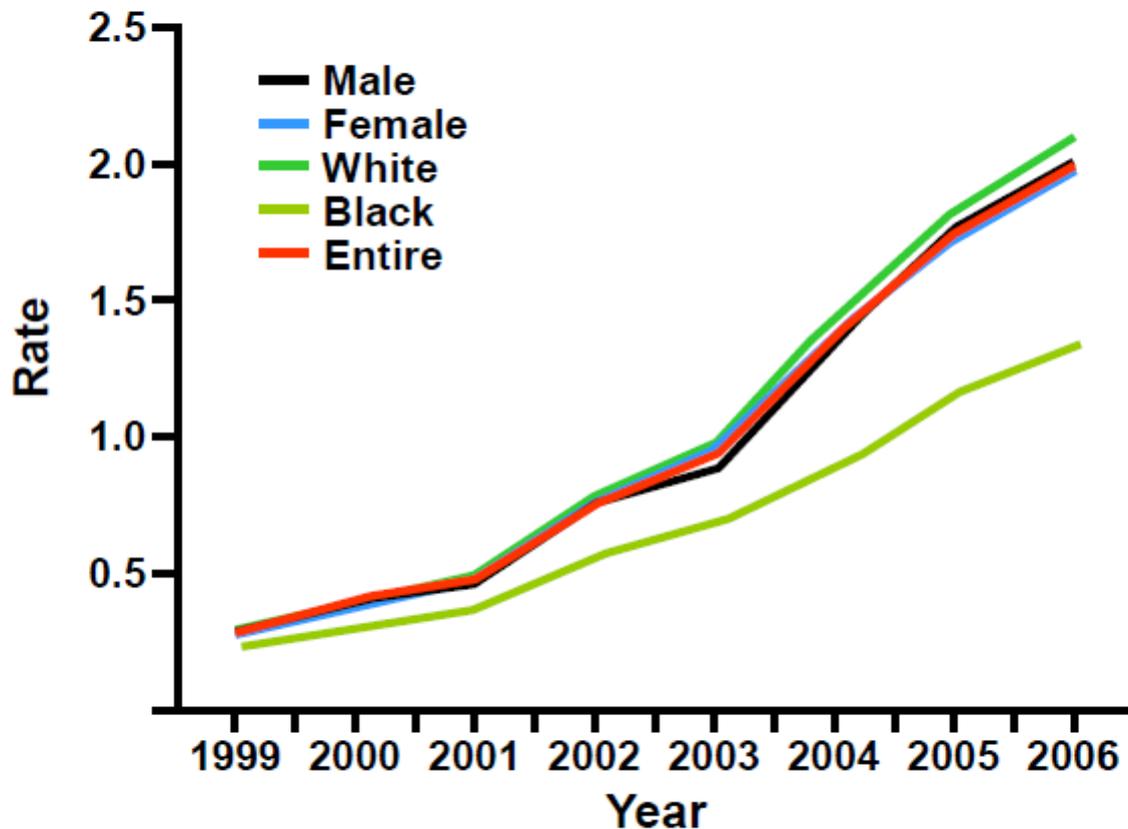
Sunenshine et al. Cleve Clin J Med. 2006;73:187-97.



Background: Impact



Age-Adjusted Death Rate* for Enterocolitis Due to *C. difficile*, 1999–2006



*Per 100,000 US standard population

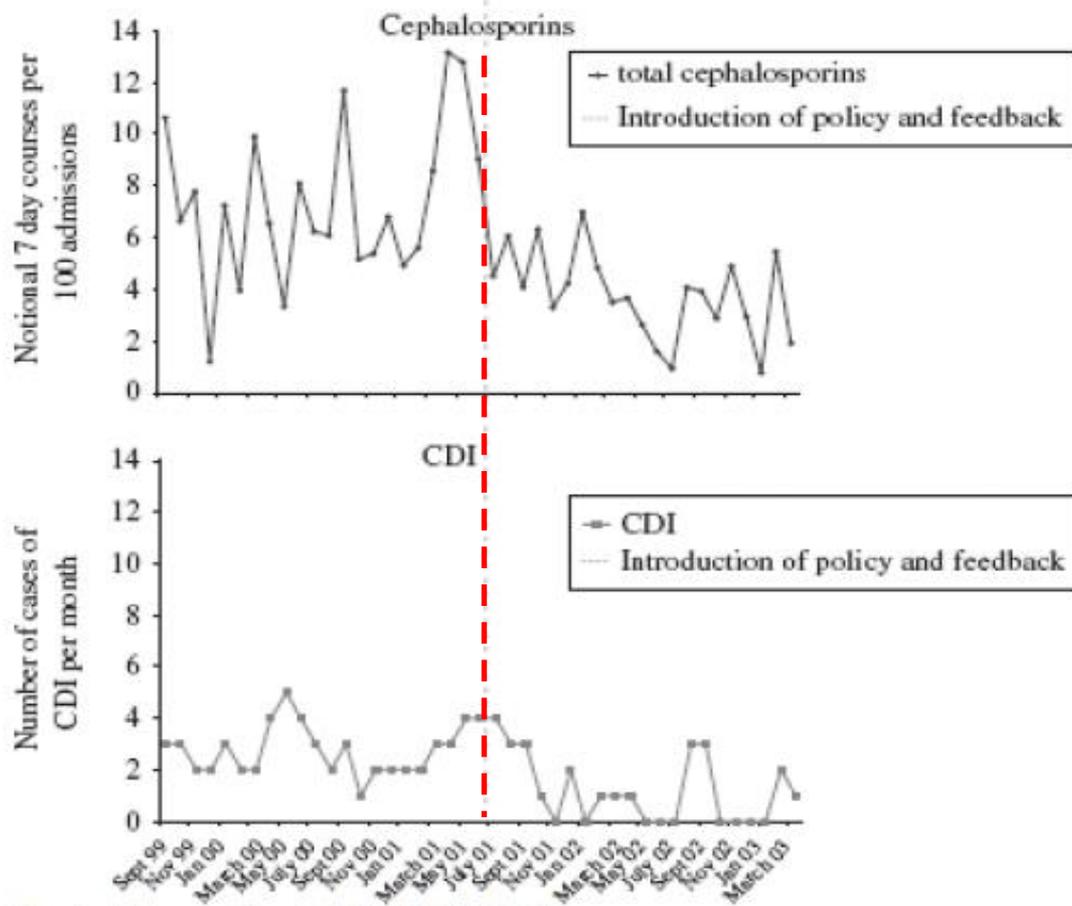
Heron et al. Natl Vital Stat Rep 2009;57(14).

Available at http://www.cdc.gov/nchs/data/nvsr/nvsr57/nvsr57_14.pdf





Supplemental Prevention Strategies: Audit and feedback targeting broad-spectrum antibiotics



Fowler et al. J Antimicrob Chemother 2007;59:990-5.