

Clostridium difficile Update



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Director of Infection Prevention



Today's Objectives

- # Describe the evolution of *C difficile* disease in the U.S.
 - # Discuss current prevention guidelines.
 - # Describe implementation challenges related to prevention.
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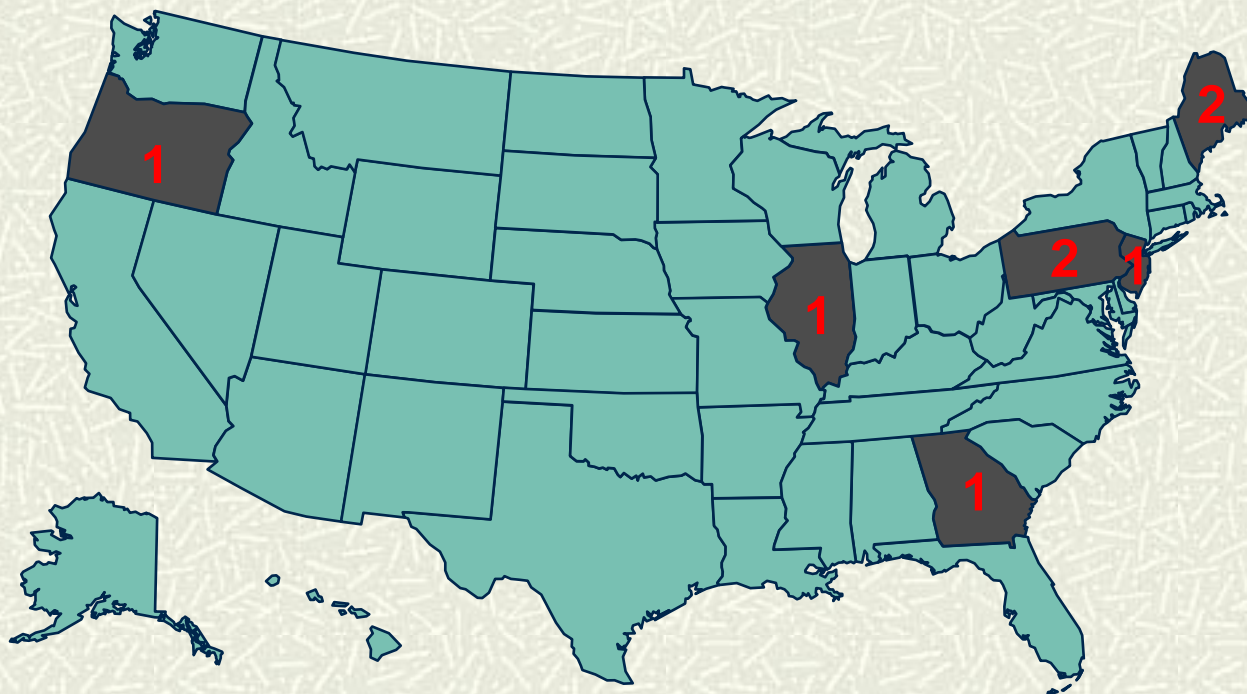
Historical Perspective

- 1893** Pseudomembranous colitis (PMC) first described as “Diphtheritic colitis.” Finney *Bull. Johns Hopkins Hosp*
- 1935** *Bacillus difficilis* isolated from feces of newborns. Hall & O’Toole *Am J Dis Child*
- 1974** Clindamycin-associated colitis. Tedesco *Ann. Intern. Med*
- 1977** Undescribed toxin in pseudomembranous colitis. Larson *Br. Med. J*
- 1977** Antibiotic-induced colitis. Implication of a toxin neutralized by *Clostridium sordellii* antitoxin. Rifkin *Lancet*
- 1977** Clindamycin-associated colitis in hamsters: protection with vancomycin. Bartlett *Gastroenterology*
- 1978** Identification of *Clostridium difficile* as a cause of pseudomembranous colitis. George *Br. Med. J*
-

The **NEW** (and NOT improved) *C Difficile*

- # Historically uncommon strain
 - Increased morbidity & mortality
 - U.S., Canada, England & the Netherlands
- # Strain, toxinotype III, North American PFGE type 1, PCR-ribotype 027 (NAP1/027)
 - Hyperproduces
 - Toxin A (16X)
 - Toxin B (23 X)
 - Increased sporulation

Acute Care Hospitals with CDAD Outbreaks Between 2001-2004

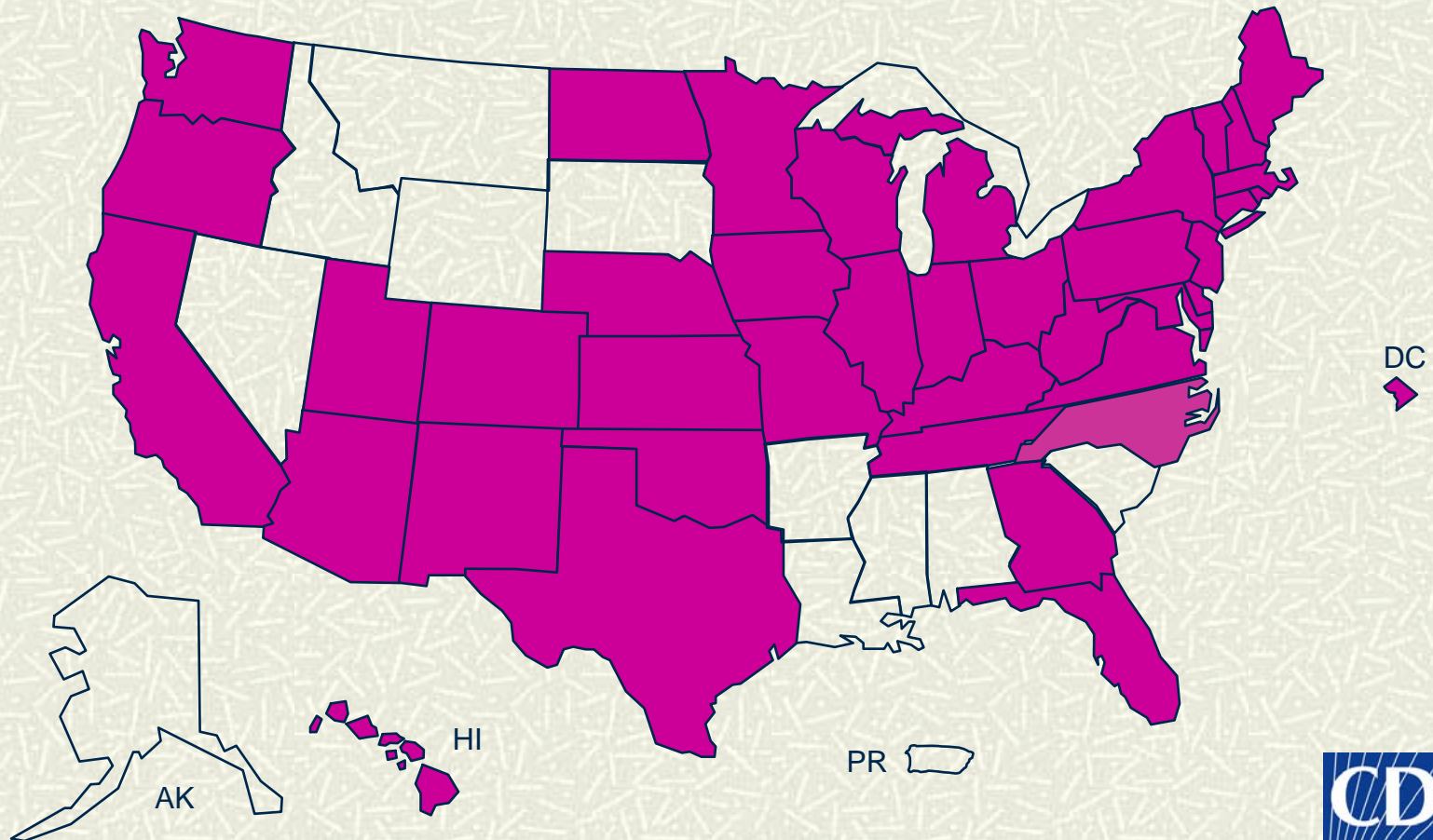


Detected by increases in the number of positive routine clinical laboratory tests for *C. difficile*.

Prevalence of Epidemic Strain by Hospital Outbreak

Location	Date of outbreak onset	No. of isolates tested	No. (%) epidemic strain
Georgia	Oct, 2001	46	27 (59)
Illinois		14	6 (43)
Maine, Hospital A	July, 2003	48	30 (63)
Maine, Hospital B		13	9 (69)
New Jersey	June, 2003	12	9 (75)
Oregon		30	3 (10)
Pennsylvania	Oct, 2003	6	3 (50)

States with BI/NAP1/027 strain of *C. difficile*, October, 2008



40 states

Changing Epidemiology of CDAD

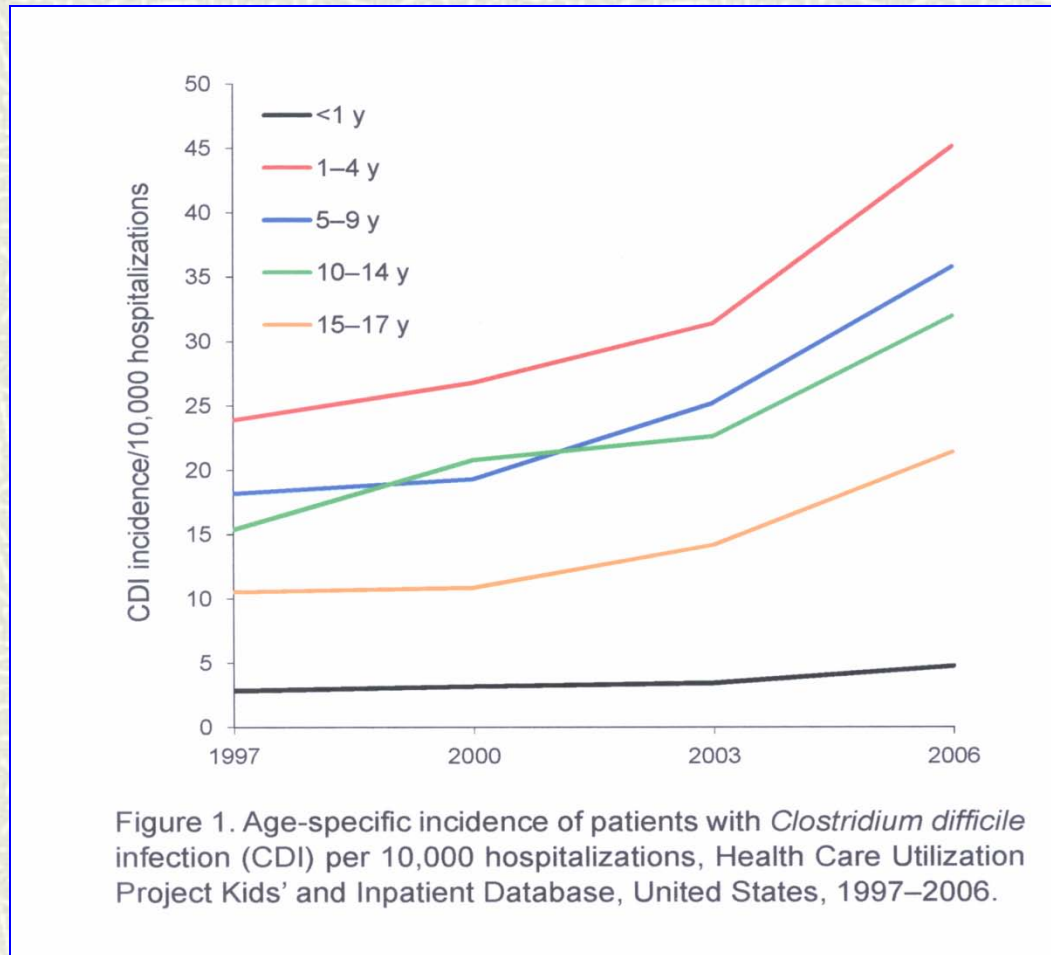
Changing Epidemiology of *Clostridium difficile*-Associated Disease in Children. *Infect Control Hosp Epidemiol* 2007;28:1233–1235 Lacey Benson, BA; Xiaoyan Song, MD, PhD; Joseph Campos, MD; Nalini Singh, MD, MPH

***Clostridium difficile*-associated diarrhea: an emerging threat to pregnant women. Roupael NG, O'Donnell JA, Bhatnagar J, et al. *Am J Obstet Gynecol* 2008;198:635-6.**

Surveillance for Community-Associated *Clostridium difficile*, Connecticut, 2006

- # 1:4 of all CA-CDAD cases were in persons who lacked established predisposing risk factors for CDAD, including advanced age, an underlying health condition, and health-care exposure during the 12 months preceding illness.
- # 32% of patients had no recent exposure to antimicrobials.
- # 9% were in patients who had none of these factors.

Clostridium difficile Infections Among Hospitalized Children, United States, 1997–2006



*You know you're in trouble
when....*

"All the News
That's Fit to Print"

The New York Times

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MONDAY, AUGUST 9, 2004

Bacteria That Strike Elderly Spread in Canadian Hospitals

By **CLIFFORD KRAUSS**

TORONTO, Aug. 8 — A type of bacteria that causes virulent diarrhea in the elderly has been spreading through hospitals in Quebec and Alberta and may have contributed to the deaths of 100 patients in one institution alone in the past 18 months, medical authorities said Sunday.

The spread of an infectious illness in at least a handful of hospitals has stirred the concerns among Canadian health experts that surfaced last year when more than 40 people died in and around Toronto during the SARS epidemic, mostly in hospital settings.

Hospital officials conceded then — and still do — that their housekeep-

ing staffs have been stretched thin because of cutbacks in federal and provincial funding in recent years and that sanitary conditions leave much to be desired.

The bacteria are commonly found in hospitals, and does not pose a health threat to healthy people. But it can be deadly to already weakened people who are being treated with antibiotics for other illnesses that allows the bacteria to flourish in the intestinal tract.

A new analysis by the Canadian Medical Association Journal found that in two hospitals in Montreal and one in Sherbrooke, Quebec, the rate of patients contracting the bacteria, known as clostridium difficile or C. difficile, had increased from 2.1

cases per 1,000 admissions in 2002 to 10 per 1,000 in 2003 and that the upward trend had continued this year.

The study found that the bacteria have taken their heaviest toll in the University of Sherbrooke's medical center in southern Quebec, where 54 deaths in 2003 and 46 more during the first half of 2004 were linked to the bacteria. The hospital has managed to decrease the rate of illness in recent months, the report said.

The bacteria were also found to have contributed to the deaths of 81 patients in Montreal, Canada's second-largest city, in recent years, which underscored that many hospitals there are in a rundown state.

The Quebec health minister, Phi-

lippe Couillard, responded cautiously to the study. "One hundred people died while having the bacteria in them," he told the Canadian Press news service. "It doesn't mean that their deaths were due to the bacteria."

Nevertheless, Quebec public health officials have been tracking the outbreak of cases since June and they have been urging hospitals to reinvigorate their hygiene programs. Beginning this month, more than 100 area facilities will issue monthly reports on contraction of the bacteria to provincial authorities.

Hospitals have stepped up precautions, including urging their staff members to wash their hands frequently.

'Stomach Bug Crystallizes an Antibiotic Threat'



New York Times, Apr 2009

The JC National Patient Safety Goals

- # Purpose: To promote improvements in patient safety
 - 16 goals to be reached by January 1, 2010
- # NPSG Highlights
 - Problematic areas in healthcare (e.g., HAI)
 - Evidence and expert-based solutions to these problems.
 - The Requirements focus on system-wide solutions.
- # NPSG #7.03.01*
 - “Implement evidence-based practices to prevent HAI due to multi-drug resistant organism (MDRO) and *C. difficile* in acute care hospitals”

HHS Action Plan to Prevent HAI: Prevention Targets

- # Central Line-associated Bloodstream Infections (CLABSI)
 - # ***Clostridium difficile* Infections (CDI)**
 - # Catheter-associated Urinary Tract Infections (CAUTI)
 - # Methicillin-resistant *Staphylococcus aureus* (MRSA) Infections
 - # Surgical Site Infections (SSI)
 - # Ventilator-associated Pneumonia (VAP)
-

HHS CDAD Prevention Target

- **Case rate per 10,000 patient-days as measured in NHSN**
 - National 5-Year Prevention Target: 30% reduction
- **Because little baseline infection data exists, administrative data for ICD-9-CM coded *C. difficile* hospital discharges is also tracked**
 - National 5-Year Prevention Target: 30% reduction

<http://www.hhs.gov/ophs/initiatives/hai/prevtargets.html>

Impact of Disease with *C. difficile*

Excess costs

- \$2,380 to \$3,240 per index hospitalization
- \$3,797 to \$7,179 inpatient costs over 180 days follow-up
- \$3669-15,180 per case

Other outcomes

- 2.8 days attributable excess length of stay
- 19.3% attributable readmission (180 days)
- 5.7% attributable mortality (180 days)
- More likely discharged to long-term care

***“It’s been the worst thing I’ve ever tried to get through in my life,
I really did think I was going to die.”***

Dubberke ER, et al. *Clin Infect Dis*. 2008;46:497-504.

Kyne L, et al. Health Care Costs and Mortality Associated with Nosocomial Diarrhea Due to Cdiff. *CID* 2002;34.

Suda KJ. et al. *Abstr Intersci Conf. Antimicrob Agents Chemother*, 43. 2003: abstract no. K-734.

Long-term Care Onset

- # 263,000 cases
- # \$2.2 billion in excess costs
- # 16,500 deaths annually

C difficile-associated Diarrhea (CDAD)

Major cause of healthcare-associated infectious diarrhea

- ~1% of all hospital admissions

Reservoirs for *C. difficile*

- # Asymptomatic colonization with *C. difficile*
 - 15-70% of healthy neonates (≤ 1 yr)
 - $< 5\%$ of normal adults
 - 20% after 1 week in hospital
 - 50% after >4 weeks in hospital
- # $\sim 30\%$ of newly colonized patients develop CDAD
 - Symptoms develop a median of 2 days post-infection
 - $2/3$ of colonized patients remain asymptomatic

(McFarland *NEJM* 1989; McFarland *JID* 1990)

Reservoirs of *C. difficile*

2 major reservoirs

- Patient (symptomatic/asymptomatic)
- Environmental

How does the Patient get *C. difficile*?

- Hands of healthcare worker
- Direct or Indirect contact with contaminated environment

How does the environment/devices get contaminated?

- Shedding from patient
 - Healthcare workers' hands
-

Risk Factors for Disease

- # Antimicrobial exposure
 - # Acquisition of *C. difficile*
 - # Advanced age
 - # Underlying illness
 - # Immunosuppression
 - # Tube feedings
 - # ? Gastric acid suppression
-

Factors that Contribute to HA-CDAD Outbreaks

- Environmental contamination
 - Persistence of spores for prolonged periods of time
 - Resistance of spores to routinely used disinfectants & antiseptics
 - Hand carriage by healthcare personnel
 - Exposure of patients to frequent courses of antimicrobial agents
-

Spectrum of Disease

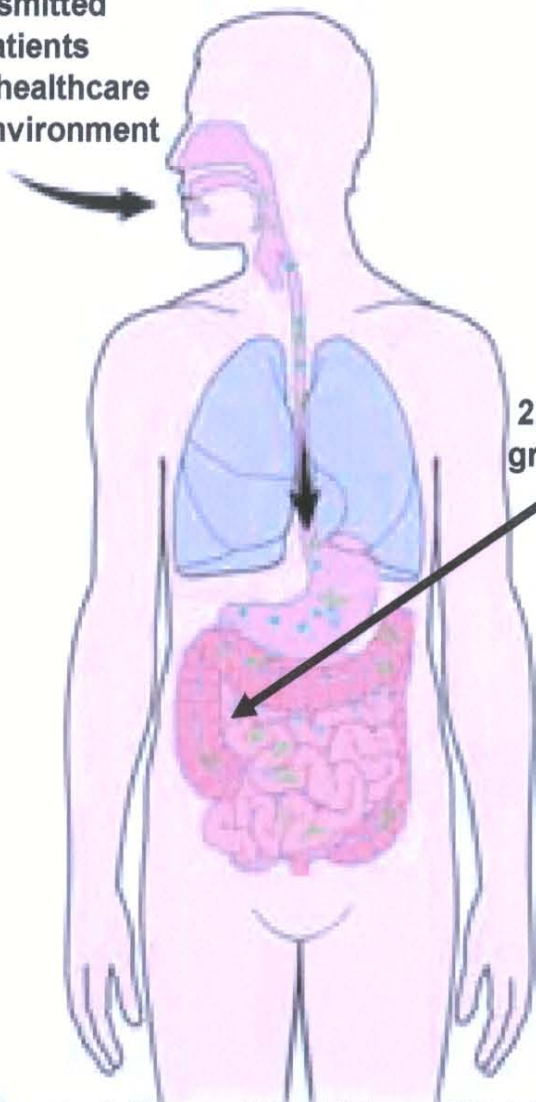
- # Diarrhea without colitis
 - # Colitis **without pseudomembranes**
 - Diffuse patchy erythema and inflammation
 - # Pseudomembranous colitis (PMC)
 - Present in 41% (Olson *ICHE* 1994)
 - Suggest more severe disease
 - # ~1% attributable mortality
 - ↑ in outbreaks
 - # ~20% recurrence rate
-



Background: Pathogenesis of CDI



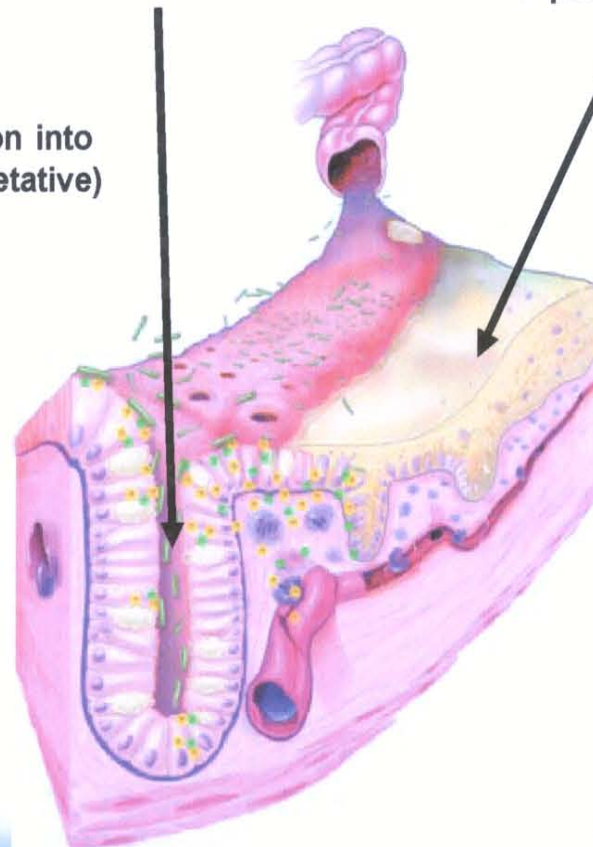
1. Ingestion
of spores transmitted
from other patients
via the hands of healthcare
personnel and environment



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



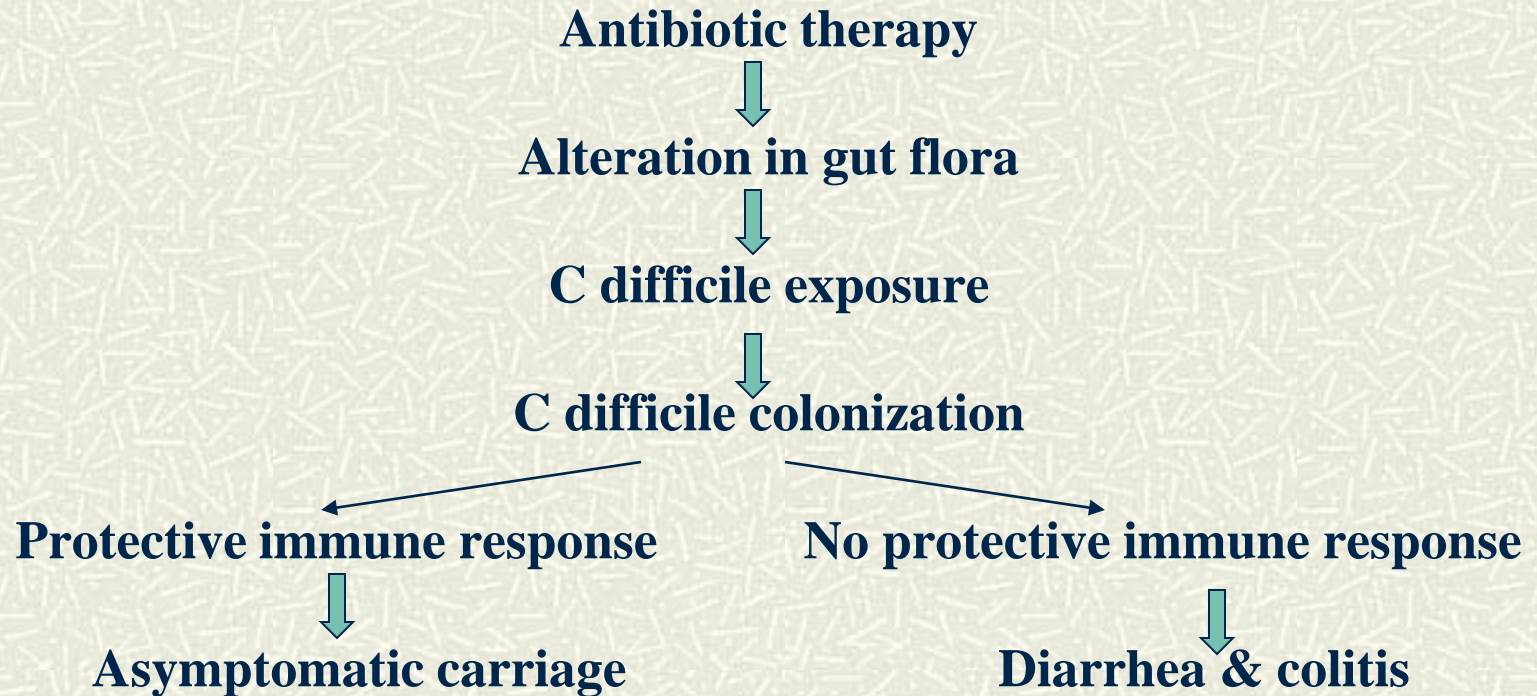


Healthy colon



Colon with PMC

Pathogenesis of *C difficile* Disease



Adapted from Kelley CP, Lamont JP. *Ann Rev Med* 1998;49.
Kyne *GI Clinics N. Am* 2001

Signs and Symptoms

- # Symptoms vary widely
 - Not readily distinguishable from other forms of colitis
 - Diarrhea developing > 72 hours after admission = high risk of CDAD
 - # Typical presentation
 - CDAD usually occurs from 2-9 days after initiating antibiotic therapy
 - Watery diarrhea without systemic signs of infection
 - 5-10% bloody; 26% occult blood
 - Fever, usually low grade 30-60%
 - Leukocytosis ($> 12,000/\text{mm}^3$) in 60%
 - 25% of patients with $\text{WBC} \geq 30,000/\text{mm}^3$ (excluding leukemics) have CDAD (Wanahita *CID* 2002); leukemoid reaction suggests severe disease
 - Abdominal pain
 - Malaise, weakness, nausea, vomiting
-

Severity of *C difficile* Disease

- # ~5% with CDAD develop fulminant colitis
 - # Severe CDAD variably defined as:
 - Diarrhea > 10 days or associated with complicated course, e.g., megacolon
 - > 10 stools/day or associated with abdominal pain, swelling or fever
 - ICU admission or died 2° to CDAD
 - Systemic toxicity: fever, hypotension, tachycardia, leukocytosis &/or volume requirements (Dallal *Annals Surg* 2002)
-

Clinical Characteristics of Severe CDAD

- # Patients with severe CDAD more likely to have:
 - Abdominal pain/peritonitis
 - WBC < 1,500 or > 25,000 (leukemoid reaction)
 - Albumin < 3.0 mg/dL (< 2.5 g/dL associated with poor prognosis)
 - Mental status decline
 - Hemoconcentration (Hct ↑ > 5%)
 - Intramural gas/ascites on CT
 - Renal insufficiency
 - Fever
-

Clinical Characteristics of Severe CDAD

- # Absence of diarrhea may reflect ileus/toxic megacolon
 - Post-op: fever, abdominal pain/distension and ileus without diarrhea may be typical presentation of *C. difficile*
 - Ileus occurs in 6% (Olson *ICHE* 1994)
 - # ~5% of CDAD patients require surgical intervention
 - Mortality ~40 - 60% (Jobe *Am J Surg* 1995; Dallal *Ann Surg* 2002)
 - # 14% mortality in all patients with CDAD
 - 1% directly attributable to *C. difficile* (Dallal *Ann Surg* 2002)
 - ↑ in outbreak settings (Pepin *CMAJ* 2004)
-

Back in 2005.....

- # **CDAD not reportable disease in NJ**
 - of course, an outbreak was, and is...
- # **Anecdotal reports of increases in incidence & severity of CDAD in NJ**



NJDHSS CDAD Survey 2005

Esther Tan, EIS Officer

- # **Determine CDAD incidence and serious complication/death rates in NJ acute care hospitals, 2000-2004**
- # **Evaluate current CDAD surveillance and infection control practices, including antibiotic prescribing patterns**
- # **Examine association between infection control practices and CDAD rates**

Survey Administration

- # 2005: Survey was distributed electronically to ICPs in all acute care hospitals in NJ
- # Response rate: 58 (70%) of 83 acute care hospitals

Case Definitions

CDAD case

- Patient with symptoms of diarrhea AND at least one of the following:
 - positive toxin assay result,
 - diagnosis of pseudomembranous colitis on sigmoidoscopy/ colonoscopy
 - histopathological/pathological diagnosis

Nosocomial CDAD

- CDAD symptoms starting ≥ 72 hours after admission

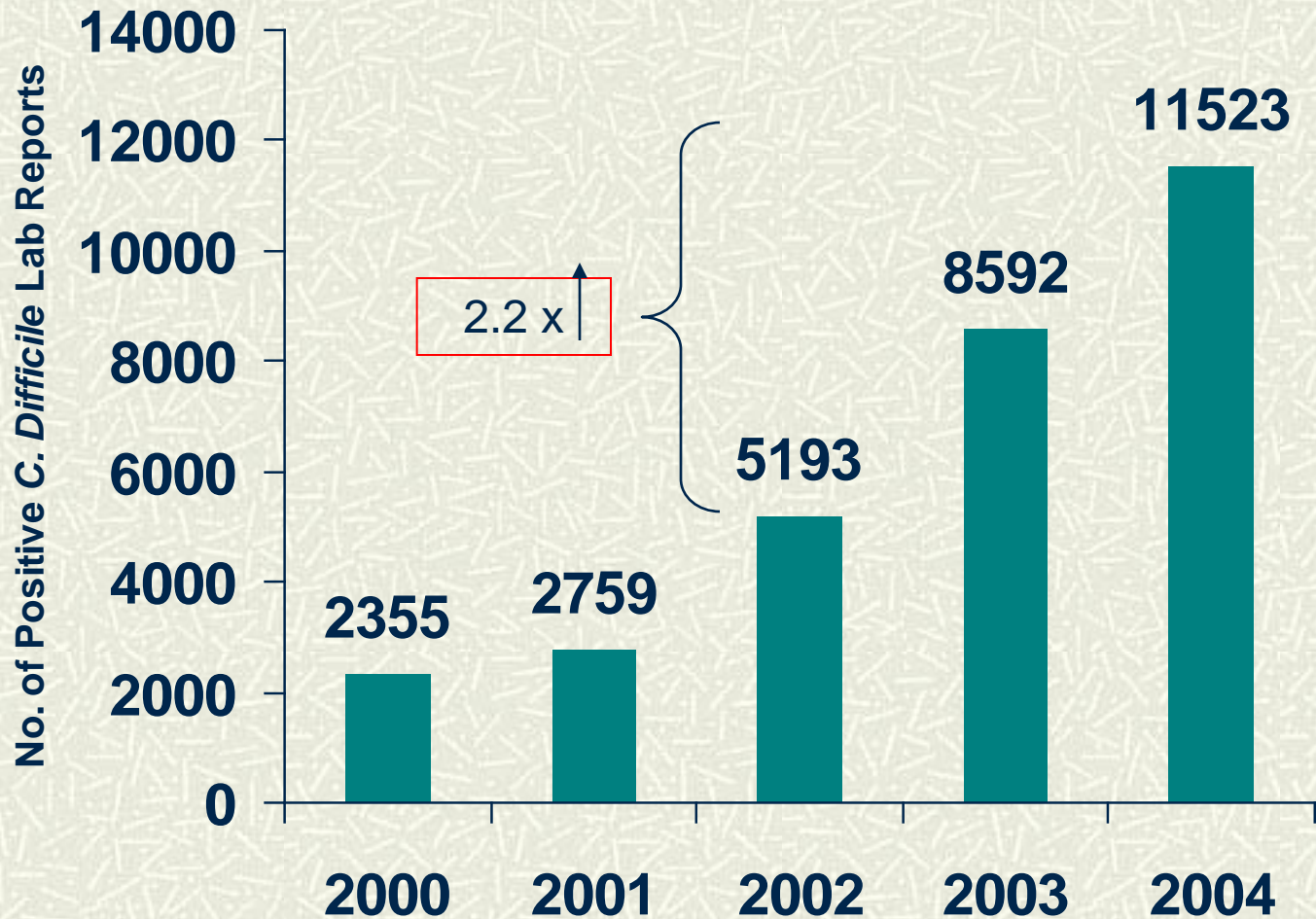
Community-acquired CDAD

- CDAD symptoms starting < 72 hours after admission or prior to admission



SURVEY RESULTS

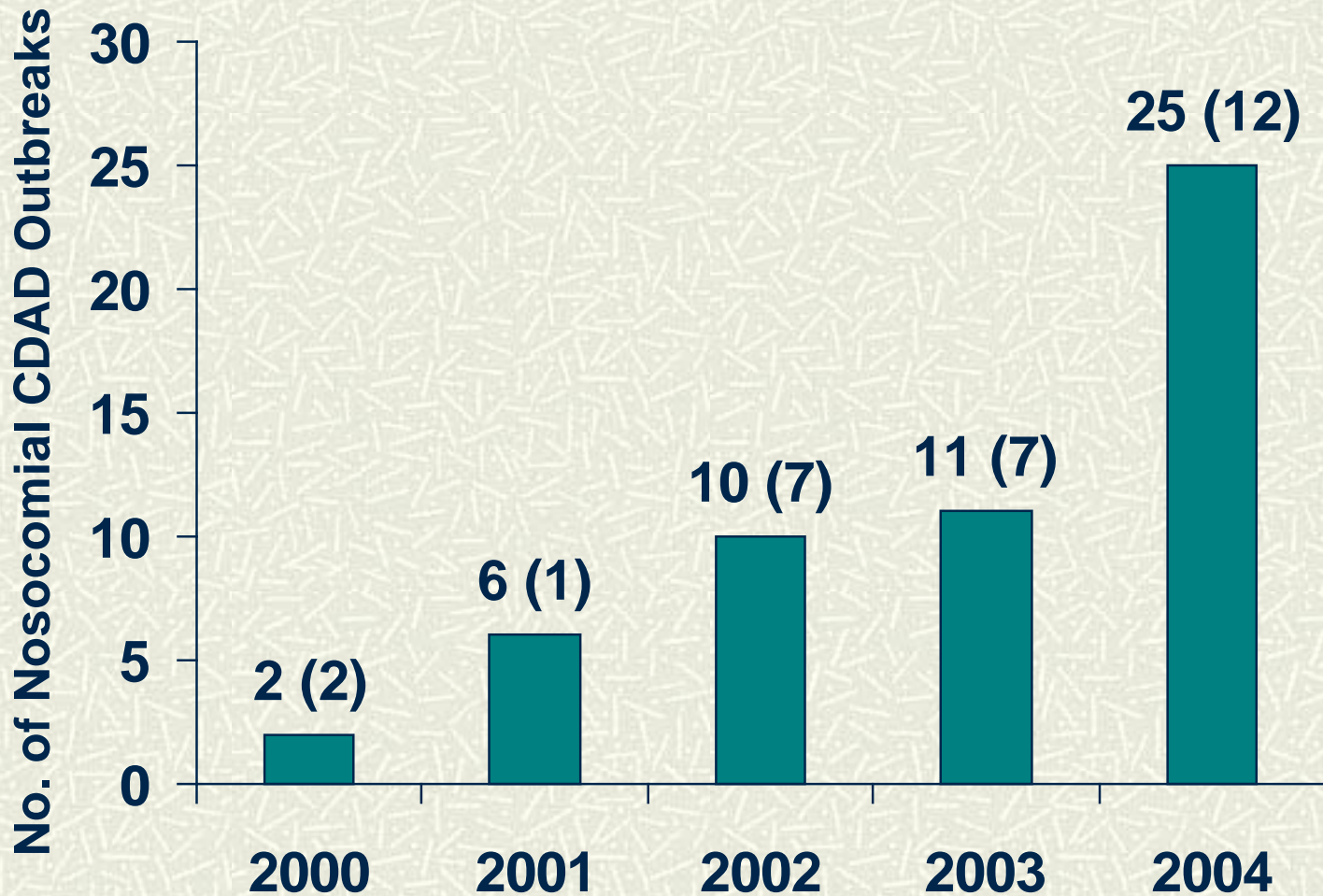
Total *C. Difficile* Positive Laboratory Test Results



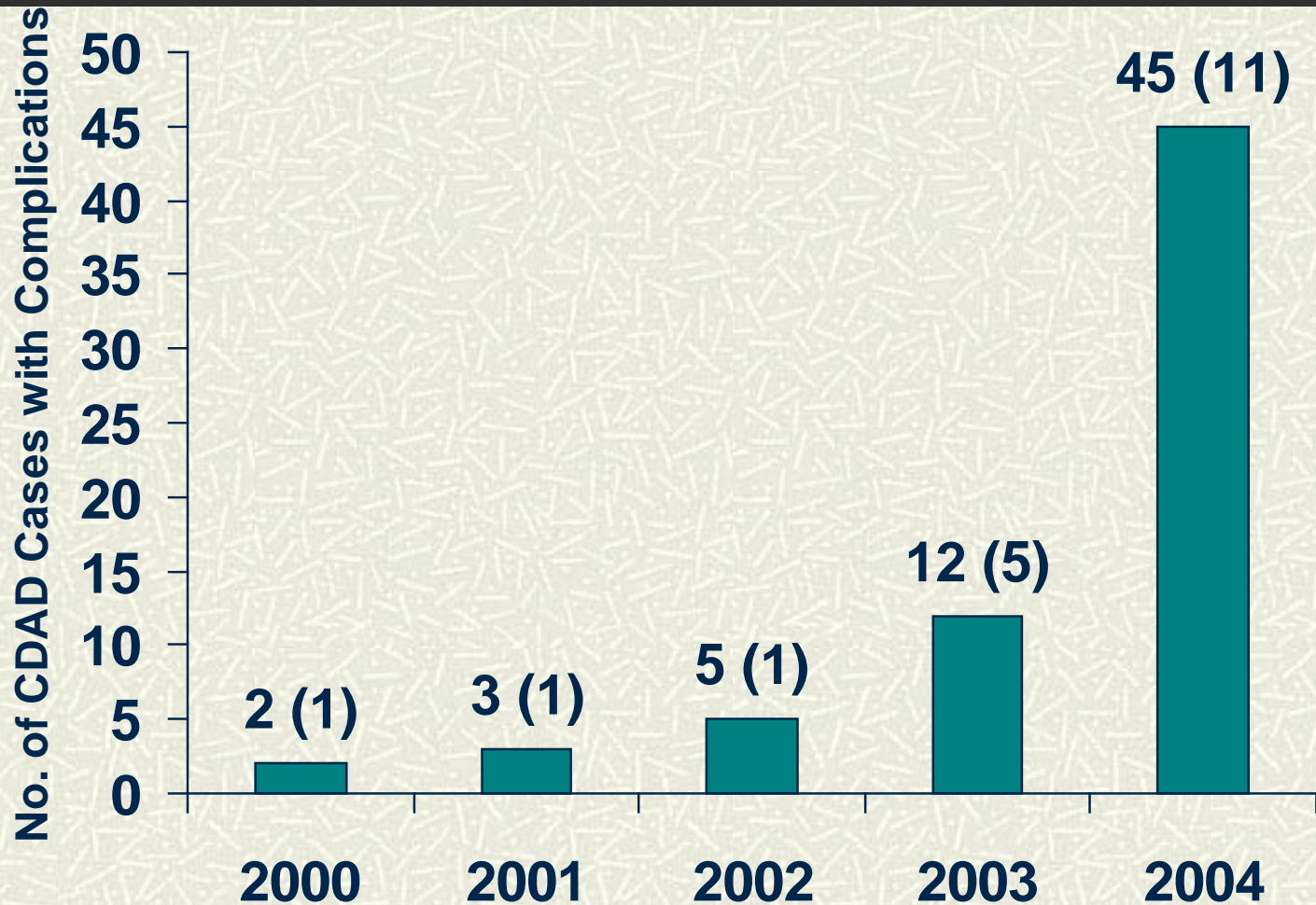
Mean Annual CDAD Incidence per 10,000 Inpatient Days



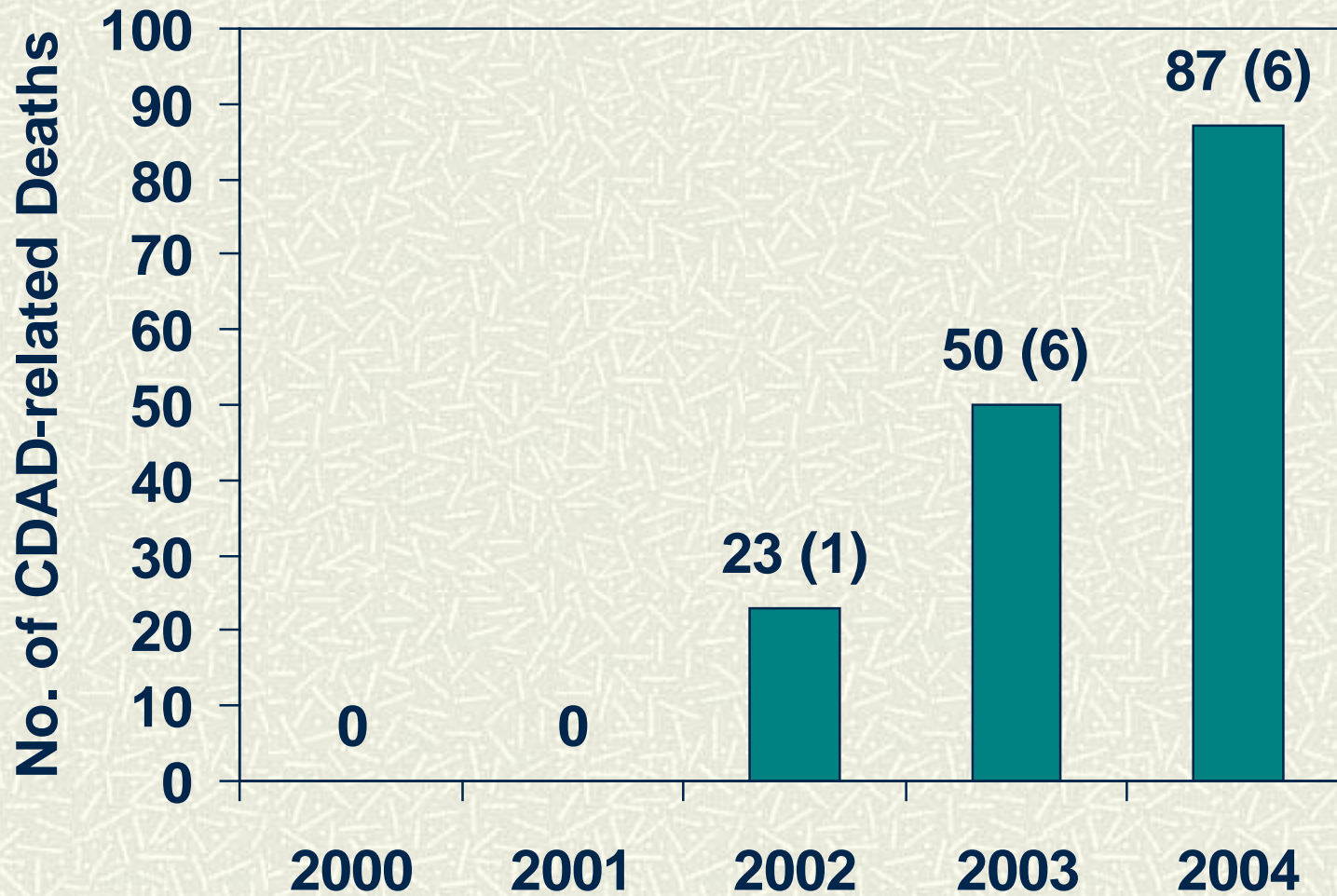
Nosocomial CDAD Outbreaks Reported per Year



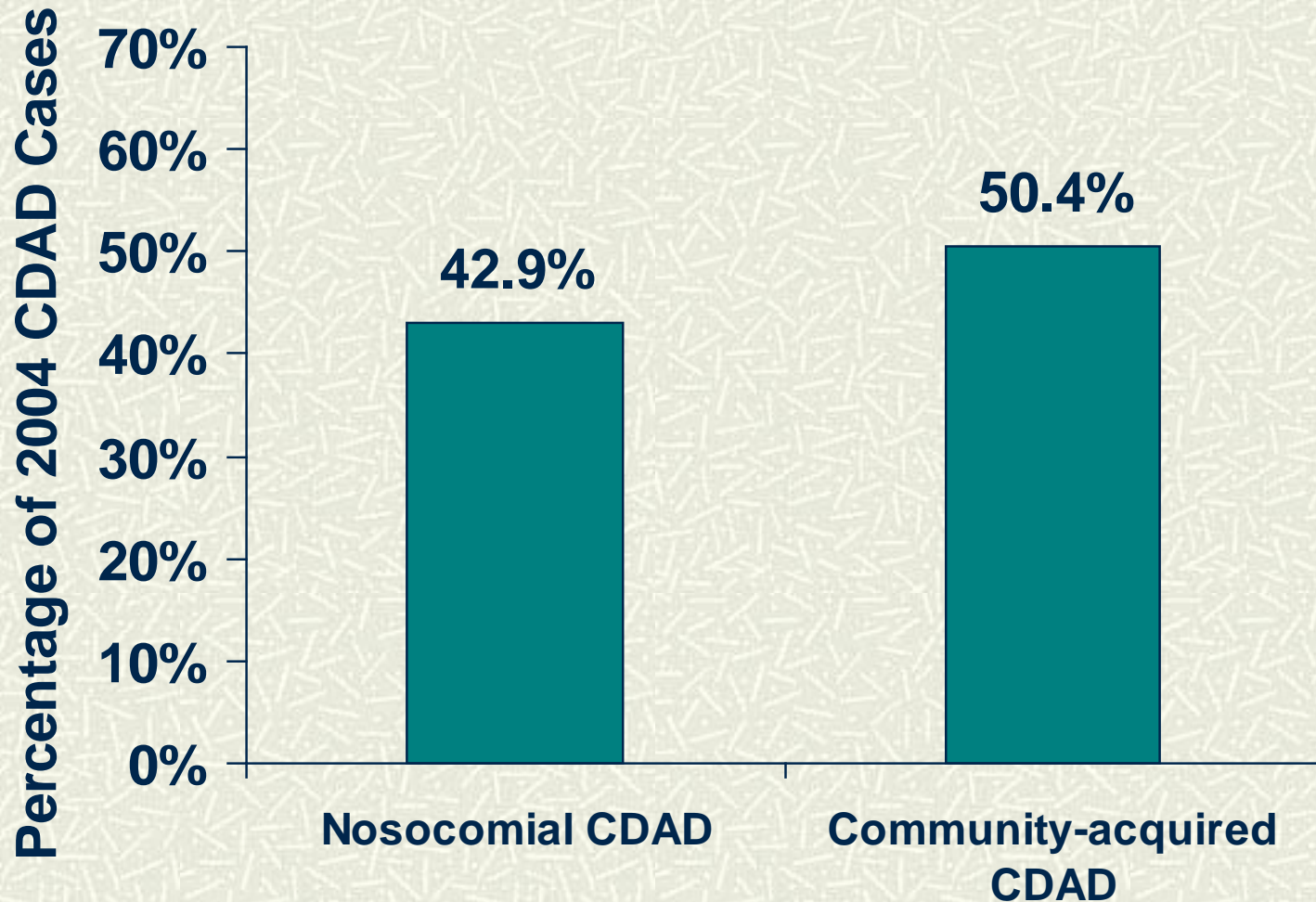
Cases with Related Complications



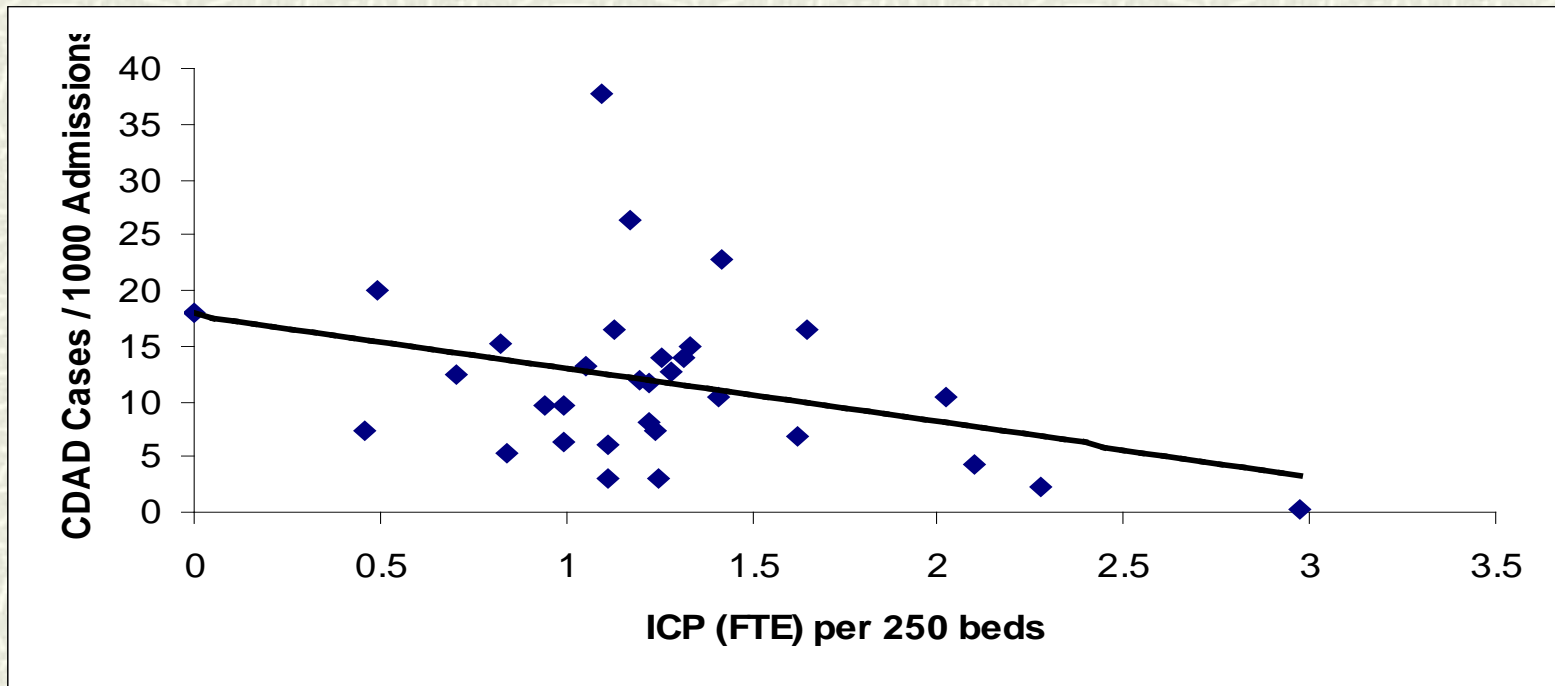
Annual Deaths within 30 Days Among CDAD Cases



2004 CDAD Cases Classified as “Nosocomial” or “Community-acquired”



CDAD Rate by # ICPs / 250 Beds

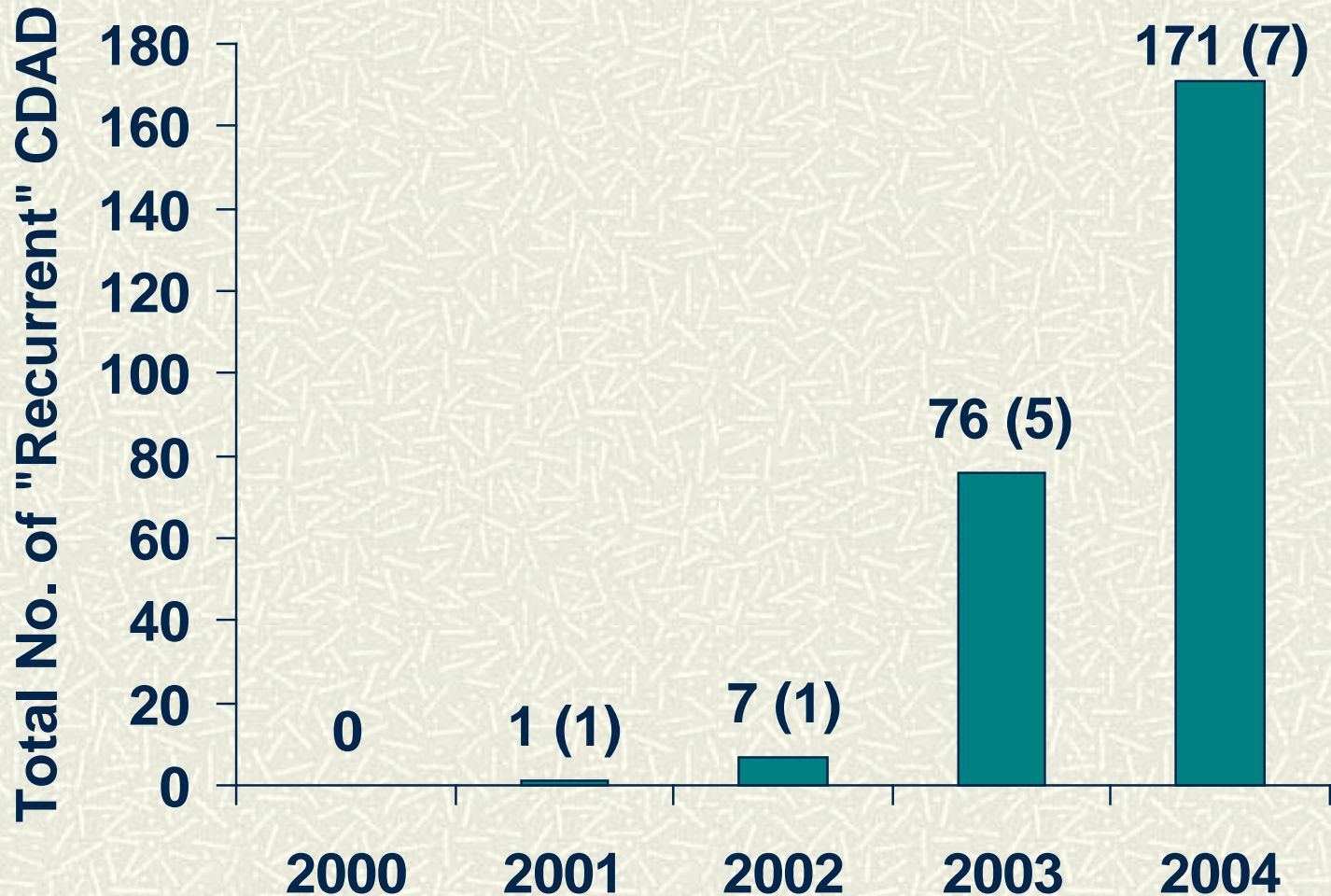


P=0.05

Case Definitions of “Recurrent” CDAD Used by Hospitals

- # Variety of case definitions cited:
 - “Repeat (+) toxin within 6 weeks of first”
 - “Positive C. difficile assay within previous 30 days”
 - “Patient previously positive in the same year”
 - “Patient with positive CDAD previously within 3 months”
 - “Recurrent CDAD positive after negative toxin level”
- # Time period used ranged from 6 weeks–1 year

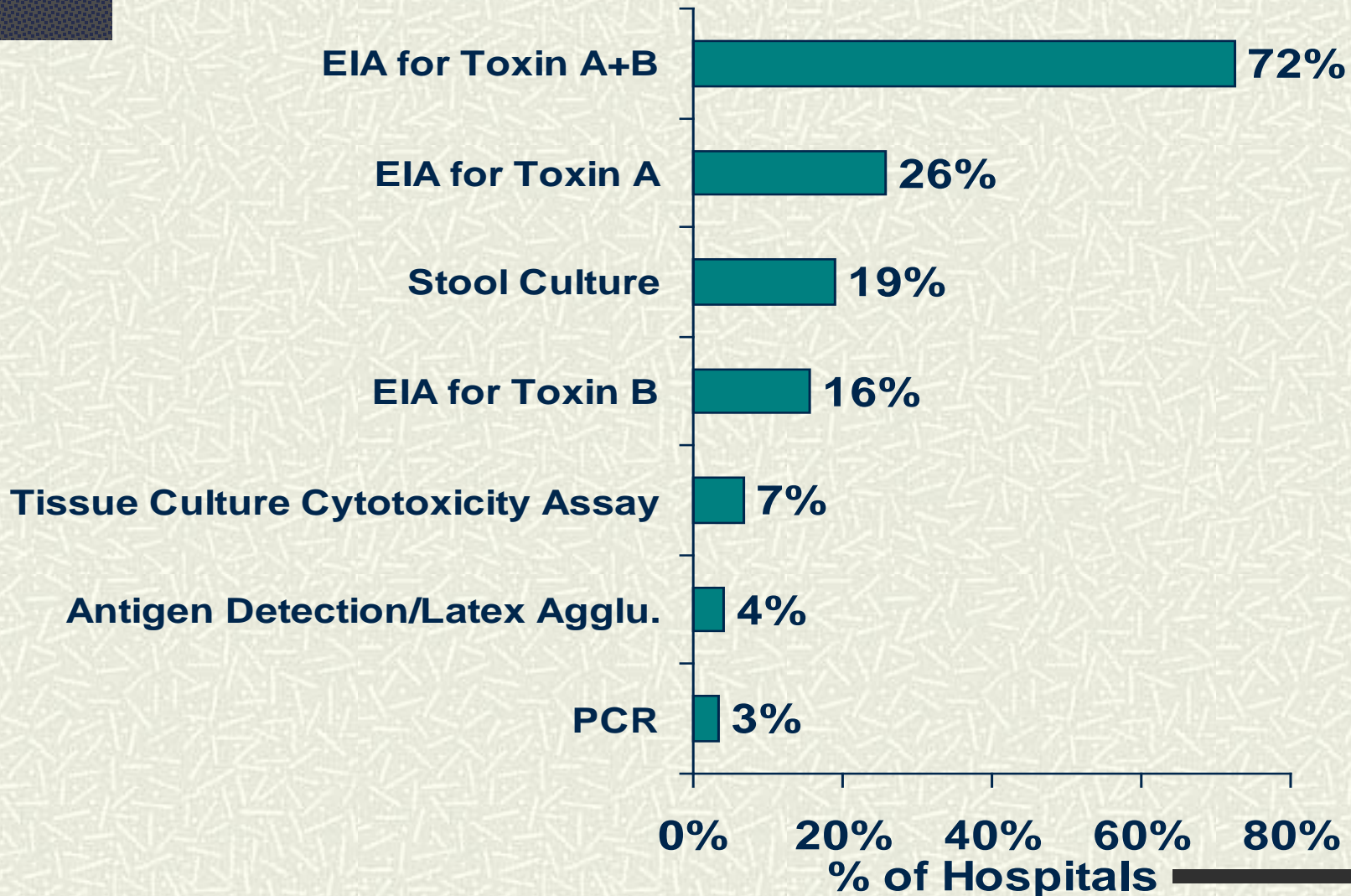
“Recurrent” CDAD Reported





Laboratory Diagnosis

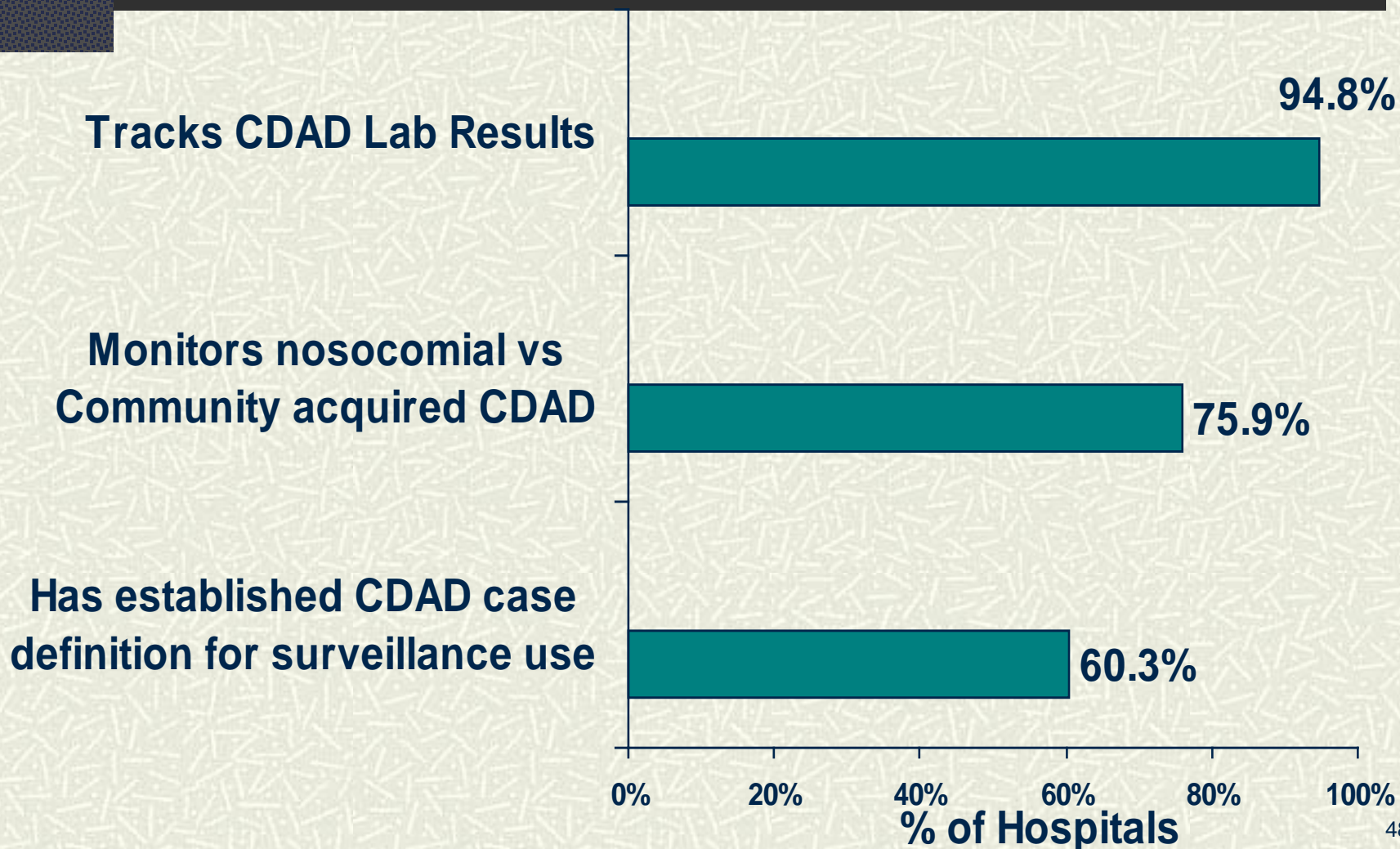
Laboratory Test Used for CDAD Diagnosis





Surveillance Activities

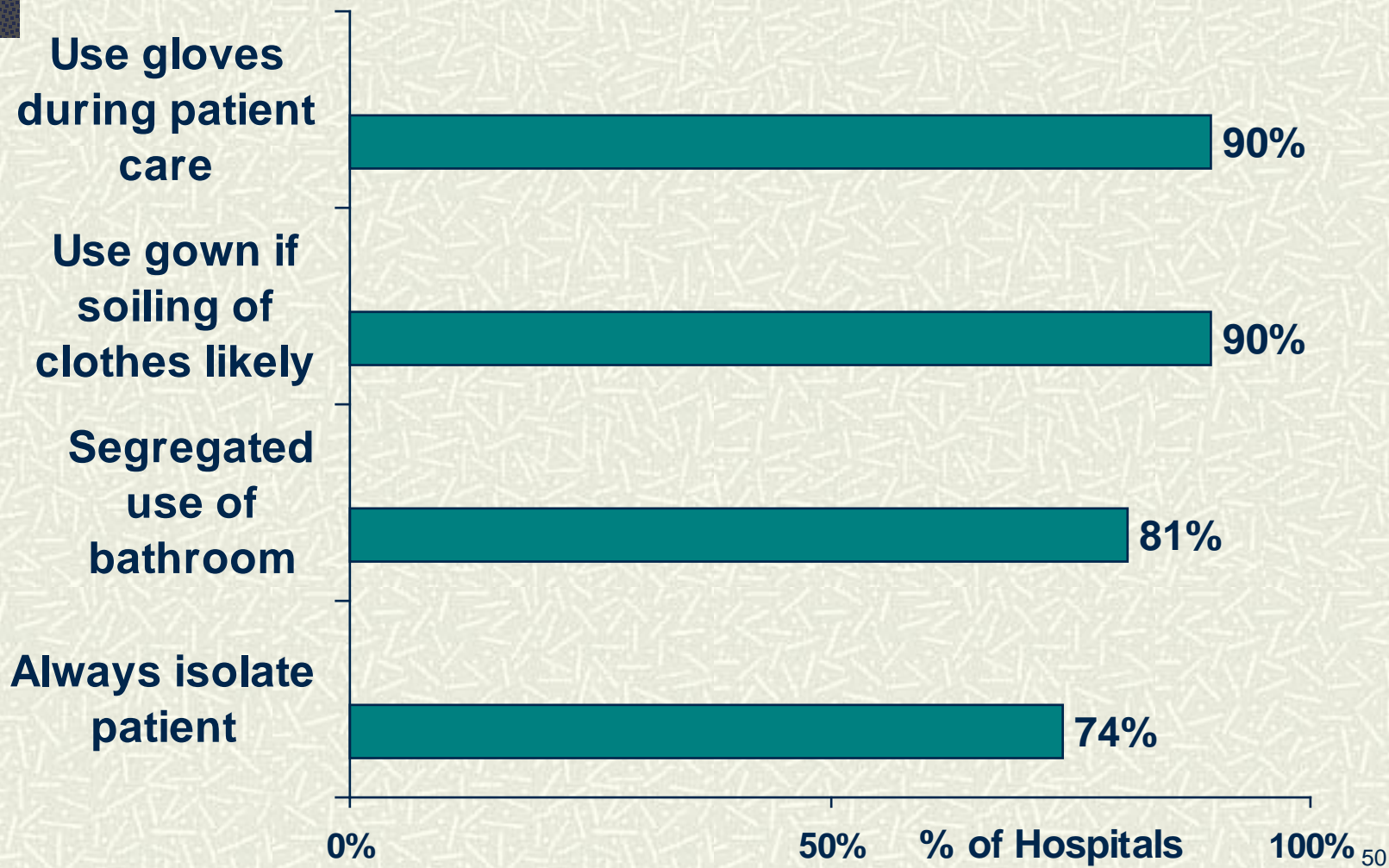
What type of activities do you have in place for tracking CDAD in your hospital?



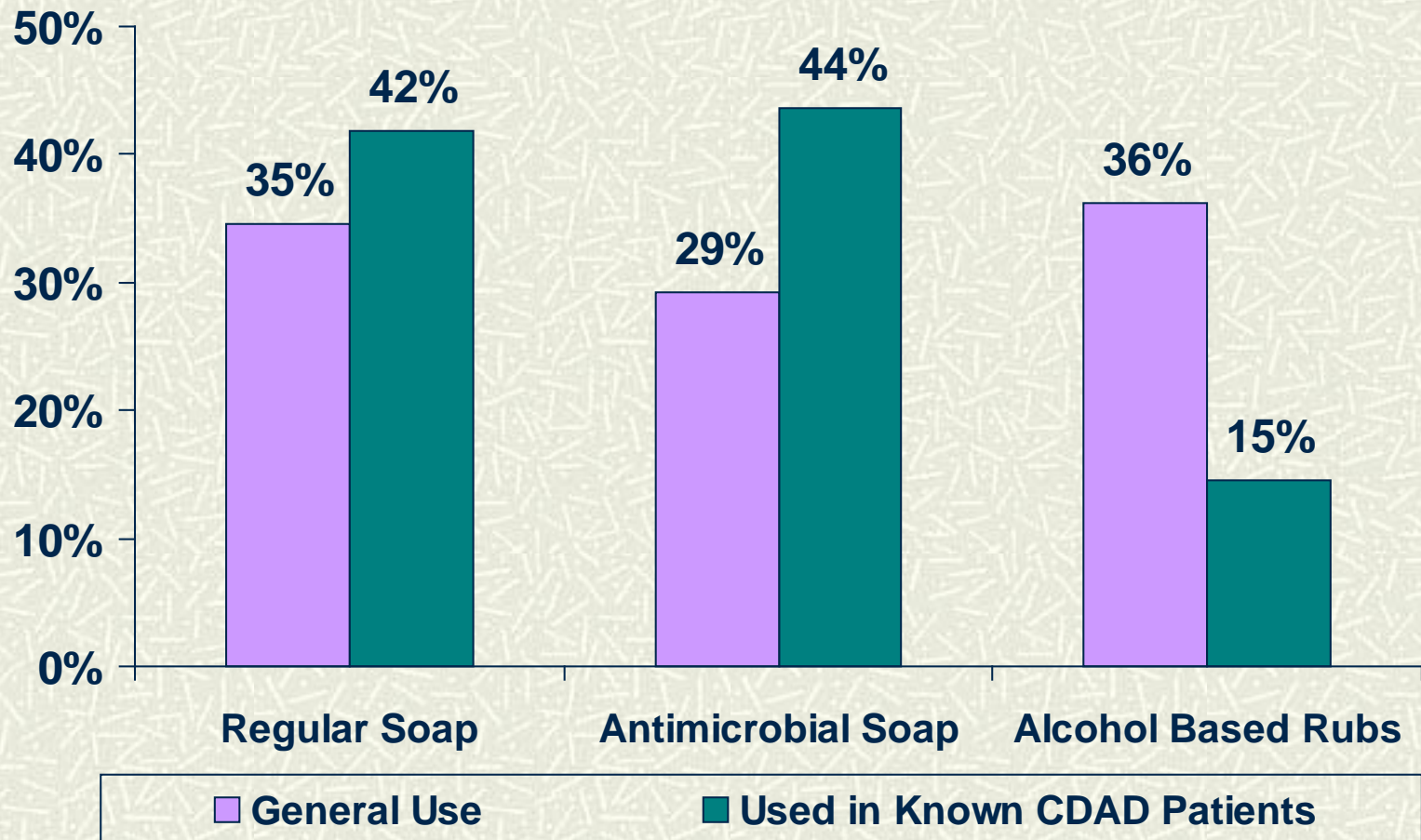


Infection Prevention Measures

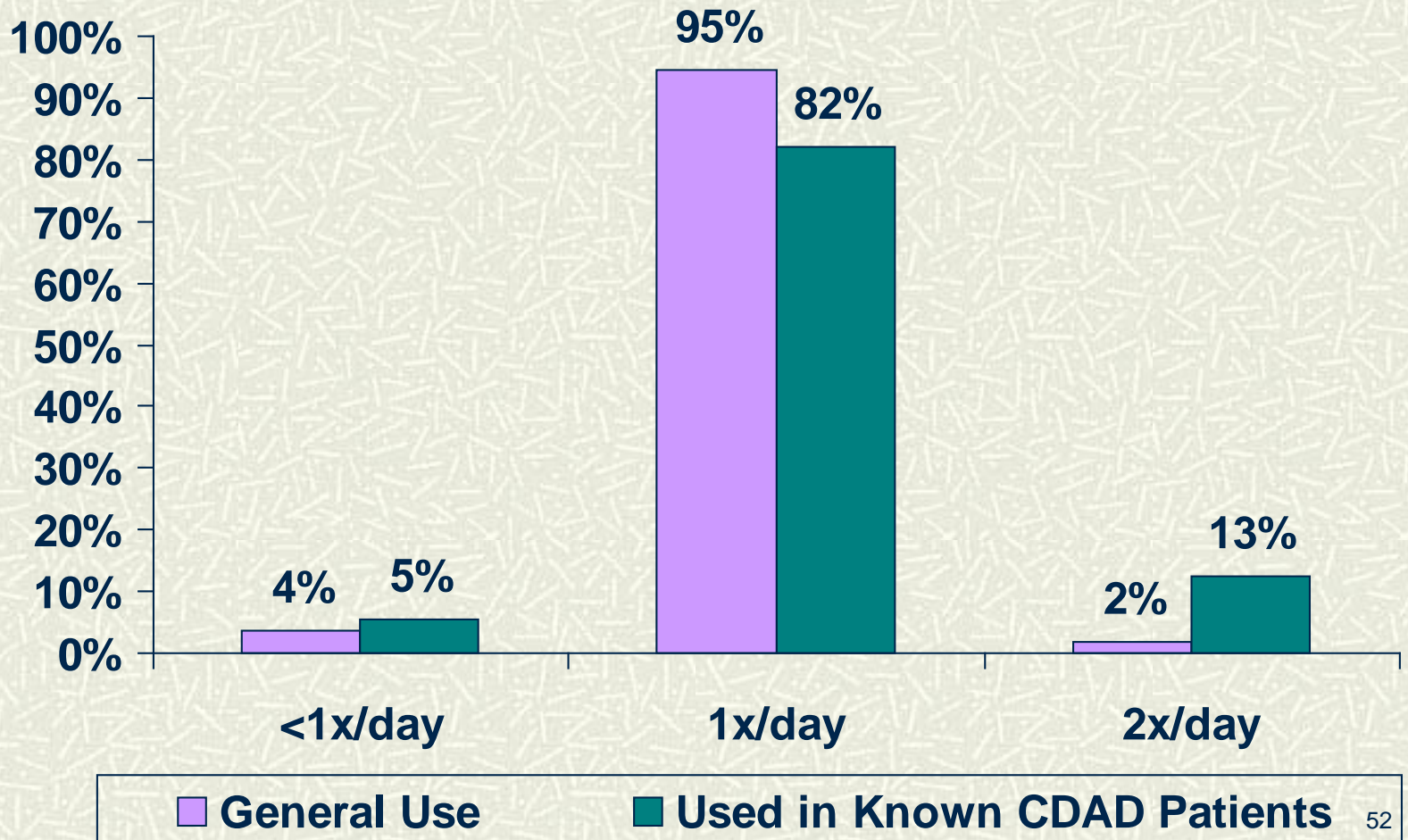
What are the infection control measures recommended for CDAD patients?



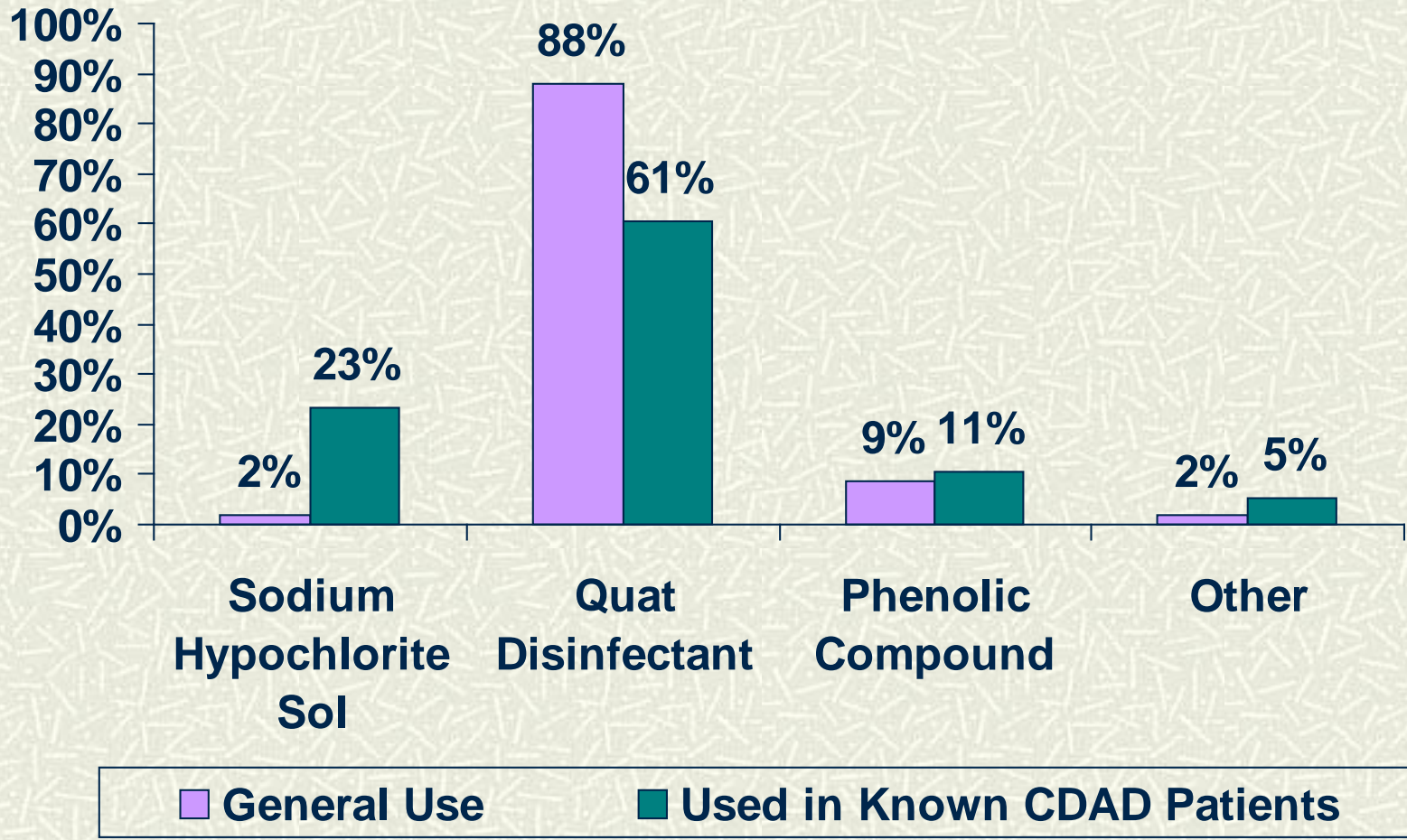
What is the predominant method of hand hygiene recommended for routine patient care vs in CDAD patients?



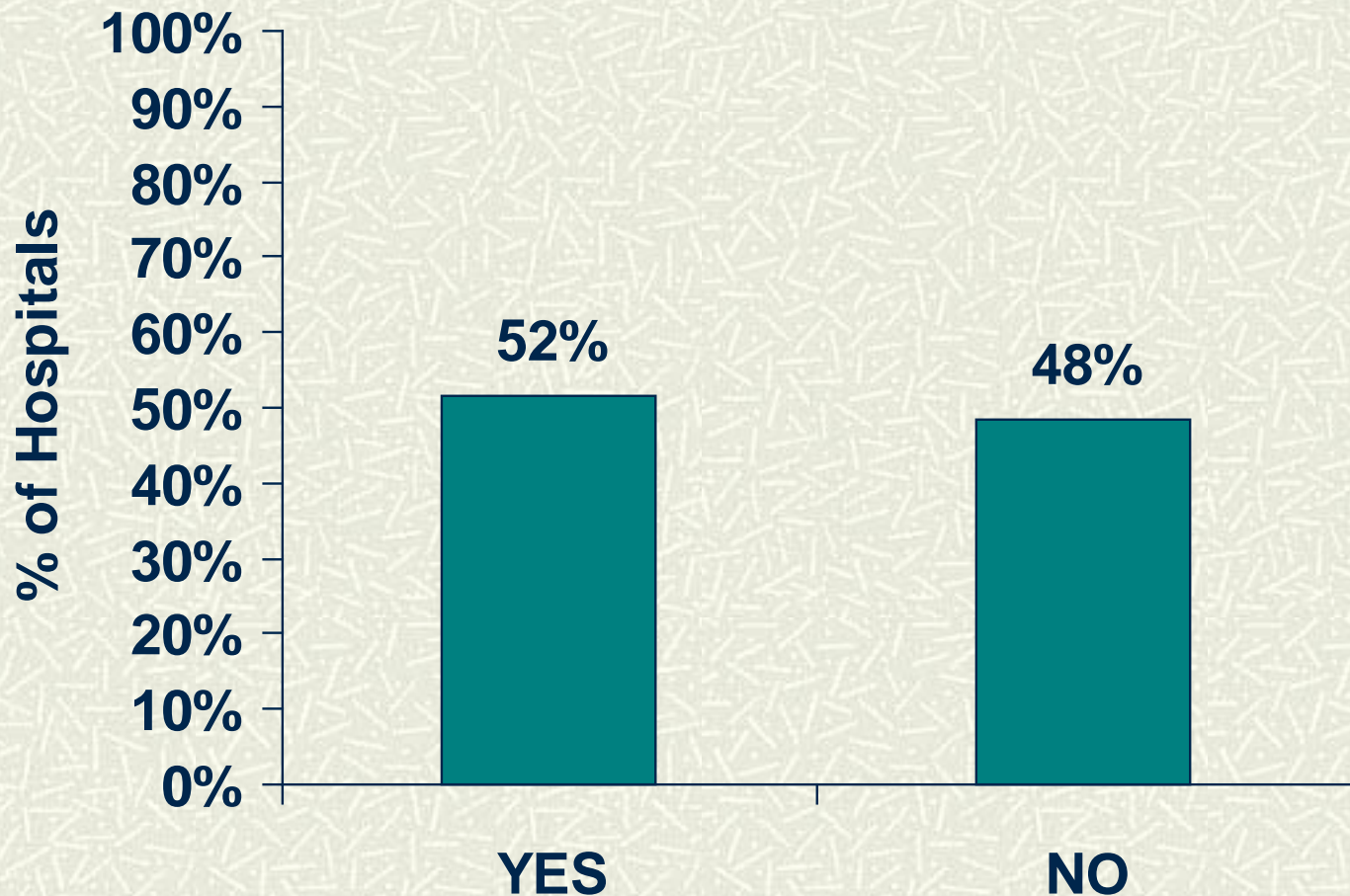
What is the average frequency of cleaning & disinfection of environmental surfaces for routine patient care vs in CDAD patients?



What is the predominant type of disinfectant used in patients generally vs in CDAD patients?



Do you use any reusable rectal thermometers (with disposable) sheaths in your hospital?



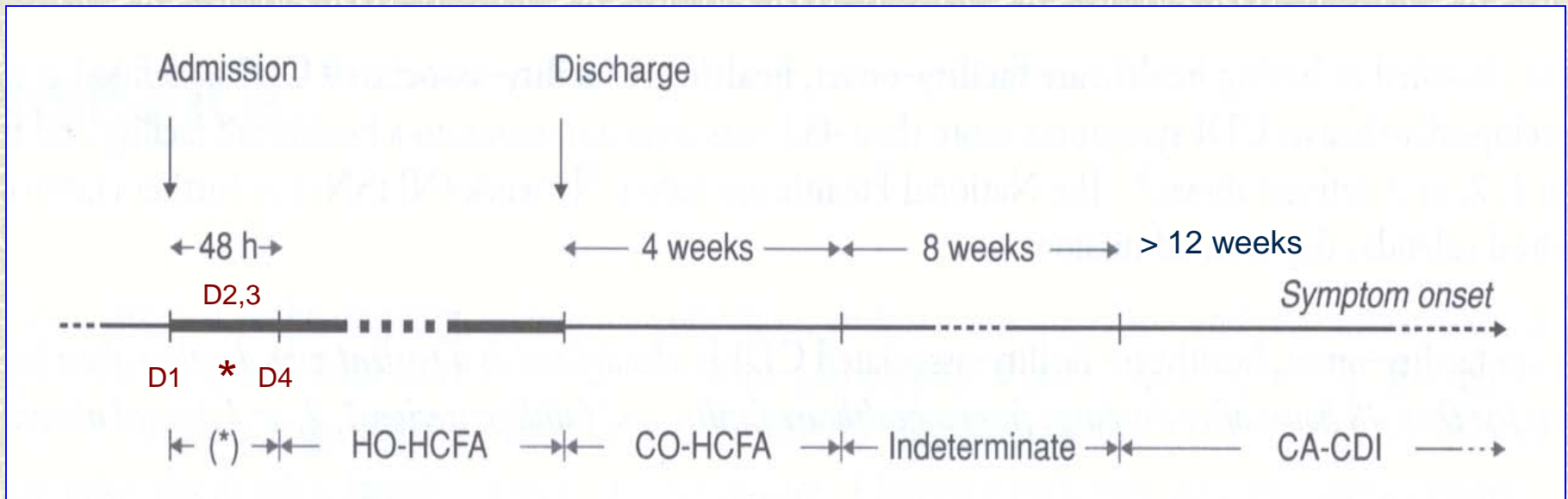
Recommendations

**How are we doing
with those???**

Recommendations (2005)

Use standardized case definitions to conduct surveillance of CDAD cases, related complications and deaths and report these to state health departments.

Revised Case Definition



HO-HCFA = Healthcare Onset, Healthcare Facility-Associated
CO-HCFA = Community-Onset, Healthcare Facility-Associated
CA-CDI = Community-Associated C difficile infection

* Depending on whether patient discharged within last 4 weeks, CO-HCFA or CA

Source: C. McDonald, DHQP, CDC, Atlanta, GA

Modified from CDAD Surveillance Working Group. *Infect Control Hosp Epidemiol* 2007;28:140-5.

APIC Guide to the Elimination of *Clostridium difficile* in HC Settings, 2008

NHSN Reporting: Definitions

- **Healthcare Facility-Onset:** stool specimen collected >3 days after admission to facility (i.e., on or after day 4)
 - **Community-Onset:** collected as an outpatient or an inpatient ≤ 3 days after admission to the facility (i.e., days 1, 2, or 3 of admission)
 - **Community-Onset Healthcare Facility-Associated:** collected from a patient who was discharged from the facility ≤ 4 weeks prior to date stool specimen collected
-

Calculating CDAD Incidence Rates

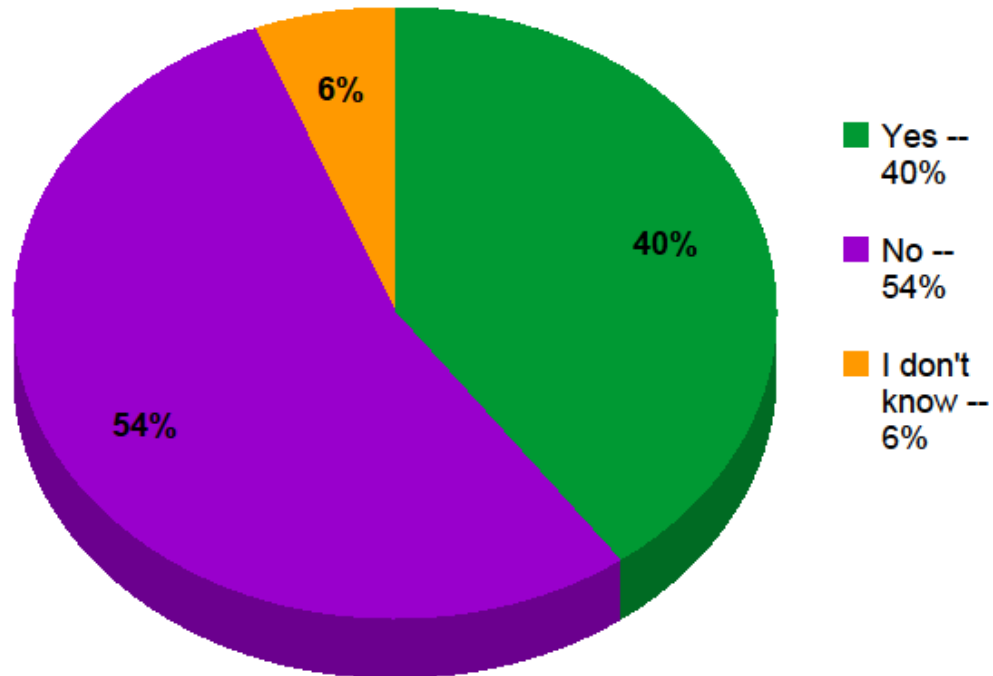
- # **Healthcare Facility-Onset Incidence Rate** =
Number of all HO CDAD patients per month /
Number of patient days for the facility x 10,000
 - # **Combined Incidence Rate** = Number of all HO
and CO-HCFA CDAD patients per month /
Number of patient days for the facility x 10,000
-

APIC 2010

Pace of Progress Survey

Feb-Mar 2010

9b. During the past 18 months, have you amended the case definition you utilize during surveillance for CDI, as detailed in the APIC Guide?



Recommendation (2005)

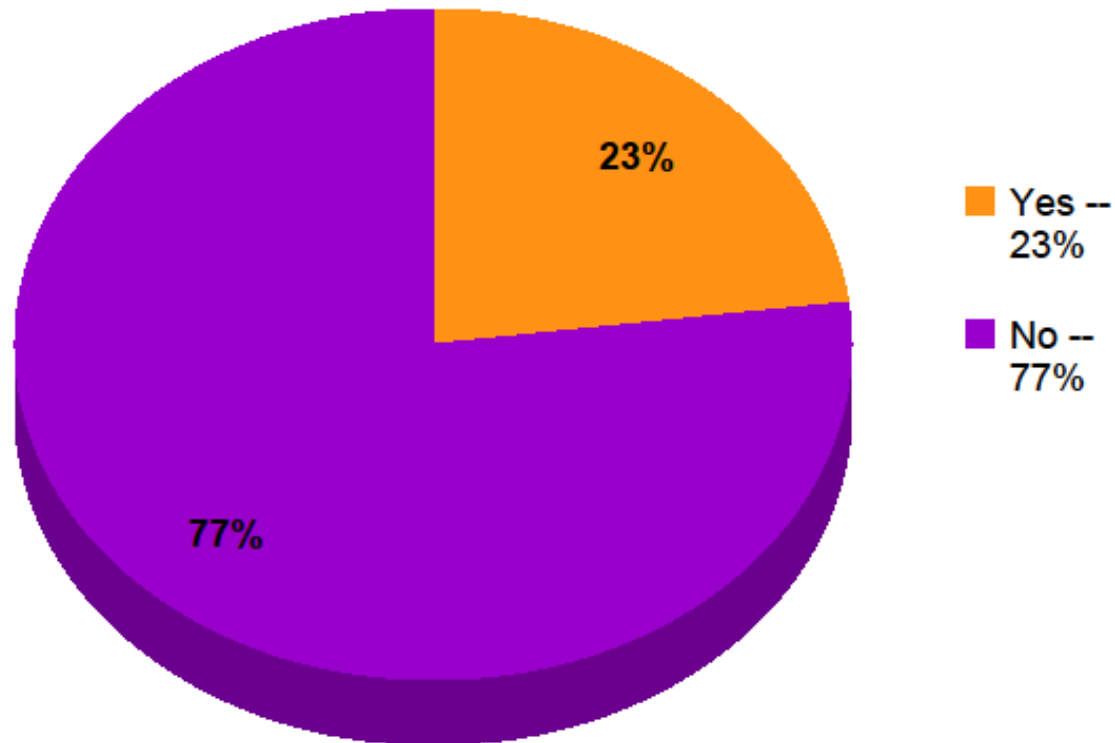
Hospitals should support increase in ICP staffing level, with the aim of decreasing CDAD infection rates.

- # 2004 NJ Hospital Licensure Regulations
 - Degree of compliance?
 - # Draft licensure regs would increase IP ratio & add Data Analyst
-

APIC 2010

Pace of Progress Survey

8. Have you added more infection prevention and control (IPC) staff or had an increase in hours dedicated to IPC at your facility during the last 18 months?



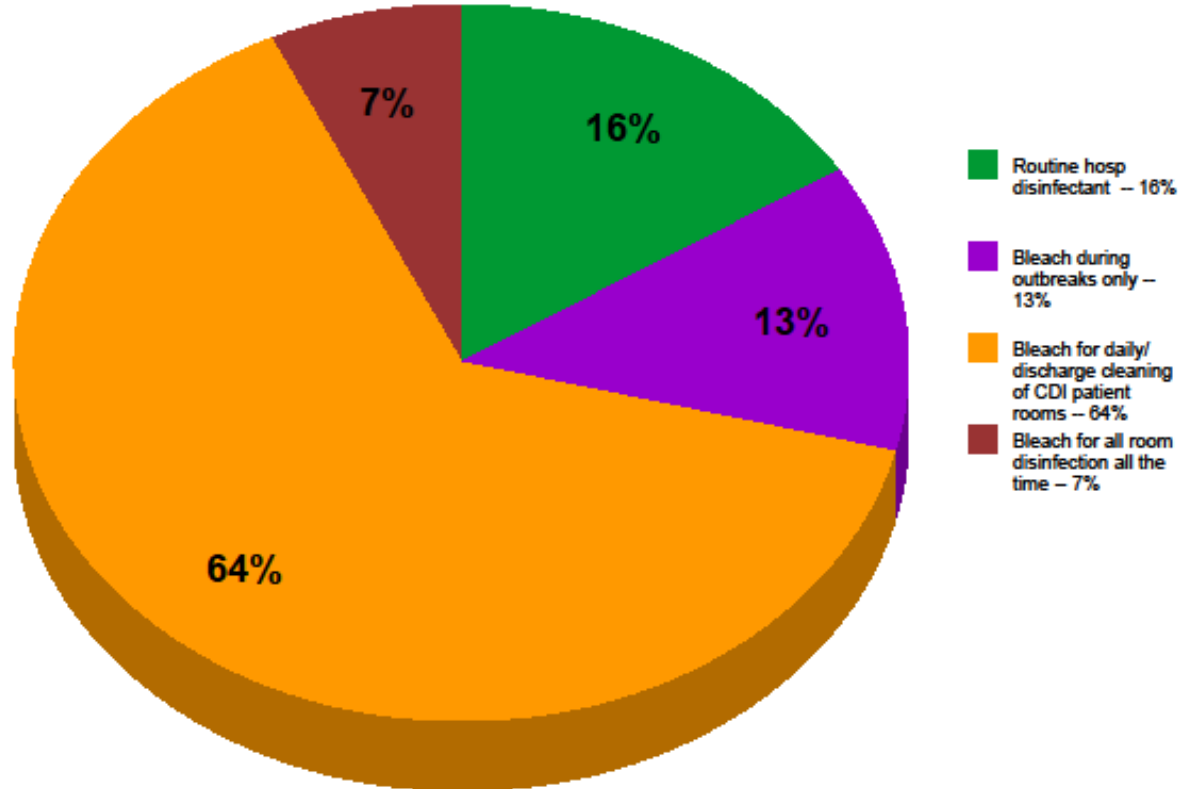
Recommendations (2005)

Hospitals should discourage use of Quats and encourage use of sodium hypochlorite-based disinfectants, especially for CDAD patients

- # Anecdotally being done
 - # Newer question: Is it the product or the process?
-

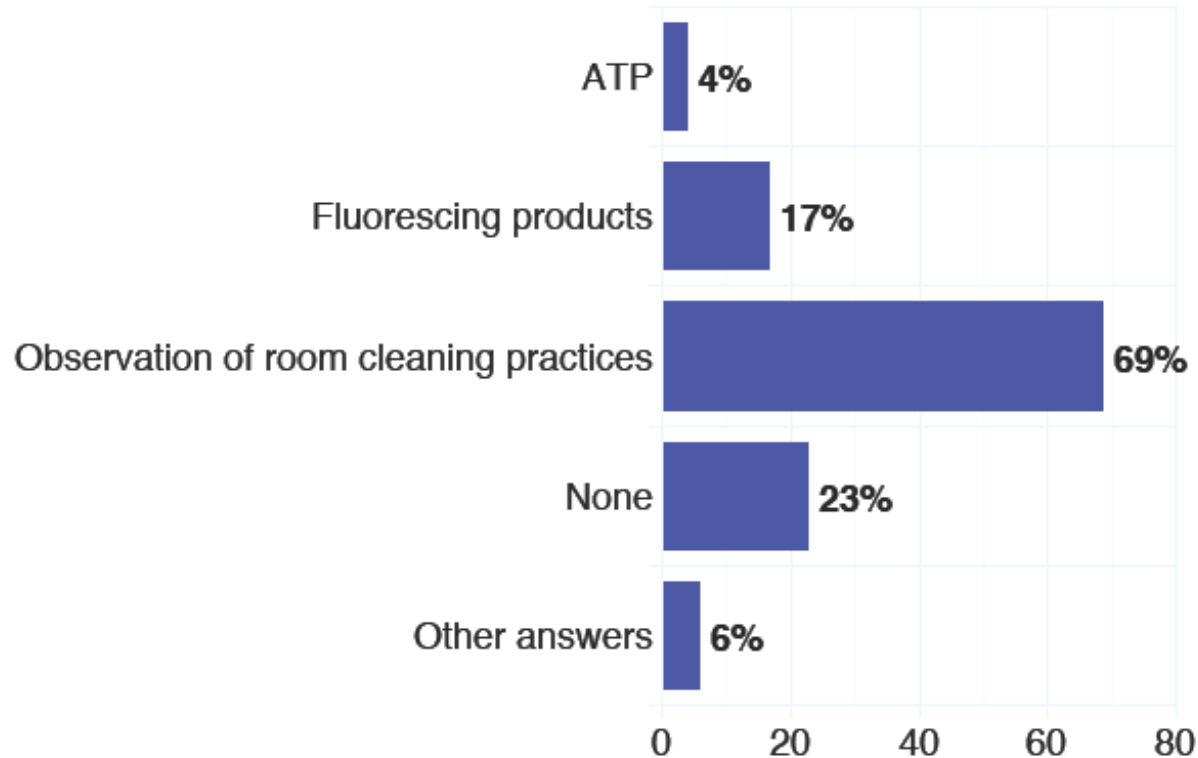
APIC 2010 Clostridium difficile Pace of Progress Survey

12b. Which of the following most accurately describes your current facility policy regarding room cleaning for patients with CDI?



APIC Survey: Monitoring Efficacy of Cleaning Process

12c. Identify any of the following that have been used to monitor the effectiveness of environmental cleaning in your facility during the past 18 months.



Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings 2007

- Wash hands with non-antimicrobial soap and water or with antimicrobial soap and water if contact with spores (e.g., *C. difficile* or *Bacillus anthracis*) is likely to have occurred. The physical action of washing and rinsing hands under such circumstances is recommended because alcohols, chlorhexidine, iodophors, and other antiseptic agents have poor activity against spores. *Category II*
- Don't share electronic thermometers
- Rigorous environmental cleaning
- Hypochlorite solutions (bleach) for outbreaks

Jane D. Siegel, MD; Emily Rhinehart, RN MPH CIC;
Marguerite Jackson, PhD; Linda Chiarello, RN MS;
the Healthcare Infection Control Practices Advisory Committee



APIC *Clostridium difficile* Elimination Guide, 2008

Tiered Approach

▣ Routine

- Calculate & communicate rates for all areas
- Monitor colectomy rate
- Adequate ID: timely, communicated
- Standard precautions for all
 - Use Contact Precautions for CD patients when possible
 - Dedicated equipment
 - Discontinue when diarrhea resolves
 - Don't isolate asymptomatic patients
- EPA-approved germicide on high-touch areas
- Alcohol hand rubs unless visible soilage
- Patient & HCW education

Heightened Response for Ongoing Transmission

- # Round to identify cases, initiate Contact Precautions for suspected cases
 - Isolate until discharge if positive
 - # Increase prevention compliance monitoring (HH, G&G)
 - # Identify barriers to good infection prevention practice with staff
 - # 10% hypochlorite for CDAD patient room
 - Consider expanding to other rooms
 - # Hand washing (soap & water) preferred
 - # Assess antibiotic use
 - # Share costs & impact with leadership
-

HAI Elimination Toolkit, Prevention Strategies: Core

- Contact Precautions for duration of diarrhea
- Hand hygiene in compliance with CDC/WHO
- Cleaning and disinfection of equipment and environment
- Laboratory-based alert system for immediate notification of positive test results
- Educate about CDAD: HCP, environmental services, administration, patients, families

<http://www.cdphe.state.co.us/hf/PatientSafety/CDItoolkit.pdf> Draft 12/09

http://www.cdc.gov/ncidod/dhqp/id_CdiffFAQ_HCP.html

Dubberke et al. Infect Control Hosp Epidemiol 2008;29:S81-92

Prevention Strategies: Supplemental

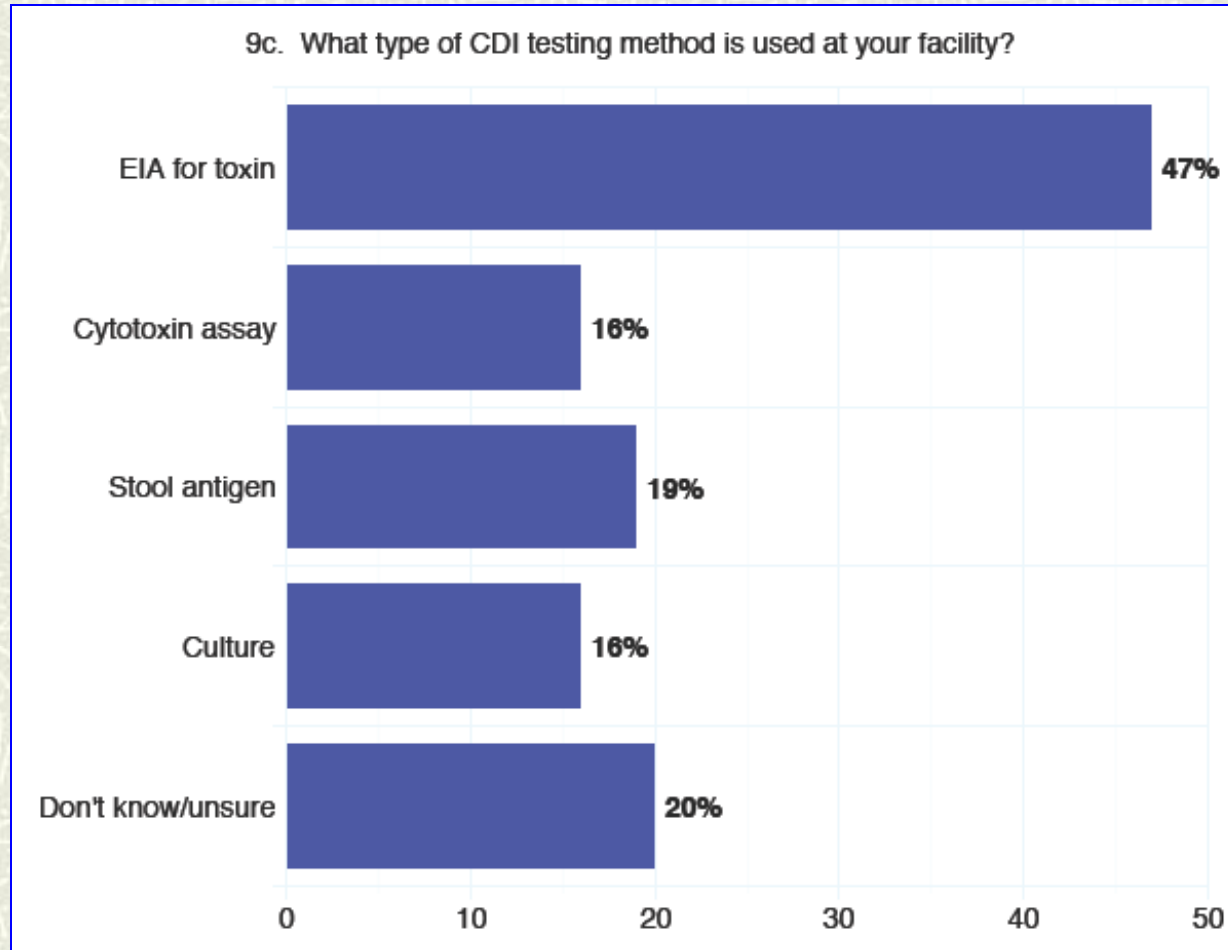
- # Extend use of Contact Precautions beyond duration of diarrhea (e.g., 48 hours)*
- # Presumptive isolation for symptomatic patients pending confirmation of CDAD
- # Evaluate and optimize testing for CDAD
- # Implement soap and water for hand hygiene before exiting room of a patient with CDAD
- # Implement universal glove use on units with high CDAD rates*
- # Use sodium hypochlorite (bleach)-containing agents for environmental cleaning
- # Implement an antimicrobial stewardship program

*Not included in CDC/HICPAC 2007 Guideline for Isolation Precautions

Supplemental Strategy: Test-ordering Practices & Diagnostic Methods

- # Most laboratories using Toxin A/B enzyme immunoassays
 - Low sensitivities (70-80%) lead to low negative predictive value
- # Poor test ordering practices (i.e., testing formed stool or repeat testing in negative patients) may lead to many false positives
 - Consider more sensitive diagnostic tests but apply more judiciously
 - Use a highly sensitive screen with confirmatory test or a PCR-based molecular assay
 - Restrict testing to unformed stool only
 - Focus testing on patients with >3 unformed stools within 24 hours
 - Require expert consultation for repeat testing within 5 days

APIC 2010 Pace of Progress Survey



Non-Utility of Repeat Laboratory Testing for *Clostridium difficile*

- # The diagnostic gain of repeat testing for *Clostridium difficile* by enzyme immunoassay versus PCR (i.e., initial negative followed by positive result) within a 7 day period was 1.9 & 1.7%, respectively.
- # There is little value of repeat testing for *C. difficile* by enzyme immunoassay or PCR.

Supplemental Strategies: Hand Hygiene – Soap vs. Alcohol Gel

- # Alcohol not effective in eradicating *C. difficile* spores
- # However, one hospital study found that from 2000-2003, despite increasing use of alcohol hand rub, there was no concomitant increase in CDAD rates
- # Discouraging alcohol gel use may undermine overall hand hygiene program with untoward consequences for HAIs in general

Boyce et al. Infect Control Hosp Epidemiol 2006;27:479-83.

Supplemental Strategies: Hand Washing: Product Comparison

Product	Log¹⁰ Reduction
Tap Water	0.76
4% CHG antimicrobial hand wash	0.77
Non-antimicrobial hand wash	0.78
Non-antimicrobial body wash	0.86
0.3% triclosan antimicr. hand wash	0.99
Heavy-duty hand cleaner used in manufacturing environments	1.21*

*Only product statistically better

Edmonds, et al. Presented at: SHEA 2009; Abstract 43

Conclusion:

Spores may be difficult to eradicate
even with hand washing.



Supplemental Prevention Strategies: Hand Hygiene Methods

- # Since spores may be difficult to remove from hands even with hand washing, adherence to glove use, and Contact Precautions in general, should be emphasized for preventing *C. difficile* transmission via the hands of healthcare personnel

Supplemental Strategy: Glove Use

- # **Consider universal glove use (in addition to Contact Precautions for patients with known CDI) on units with high CDI rates**
 - Although the magnitude of their contribution is uncertain, asymptomatic carriers have a role in transmission.
 - Practical screening tests are not available.
 - There may be a role for universal glove use as a special approach to reducing transmission on units with longer lengths of stay and high endemic CDI rates.
 - Focus on enhanced environmental cleaning strategies and avoid shared medical equipment on such units as well.
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Supplemental Prevention Strategies: Environmental Cleaning

- # Bleach can kill spores, whereas other standard disinfectants cannot.
- # Limited data suggest cleaning with bleach (1:10 dilution prepared fresh daily) reduces *C. difficile* transmission
- # Two before-after intervention studies demonstrated benefit of bleach cleaning in units with high endemic CDI rates
- # Therefore, bleach may be most effective in reducing burden where CDI is highly endemic

Mayfield et al. Clin Infect Dis 2000;31:995-1000.

Wilcox et al. J Hosp Infect 2003;54:109-14.

Strategy: Environmental Cleaning

- # **Assess adequacy of cleaning before changing to new cleaning product such as bleach**
 - Ensure that environmental cleaning is adequate and high-touch surfaces are not being overlooked
 - One study using a fluorescent environmental marker to assess cleaning showed:
 - only 47% of high-touch surfaces in 3 hospitals were cleaned
 - sustained improvement in cleaning of all objects, especially in previously poorly cleaned objects, following educational interventions with the environmental services staff
 - The use of environmental markers is a promising method to improve cleaning in hospitals.

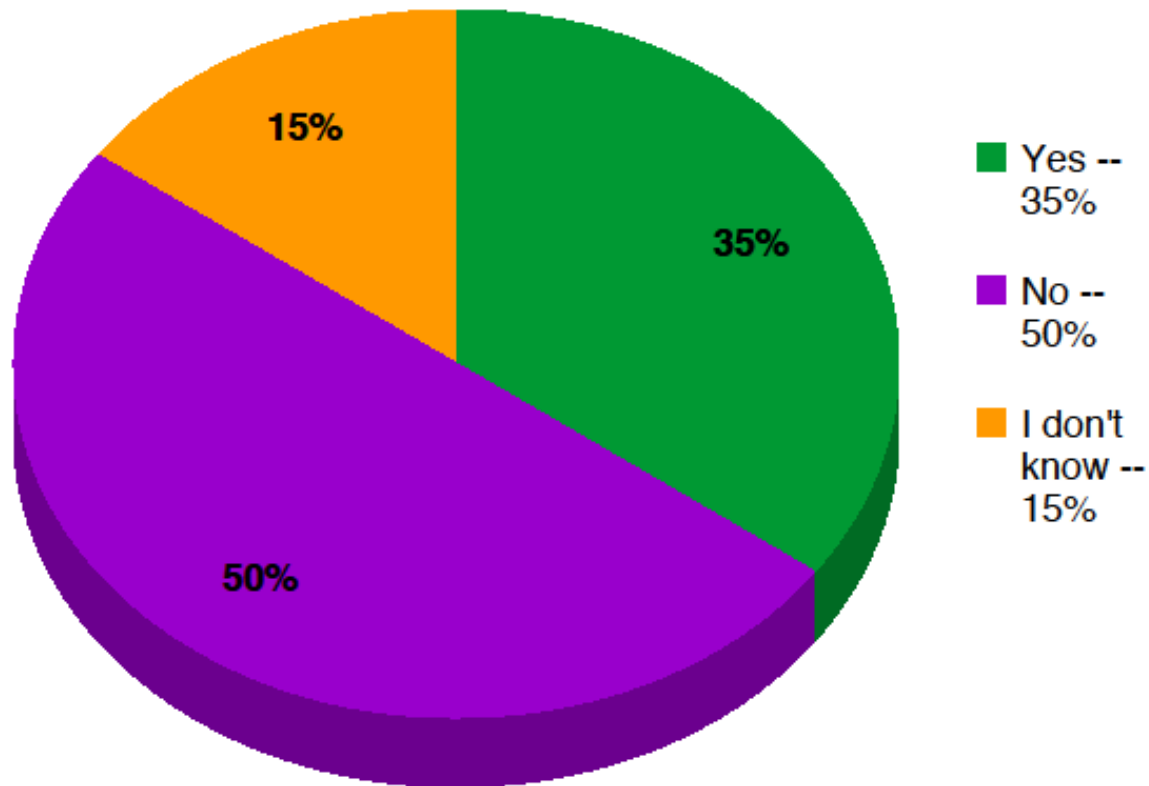
Supplemental Strategy: Audit and Provide Feedback on Targeted Broad-spectrum Antibiotics

A prospective, controlled interrupted time-series analysis in 3 acute medical wards for the elderly in the UK demonstrated the impact of antimicrobial management on reducing CDI.

- Introduced a narrow-spectrum antibiotic policy
- Reinforced using feedback
- Associated with significant changes in targeted antibiotics and a significant reduction in CDI

Antibiotic Stewardship Programs

13d. During the past 18 months, have you increased the monitoring and/or evaluation of antimicrobial use in your facility?



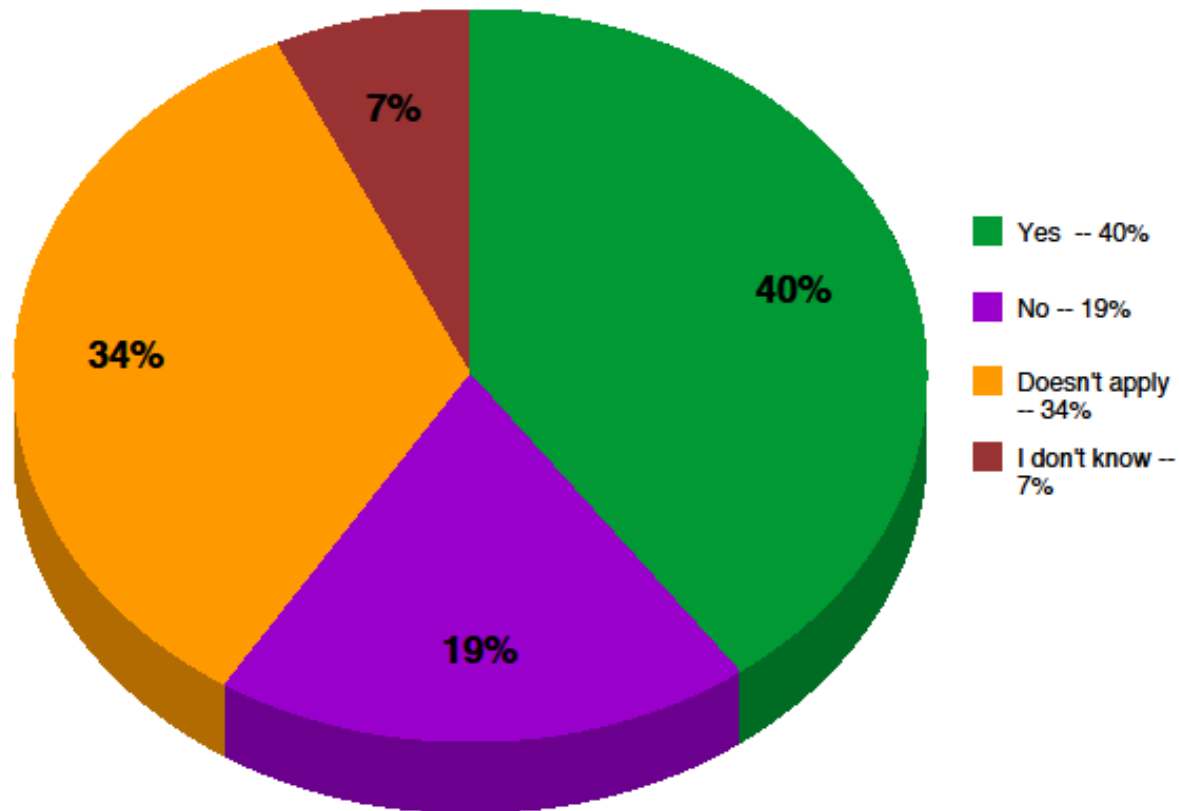
Treatment

- # For patients with mild CDAD, discontinuation of the causative antibiotics, without further treatment, may be sufficient.
- # For treatment of recurrent CDAD, widely used antibiotics are vancomycin and metronidazole.
- # Vancomycin, metronidazole, bacitracin, and fusidic acid have been shown to be effective for CDAD in controlled clinical trials.
- # In a retrospective study, mean duration of symptoms was significantly shorter with vancomycin vs metronidazole.
- # Many guidelines recommend metronidazole for patients with CDAD but there is recent evidence for high failure rates of, as well as resistance to, metronidazole. Resistance may not necessarily be the cause of treatment failure.
- # An RCT supports the use of vancomycin with the probiotic *S. boulardii*.
- # Pulsed, tapered use of vancomycin is supported by 1 uncontrolled trial and clinical experience.
- # Intracolonic vancomycin may be an effective adjunctive treatment in patients with severe *C. difficile*-associated colitis, based on a small, retrospective case series.
- # A small, uncontrolled trial of rifaximin, a rifamycin derivative, suggests good tolerability and early resolution of symptoms as effective as vancomycin.
- # Teicoplanin, which may not currently be available in all countries, may be as effective as or slightly more effective than vancomycin, according to a Cochrane review.
- # Other antimicrobials in development include nitazoxanide (a nitrothiazole benzamide; RCT); PAR-101 (a macrocyclic antibiotic; phase 3), and ramoplanin (a lipoglycopeptide; phase 2).

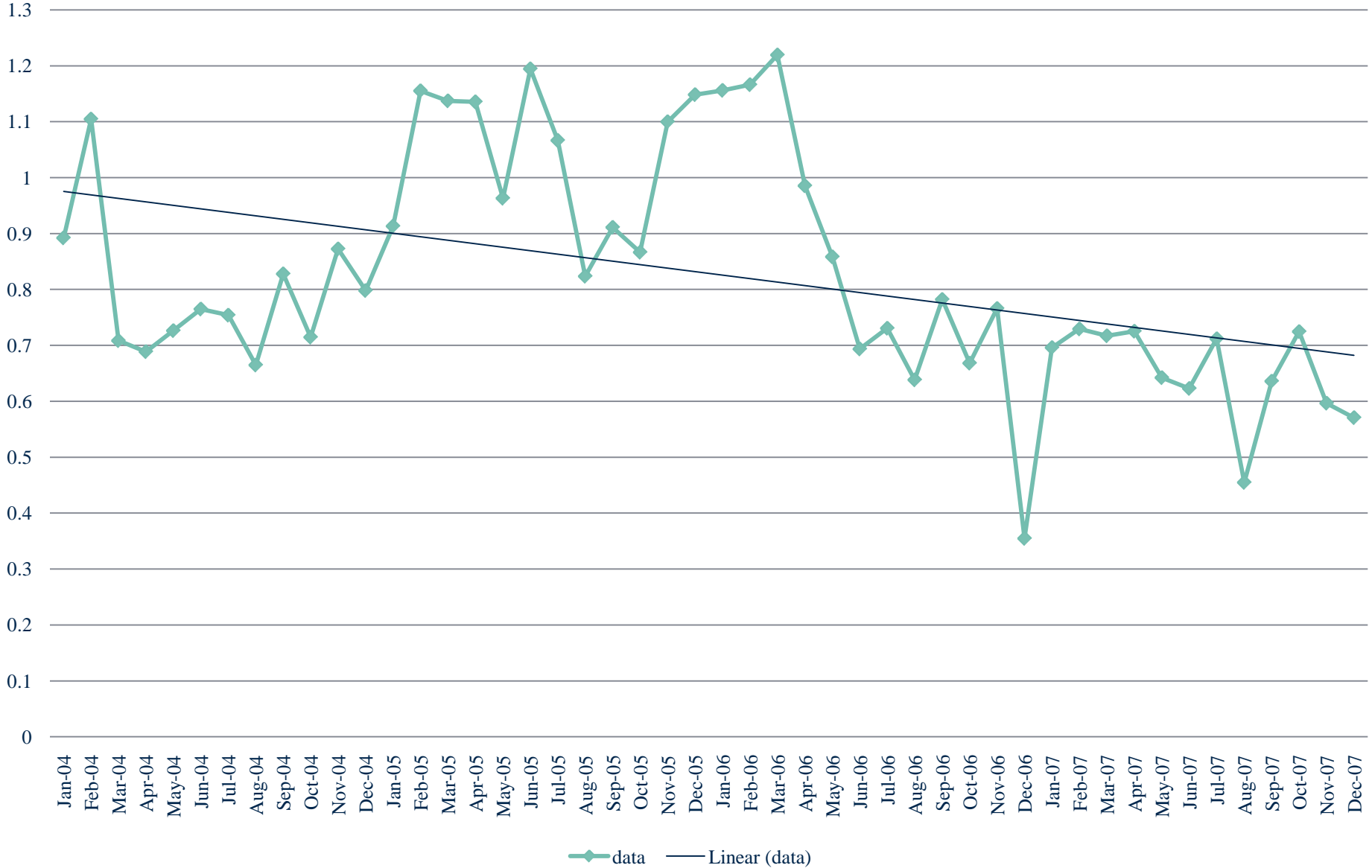
APIC 2010

Pace of Progress Survey: Rates

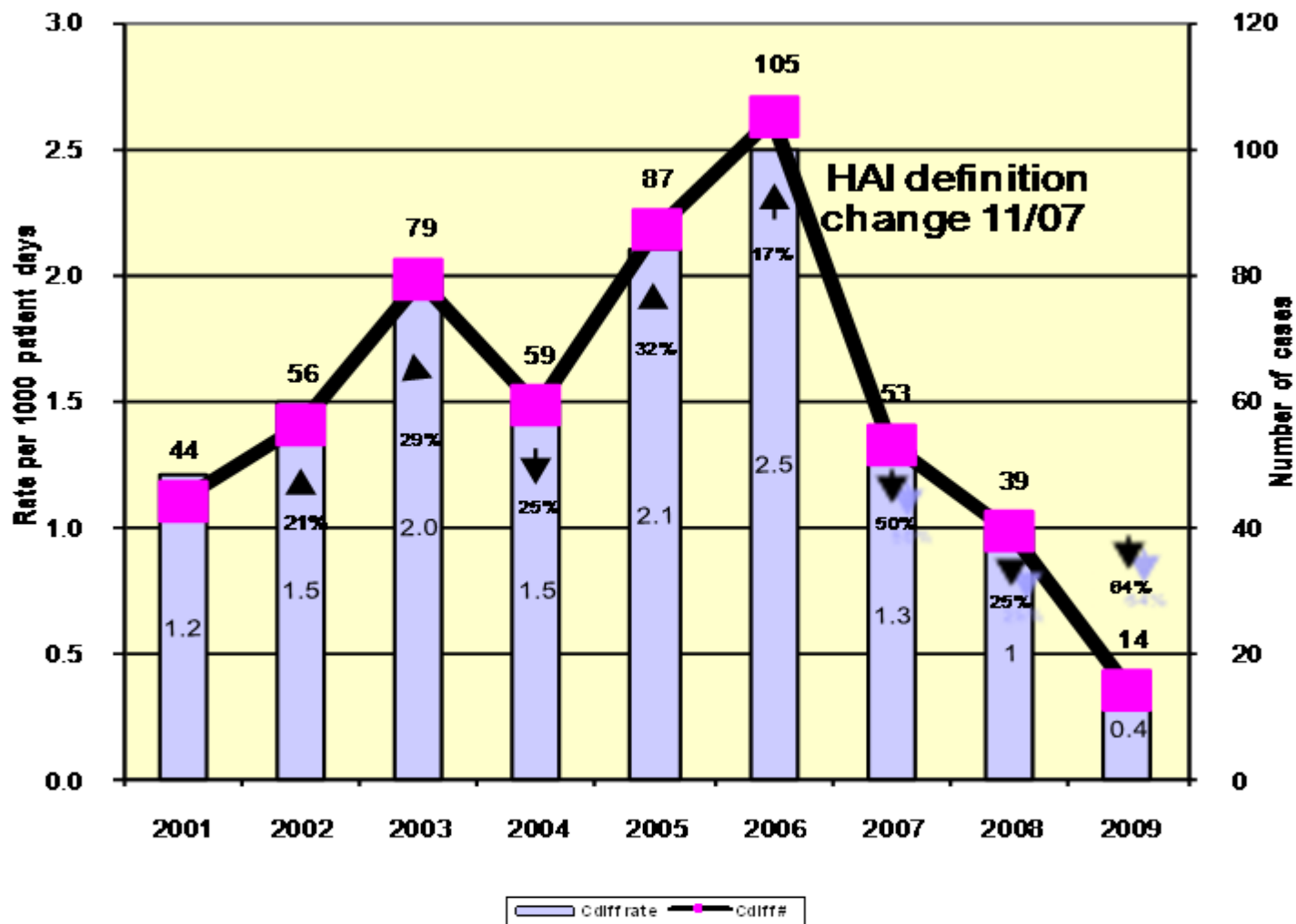
4. Have you noticed a decline in your healthcare facility onset/healthcare facility associated CDI rates following implementation of interventions?



VHA East Coast Infection Control Council C Diff Rates Data Sharing (25 hospitals) 2004 through 2007



HA-CDAD Rates & Numbers 2001-2009



In Conclusion

- # CDAD is an important disease to prevent.
 - # Our ability to control it may reflect the quality of prevention in our institutions.
 - # Prevention guidelines continue to evolve and we need to keep up with them.
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Thank You!