Tackling *Clostridium difficile* in Nursing Homes

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New York State Department of Health

Outline
- Getting to know you
- Background
- Surveillance
- Routine prevention and control
- Outbreaks, high incidence, and transmission within facilities
- NYSDOH *C. difficile* Prevention Collaborative
- Summary
- Questions

**C. difficile** Epidemiology
- CDC “Vital Signs”, March 2012*
  - *C. difficile* infections (CDIs) at a historic high
  - 14,000 deaths per year in U.S.
  - 400% increase from 2000 to 2007

*http://www.cdc.gov/vitalsigns/HAI/index.html
C. difficile Epidemiology

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

CDC “Vital Signs”, continued
- 25% of CDIs occur in hospitalized patients, and 75% of CDIs occur either in nursing home patients or in persons with recent outpatient treatment
- About 50% of infections occur in persons ≥65, but >90% of deaths occur in persons ≥65
- It has been shown that prevention programs can reduce CDI rates

C. difficile Infections (CDIs) in New York Hospitals — 2011

- 10,383 hospital-onset cases
  - 8.48 cases/10,000 patient-days
  - 3% increase from 2010
  - More hospitals using highly sensitive testing methods
- 2946 hospitalized community-onset healthcare-associated cases
- 500–1000 deaths per year?
  - Mortality rate estimates vary widely

CDI Incidence in New York Nursing Homes

Long term care facility onset (LO) CDI rate for 60 NYS nursing homes
CDIs Incidence in Nursing Homes – Other Estimates

- State of Ohio, 2006
  - 1.7 to 2.9 cases per 10,000 resident-days
- State of Pennsylvania, 2010
  - 0.35 to 5.2 cases per 10,000 resident-days
- Monroe county, NY, 2010
  - 2.3 cases per 10,000 resident-days
- Variable definitions, populations, time periods

Background: Epidemiology and Risk Factors

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

Main modifiable risk factors

Surveillance - Methods

- One method
  - Logs, lab report reviews, medical record reviews, manual counts and/or rate calculations
    - Identify outbreaks and increased incidence
    - Outbreaks and increased incidence are reportable to NYSDOH (NORA)
- Another method
  - National Healthcare Safety Network (NHSN)
    - Lab-based surveillance
    - Analytics available as part of NHSN

Surveillance

Webinar attendees’ estimation of their facilities’ C. difficile infection rates compared to other New York nursing homes

Number of attendees responding

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**NYS C. difficile Prevention Collaborative**

Familiarity with NHSN before project

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<thead>
<tr>
<th>Familiarity with NHSN</th>
<th>Number of Attendees Responding</th>
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<tr>
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<td>Heard of NHSN</td>
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<td>Have used NHSN</td>
<td>28</td>
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<tr>
<td>Not sure</td>
<td>10</td>
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<tr>
<td>No answer</td>
<td>30</td>
</tr>
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Webinar attendees’ familiarity with NHSN

**NHSN LTCF Modules**

- Healthcare associated infections
  - Urinary tract infections (both catheter and non-catheter-associated)
- Laboratory identified (Lab ID) event
  - *C. difficile* infections
  - Multidrug-resistant organisms
- Prevention process measures
  - Hand hygiene
  - Gown and glove use

**Surveillance - NHSN**

**C. difficile in NHSN**

- Provides data input checks
- Categorizes cases
- Calculates rates
- Contributes to national baseline
National Infection Control Initiatives

• Centers for Medicare and Medicaid Services (CMS) Initiative
  – Quality Assurance and Performance Improvement (QAPI)
• Health and Human Services (HHS) National Action Plan to Prevent Healthcare-Associated Infections
  – Roadmap to Elimination focusing on LTCFs
• Centers for Disease Control and Prevention (CDC)
  – Development of LTCF component of NHSN

Routine Prevention and Control

Reason for Surveillance

• Action!
  – Identification of outbreaks or increased incidence
  – Implementation of additional preventive measures
  – Review of cases

Environmental Cleaning and Disinfection

• Why is *C. difficile* such a problem with regard to environmental cleaning and disinfection and infection control in general?
  – Shed in large numbers
  – Difficult to kill
  – Low infectious dose
Routine Disinfection

• Routine situations with no elevated concern about CDI
  – Clean
  – Disinfect with an EPA-approved germicide
  – Provide disinfectant wipes for use by healthcare workers

Level I Program

• Teamwork between IP and Environmental Services leadership
• Facility specific expectations are defined and based on CDC guidance
• Structured education of ES staff
• Development of measures for monitoring (i.e., competency evaluation of ES staff, patient satisfaction surveys)
• Interventions to optimize environmental cleaning should be a standing agenda item on Infection Control/Quality Assurance program meetings
• Consider feasibility of moving to Level II program

http://www.cdc.gov/hai/toolkits/evaluating-environmental-cleaning.html

Evaluate the Environmental Cleaning

• Level I Program
• Level II Program

Options for Evaluating Environmental Cleaning

Proposed by
Amanda J. Boyle, MA;
Michelle L. Devine,
Environmental Evaluation Workgroup;
December 2010

http://www.cdc.gov/hai/toolkits/evaluating-environmental-cleaning.html

Level II Program

• Objective assessment of surface disinfection
• Results of objective evaluation should be incorporated into an environmental services educational activity in a non-punitive manner
• Regular performance of one or more objective assessment methods (e.g., three times a year)
• Share results within facility as appropriate

http://www.cdc.gov/hai/toolkits/evaluating-environmental-cleaning.html
Monitoring of Environmental Cleaning and Disinfection

Recent studies using direct covert observation or a biomonitor targeting method have consistently confirmed that most near-patient surfaces are not being cleaned in accordance with existing hospital policies. While researchers have confirmed that patients admitted to rooms previously occupied by patients with hospital pathogens have a substantially greater risk of acquiring the same pathogens than patients not occupying such rooms.

- "...most near patient surfaces are not being cleaned in accordance with existing hospital policies..."
- "...patients admitted to rooms previously occupied by patients with hospital pathogens have a substantially greater risk of acquiring the same pathogen than patients not occupying such rooms."
- Disinfection and cleaning "can be improved on average more than 100% over baseline" and "such improvement has been associated with a decrease in environmental contamination..."

Evaluating hygienic cleaning in health care settings: What you do not know can harm your patients

Carling PC, Bartley JM, Am J Infect Control 2010;38:541-50

Monitoring of Environmental Cleaning and Disinfection

Carling PC, Bartley JM, Am J Infect Control 2010;38:S41-50
Environmental Services Staff

- Involve and engage Environmental Services staff, especially front-line staff
  - Infection prevention is a major part of their job!
  - ...and they need to know that
  - and be trained with infection prevention in mind
  - and routinely engaged in infection prevention activities related to environmental services
  - and receive appropriate feedback in a non-punitive manner
  - and be given enough time to do their job properly

Approaches to Environmental Monitoring

- “Conventional”
  - Subjective, visual
  - Deficiency-oriented
  - Episodic
  - Feedback about problems

- “Enhanced”
  - Objective, quantitative
  - Performance-oriented
  - Ongoing, cyclic
  - Feedback about performance

Environmental Services Staff

- Produced by the Illinois Department of Public Health
- www.notjustamaidservice.com/
- www.youtube.com/notjustamaidservice

Monitoring Methods

- Direct covert practice evaluation
- Swab cultures
- Agar slide cultures
- Fluorescent markers
- ATP bioluminescence
Direct Covert Practice Evaluation

- Observer monitors cleaning and disinfection using a checklist
  - Observation and recognition issues
- Conceptually easy but logistically might be challenging
- Resource needs
  - Staff time to observe cleaning and disinfection

Fluorescent Markers

- Fluorescent gel, powder, or lotion used to mark surfaces before room cleaning; UV light used to look for fluorescent marks after cleaning
  - Gels might be preferred – invisible when dry
  - Physical removal of the marker used as a proxy to indicate that the item or surface was cleaned
  - Same person should place markers and look for markers after cleaning, using checklist both times
- Resource needs
  - Staff time
  - UV light, fluorescent markers

Comparison of Methods

<table>
<thead>
<tr>
<th>Method</th>
<th>Ease of Use</th>
<th>Identifies Pathogens</th>
<th>Useful for Individual Teaching</th>
<th>Directly Evaluates Cleaning</th>
<th>Published Data in Prognostic Improvement</th>
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<tr>
<td>Direct Practice Observation</td>
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<td>Yes</td>
<td>Yes</td>
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<tr>
<td>Seeds solution</td>
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<td>No</td>
<td>Yes</td>
<td>1 Hospital(4)</td>
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<tr>
<td>Slides solution</td>
<td>High</td>
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<td>No</td>
<td>Yes</td>
<td>1 Hospital(5)</td>
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<tr>
<td>Fluorescent gel</td>
<td>High</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>1 Hospital(6)</td>
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<tr>
<td>ATP system</td>
<td>High</td>
<td>No</td>
<td>Yes</td>
<td>Potentially</td>
<td>2 Hospitals(7)</td>
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Comparison of Methods

Carling and Bartley

Evaluating Patient Zone Environmental Hygiene

Comparing Methods

Carling PC, Bartley JM. Am J Infect Control 2010;38:S41-S90

Monitoring Checklist

- Checklists can be used regardless of monitoring method chosen
- Excel spreadsheet with pre-set calculations available for use when monitoring multiple rooms
- Use CDC checklist, or modify as needed for your facility
How Many Samples?

- Ideal is to detect small fluctuations in practice, but this is labor intensive
- Meaningful change in cleaning practice can be detected by sampling 10-15% of patient rooms that is >150 beds, evaluate surfaces on checklist in each sampled room

For more information...


Novel Methods of Environmental Disinfection: Types of Systems

- Aerosolized hydrogen peroxide (H₂O₂)
- H₂O₂ vapor
- Ultraviolet C radiation
- Pulsed-xenon UV radiation
  - Newest, not a lot of data yet

For more information...


Novel Methods of Environmental Disinfection

- Bottom line: Pros and cons to each type of system
- Regardless of type of system, room needs to be cleaned beforehand
  - Aesthetic reasons
  - Presence of organic matter on surfaces reduces effectiveness of all systems
  - May shorten time needed to clean adequately
Environmental Cleaning and Disinfection as Part of a Comprehensive Infection Prevention Program

- Including, but not limited to
  - Hand hygiene and PPE use
  - CDI testing protocol
  - Antimicrobial stewardship

Contact Precautions

- Need to address quality of life issues
  - Ensure appropriate stimulation and social interaction, e.g. activity personnel visits
- Facility policies should address all of the issues surrounding contact precautions
  - Surveyors may look for appropriate policies (PPE, isolation of resident in room, presumptive precautions pending confirmation, duration, potential modifications, quality of life, etc.)

Contact Precautions

- Gown, gloves
- Resident remains in room
- Presumptive precautions before lab confirmation
- Duration
  - At least until diarrhea resolves
  - In some situations, beyond diarrhea resolution
  - Potential for modifications that might allow the resident to leave his/her room in long-term situations with persistent diarrhea – consult internal and external public health experts

Contact Precautions

- Rationale for considering extending isolation beyond duration of diarrhea
Hand Hygiene

- Alcohol-based hand rub does not kill *C. difficile* spores
  - But do not remove dispensers in the face of *C. difficile*
- Soap and water mechanically removes spores
  - Imperfect
- Importance of objective monitoring

CDI Testing Protocol

- Test for *C. difficile* toxins
  - Enzyme immunoassay (EIA) for toxin A, B, or both
- Test for *C. difficile* antigen
  - EIA for glutamate dehydrogenase (GDH)
- Test for *C. difficile* DNA (nucleic acid amplification test – NAAT)
  - Polymerase chain reaction (PCR)
- Test for the *C. difficile* organism
  - Culture

Antimicrobial Stewardship

- The future?

  "SHEA, IDSA, and PIDS recommend that the Centers for Medicare and Medicaid Services (CMS) require participating healthcare institutions to develop and implement antimicrobial stewardship programs. This can be achieved by incorporating the requirement into existing regulations via expansion of interpretive guidelines of the relevant regulation(s). All healthcare facilities, including hospitals, long-term care facilities, long-term acute care facilities, ambulatory surgical centers, and dialysis centers should develop and implement an antimicrobial stewardship plan that is modeled after the IDSA and SHEA "Guidelines for Developing an Institutional Program to Enhance Antimicrobial Stewardship.""

  *Policy Statement on Antimicrobial Stewardship by the Society for Healthcare Epidemiology of America (SHEA), the Infectious Diseases Society of America (IDSA), and the Pediatric Infectious Diseases Society (PIDS). Infect Control Hosp Epidemiol. 2012;33:7-27."
Antimicrobial Stewardship

- 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


What is an “outbreak”? 

- Dictionary definition
  - A sudden rise in the incidence of a disease
- Epidemiology definition
  - An increase in the incidence of a disease above what is normally expected

Outbreak Investigation Steps - short

1. Verify the diagnosis
2. Construct a case definition
3. Find cases systematically
4. Confirm the epidemic
5. Describe the epidemic by person, place, and time

Outbreaks

Increased Incidence

Transmission within the Facility
Outbreak Investigation Steps - long

1. Confirm the diagnosis
2. Verify that an outbreak exists
3. Literature review
4. Assemble an outbreak control team
5. Establish a case definition
6. Implement measures to identify cases
7. Describe cases: who, when, where
8. Develop a hypothesis of causation
9. Define and implement control measures
10. Communicate findings

Uncovering Outbreaks

- Information from clinical staff
- Call from a lab or review of lab results
- Routine analysis of infection control surveillance data

- Don’t forget that onset of symptoms may occur after discharge

Step 0

Talk to your lab and ask them to save any specimens that might be part of the outbreak!!!

Is it an outbreak?

- In some situations, one case can be considered an outbreak because the expected number of cases should be zero
  - Healthcare-associated *Legionella*
  - Post-operative invasive group A Streptococcus infection
  - *C. difficile* infection, some day, hopefully
Description of Cases

UNIT A Floor Plan
Census = 26
○ = Lab Confirmed
○ = Symptomatic

Epidemic Curve

Line List

• A way to systematically describe cases

Develop a Hypothesis about the Cause of the Outbreak

• Sub-optimal environmental cleaning?
• Sub-optimal hand hygiene?
• Sub-optimal use of PPE
• Overuse of antibiotics?
• Transmission by asymptomatic carriers or recovering patients?
• Cluster of sporadic cases (pseudo-outbreak)?
• Combination of multiple causes
Role of the Laboratory

- Initial testing
- Testing with a more sensitive/specific assay?
- Culture and molecular testing
  - Generally performed at a reference lab such as Wadsworth Center (New York State's public health laboratory)
  - Pulsed-field gel electrophoresis
    - Strain identification
    - Helpful in outbreaks, not generally helpful for sporadic cases

Summary of Reported Outbreaks

- Nosocomial Outbreak Reporting Application (NORA) reports
- January 1, 2003 through November 14, 2013
- 157 outbreaks reported
  - 79 hospital
    - Involving 1320 patients with 55 deaths
    - Median of 7 patients per outbreak
  - 78 nursing home
    - Involving 762 residents with 59 requiring hospitalization and with 21 deaths
    - Median of 4 residents per outbreak
Disinfection when there is Elevated Concern about C. difficile

- CDI patient rooms, outbreak situations, and possibly throughout units with high endemicity or with ongoing transmission
  - Clean
  - Disinfect with 1:10 sodium hypochlorite solution (bleach and water) or an EPA-registered disinfectant with a sporicidal claim
    - Remember that some commonly-used disinfectants (such as quaternary ammonium products) are not sporicidal and therefore will not kill C. difficile!

Disinfection when there is Elevated Concern about C. difficile

- Why not always use bleach-based products, even when there is no elevated concern about C. difficile?
  - Can cause corrosion/pitting of some equipment and surfaces over time
  - Concerns such as respiratory irritation

Disinfection when there is Elevated Concern about C. difficile

- Verify compatibility of equipment with the bleach solution or other sporicidal product
- Training
  - How to dilute and use
  - Be aware that hypochlorite concentration decreases with time
  - Don't mix with other solutions
- Consider providing bleach wipes for use by healthcare workers

Hand Hygiene and Outbreaks

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<tr>
<td>4% CHG antimicrobial hand wash</td>
<td>0.77</td>
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<td>Non-antimicrobial hand wash</td>
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</tr>
<tr>
<td>Non-antimicrobial body wash</td>
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<tr>
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<td>0.99</td>
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<tr>
<td>Heavy-duty hand cleaner used in manufacturing environments</td>
<td>1.21*</td>
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* Statistically significant

Conclusion: Spores may be difficult to eradicate even with hand washing.

Hand Hygiene and Outbreaks

• Difficult to eliminate *C. difficile* spores from hands
  – Glove use is critically important to prevent contamination of hands
  – Consider implementation of universal glove use (for all patients) on units with outbreaks or high endemic rates
    • Imperfect efficacy of and adherence to hand hygiene
    • Potential transmission from asymptomatic carriers
• Monitor adherence

Contact Precautions and Outbreaks

• Monitor adherence
• Ensure patients with diarrhea are presumptively put on Contact Precautions pending lab results
• If not done routinely, consider making it part of your policy to extend Contact Precautions beyond the duration of diarrhea

Asymptomatic Carriers

– Rationale for universal glove use when CDI rates are high

Transmission within Facilities

• Consider conducting a careful review of all cases that might involve transmission within your facility (i.e. mini root cause analysis)
  – How might it have been transmitted and what can be done to prevent that from happening in the future?
  – Was the patient currently or recently on antibiotics? Were those antibiotics indicated?

Outbreak #1: Background

- New York nursing home
- Six cases of *C. difficile* infection within 7 months, 5 of which were on the dementia unit
- Some cases occurred in residents of rooms where CDI patients had been residing and in roommates of CDI patients
- No PFGE performed, but very suspicious for transmission
- Had not been using dedicated or disposable equipment for CDI patients

Outbreak #1: Recommendations

- Environmental cleaning and disinfection
  - For rooms of CDI patients, clean with detergent, then disinfect with 1:10 bleach solution
  - One-time intensive cleaning and disinfection of affected units
    - Monitor cleaning with a checklist
    - Inspect mattresses for rips
    - Attention to equipment such as mattresses, call buttons, pulse oximeters, TV remotes, telephones, etc.
    - Careful cleaning and disinfection of bathrooms
    - Move personal items to allow for thorough cleaning

Outbreak #1: Recommendations

- Two-tiered approach to CDI prevention (APIC and CDC)
- Objective monitoring of hand hygiene with feedback
- Supervised hand hygiene for residents
- Assess compliance with precautions, with feedback
- Visible presence of infection preventionist
- Observation of environmental cleaning and disinfection
- Staff and visitor education

Outbreak #1: Recommendations

- Environmental cleaning and disinfection, cont.
  - Launder privacy curtains
  - Clear off surfaces in nursing station and clean and disinfect
- Continue surveillance
- Have lab freeze stool specimens from residents with CDI for possible additional testing
- Implement antimicrobial stewardship interventions
Outbreak #2: Background

- New York hospital with attached nursing home
- *C. difficile* cases on 2 units of the nursing home
  - 9 cases and 4 deaths (CDI contributory)
  - All had been given antibiotics, mostly for respiratory infections

Outbreak #2: Recommendations

- Send specimens to Wadsworth lab for additional testing
- Dedicated or disposable equipment (ex. thermometers)
- Enhanced environmental cleaning with bleach
- Staff and visitor education

Outbreak #2: Laboratory Assistance

- Lab results
  - 5 specimens underwent additional testing at Wadsworth lab
    - 3 indistinguishable by PFGE
    - Severe strain (NAP-1)

Outbreak #3: Background

- New York hospital
- Identified increased number of cases for previous months through internal surveillance
- At the time of reporting, there were 9 confirmed cases, 4 suspected cases, and 1 death
- Some rooms did not have private bathrooms
- Hospital had already implemented a number of control measures
  - e.g. education, environmental disinfection
Outbreak #3: Background
• Some specimens had been discarded
• Molecular testing (PFGE) of available specimens identified 2 circulating strains among outbreak patients
  – One strain was NAP-1
  – The other strain did not have an assigned NAP type
  – Additionally, several isolates tested near the end of the outbreak were unrelated, indicating that they were sporadic cases not related to the outbreak

Don’t Forget...
Talk to your lab and ask them to save any specimens that might be part of the outbreak!!!

Outbreak #3: Recommendations
• Commode care
• Patient placement
  – Patient with confirmed or suspected CDI prioritized to rooms with a private bathroom
• Universal glove use on affected units
• Disinfection with bleach
• Objective monitoring of environmental cleaning
• Final case counts: 19 HO, 18 CO-HCFA

Prevention Summary
• Core strategies
  – 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
  – Surveillance for CDI
  – Educate about CDI: HCP, housekeeping, administration, patients, families

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  – Educate about CDI: HCP, housekeeping, administration, patients, families

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

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

How NYSDOH Can Help You

• Advice about prevention measures to decrease high endemic rates
• Advice about how to control an outbreak
  – Should be reported via NORA
• Specialized laboratory testing at Wadsworth
  – Pulsed field gel electrophoresis (PFGE)
    • Determines whether isolates are the same strain or not
    • Can help determine whether transmission is occurring or whether a cluster consists of sporadic unrelated cases
    – Save isolates if you’re concerned about a cluster!

NYS C. difficile Prevention Collaborative

• Activities
  – C. difficile infection surveillance and reporting
  – Objective monitoring of environmental cleaning
  – Improvement of environmental cleaning and disinfection, when needed
  – Implementation of a transfer form including infection control information
  – Process measures of hand hygiene and personal protective equipment (PPE) use (optional)
  – Attendance at educational webinars

NYS C. difficile Prevention Collaborative

• Data collection
  – NHSN, or
  – Paper forms (printed from NHSN)
NYS C. difficile Prevention Collaborative Participation

- 636 LTCFs in New York State, all invited
- 178 submitted participation documents
- 178 have attended at least one webinar
- 29 enrolled in NHSN and joined our group
- 32 indicated would report using paper forms
- 117 no information yet about reporting

Summary

- Conduct surveillance for C. difficile infections and modify control strategies as needed
- You can intervene to decrease your facility’s C. difficile infection rates

NYS C. difficile Prevention Collaborative Nationwide LTCF NHSN enrollment

- 130 enrolled as of August 2013
  - 29 from our C. difficile project
  - Possibly a few more that we cannot see yet (i.e. enrolled but have not successfully joined our group)
  - Several others from a regional prevention project

For More Information

http://www.cdc.gov/HAI/organisms/cdiff/Cdiff_infect.html
Questions for You

• What do your resources (time, personnel) allow you to do?
• How much of the material presented in this talk was review?
• What else can you do you think NYSDOH could do to help you decrease rates of C. difficile infection?

References