Clostridium difficile Infection Prevention

Basics of Infection Prevention
2-Day Mini-Course
2013

Objectives

- Describe the etiology and epidemiology of *C. difficile* infection (CDI)
- Review the evidence-base for CDI prevention
- Discuss core and supplemental strategies to prevent CDI
- Review CDI surveillance

Clostridium difficile Bacteria

- Anaerobic, spore-forming bacillus
- Infective form are **spores** that can survive for months in the environment
  - Outer coating 'sticky', allowing firm adherence to environmental surfaces
- Contamination of environment well-documented
  - Contamination most extensive in close proximity to symptomatic patients
- Equipment contamination linked to spread of *C. difficile*
  - Commodes, bed pans, blood pressure cuffs, oral and rectal thermometers
- Not normal flora; transient colonization is <2% in adults without recent inpatient healthcare facility exposure

Libby & Bearman, *Int J Inf Dis,* 2009

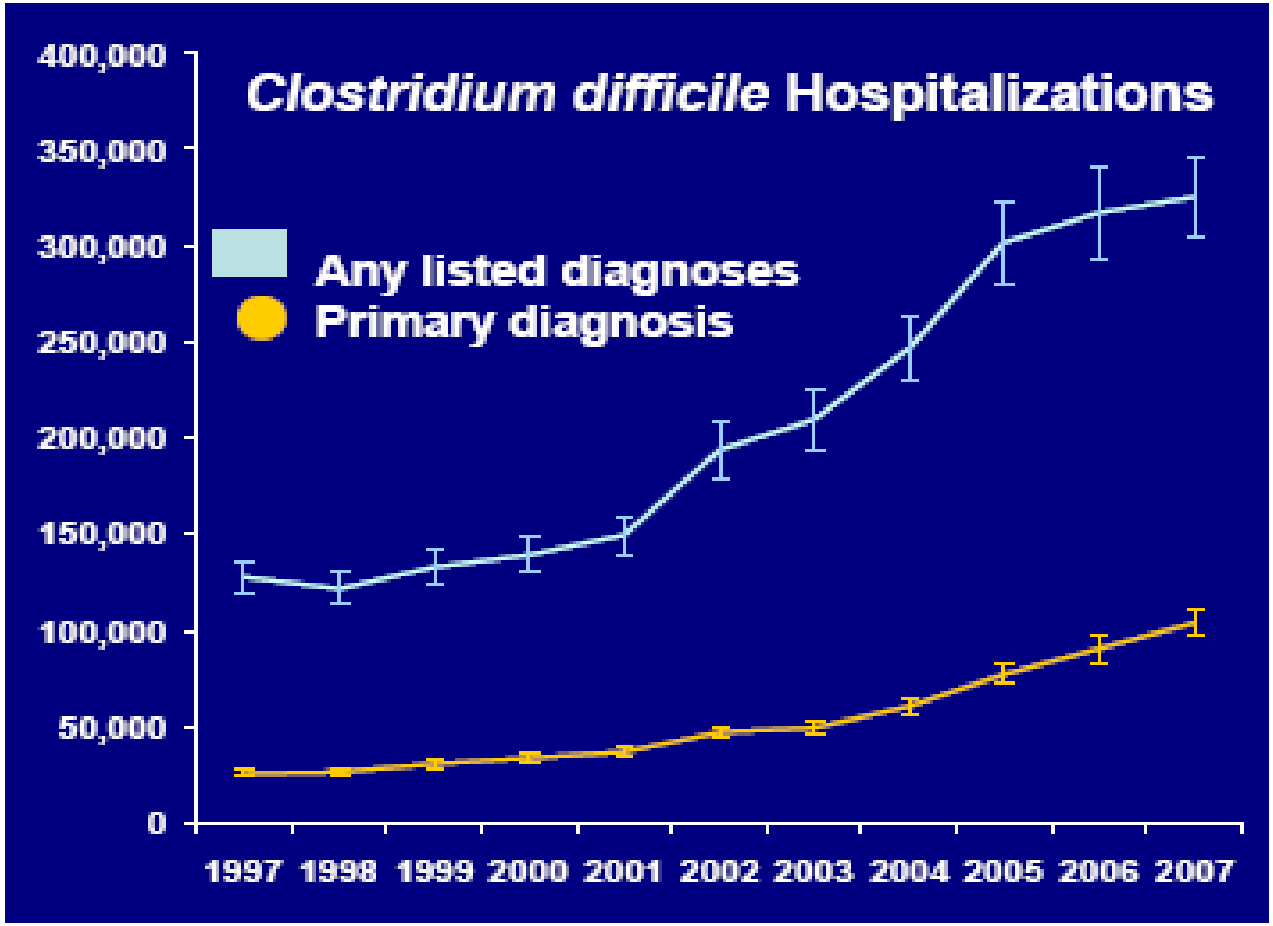
Epidemiology of *C. difficile* Infection (CDI)

- Most common cause of infectious diarrhea in hospitalized patients
- Symptoms of CDI begin soon after colonization, with median time to onset of 2-3 days
- 96% patients with CDI received antimicrobials in 14 days prior to onset of diarrhea
  - ALL had received antimicrobial in previous 3 months
- *C. difficile* infection (CDI) ranges in severity from diarrhea to colitis to toxic megacolon to death

IDSA/SHEA Clinical Guidelines for CDI in Adults, 2010 Update

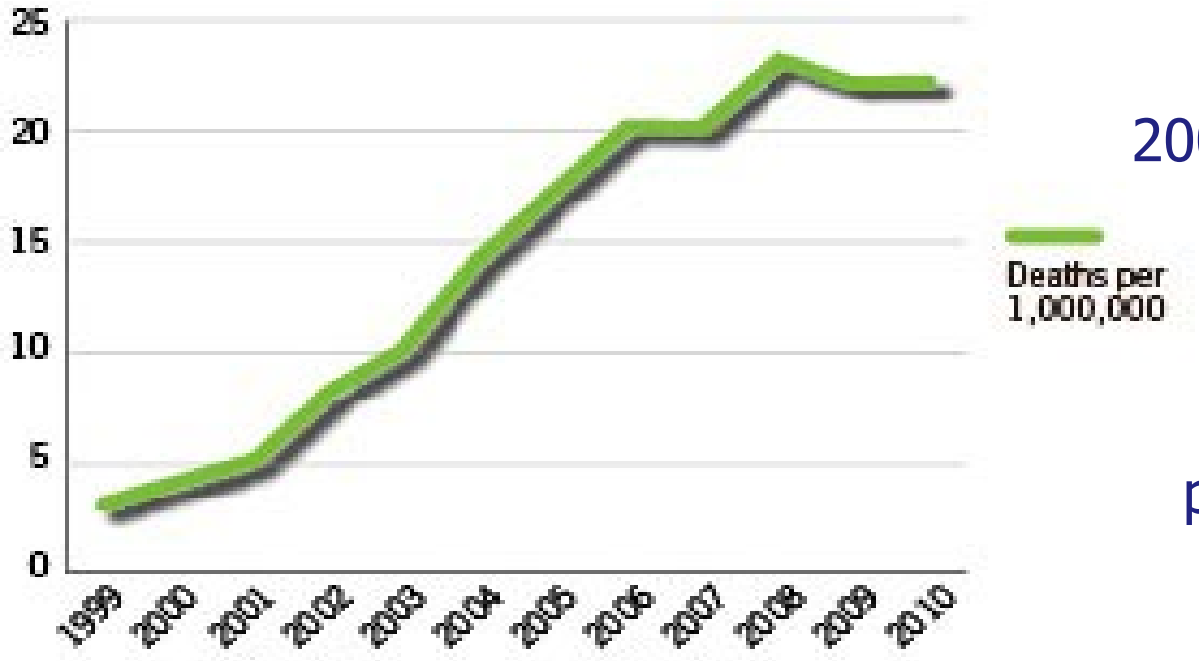
Epidemiology of CDI - continued

- CDI incidence *and* severity of illness increasing while other HAI decreasing



Deaths Caused by *C. difficile* Infections

Age-adjusted rate of *C. difficile* as the primary (underlying) cause of death



1999-2000:
3,000 deaths/year

2006-2007:
14,000 deaths/yr

90% deaths in persons ≥65 years

CDC National Center for Health Statistics, 2012
CDC MMWR, March 2012

New Epidemic Strain of *C. difficile*

- NAP1/BI/027
  - Historically uncommon – epidemic since 2000
- Highly resistant to fluoroquinolones (e.g. Cipro)
- Hypervirulent
  - Increased toxin A and B production
  - Toxin B binding factor, more adherence in the gut
- Increased sporulation

McDonald et al. N Engl J Med. 2005
Warny et al. Lancet. 2005
Stabler et al. J Med Micro. 2008
Akerlund et al. J Clin Microbiol. 2008

CDPH California Department of PublicHealth

Healthcare-associated Infections HAI Elimination

Risk Factors for CDI

- Acquisition of *C. difficile* bacteria
- Antimicrobial exposure
- Advanced age
- Immunosuppression
- Tube feedings
- Gastric acid suppression
- Prolonged stay in healthcare facility
- Inflammatory bowel disease
- GI surgery

Risk Factors for CDI

- Acquisition of *C. difficile* bacteria
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- Tube feedings

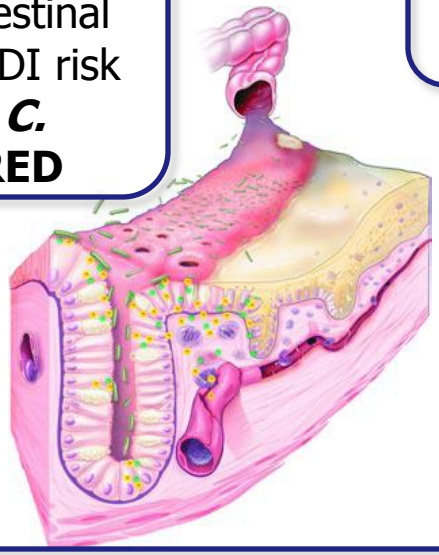
Modifiable risk factors

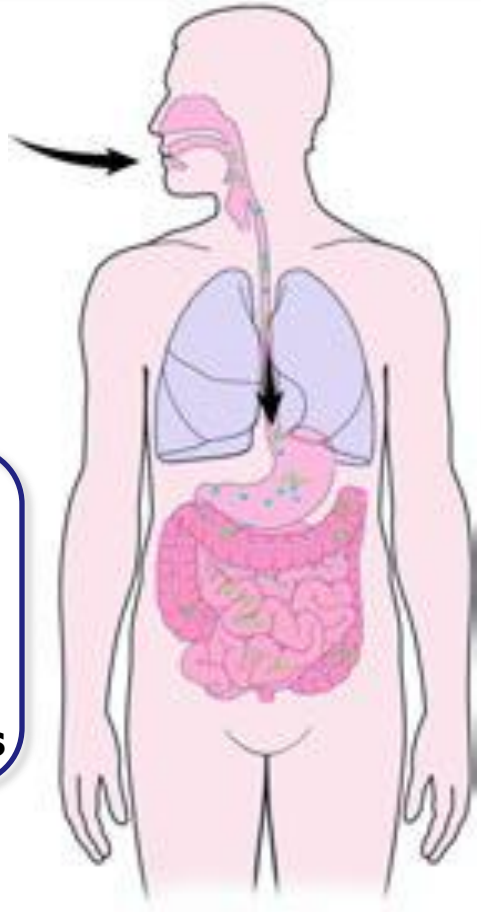
- Gastric acid suppression
- Prolonged stay in healthcare facility
- Inflammatory bowel disease
- GI surgery

Role of Transmission and Antimicrobial Use in CDI Pathogenesis

Antimicrobial exposure changes lower intestinal flora, increasing CDI risk for ~3 months **IF *C. difficile* ACQUIRED**

C. difficile spores are transmitted **via hands of healthcare personnel** transiently contaminated after contact with a CDI symptomatic patient or that patient's surrounding environment





Uninfected patient ingests spores
Spores germinate into growing, vegetative bacteria

If antimicrobial exposure disrupted normally protective bacteria in lower intestines, bacteria proliferate. **Incubation period until CDI (diarrhea, toxin production) is 2-3 days**

Adapted from Sunenshine, Cleve Clin J Med, 2006

Diagnosis of CDI

- Symptoms - usually diarrhea
  - ≥3 unformed STOOLS over 24 hours (conforms to shape of cup)
- Positive stool test for presence of *C. difficile* or toxins
- Diagnostic Imaging
  - Endoscopic or histologic (pseudomembranous disease)
- Relapse occurs in 10-25% cases

Cohen, S., Clostridium difficile Infection: Current Challenges and Controversies, 2008
LaMont, C diff in adults, Clinical Manifestations and diagnosis, 2013

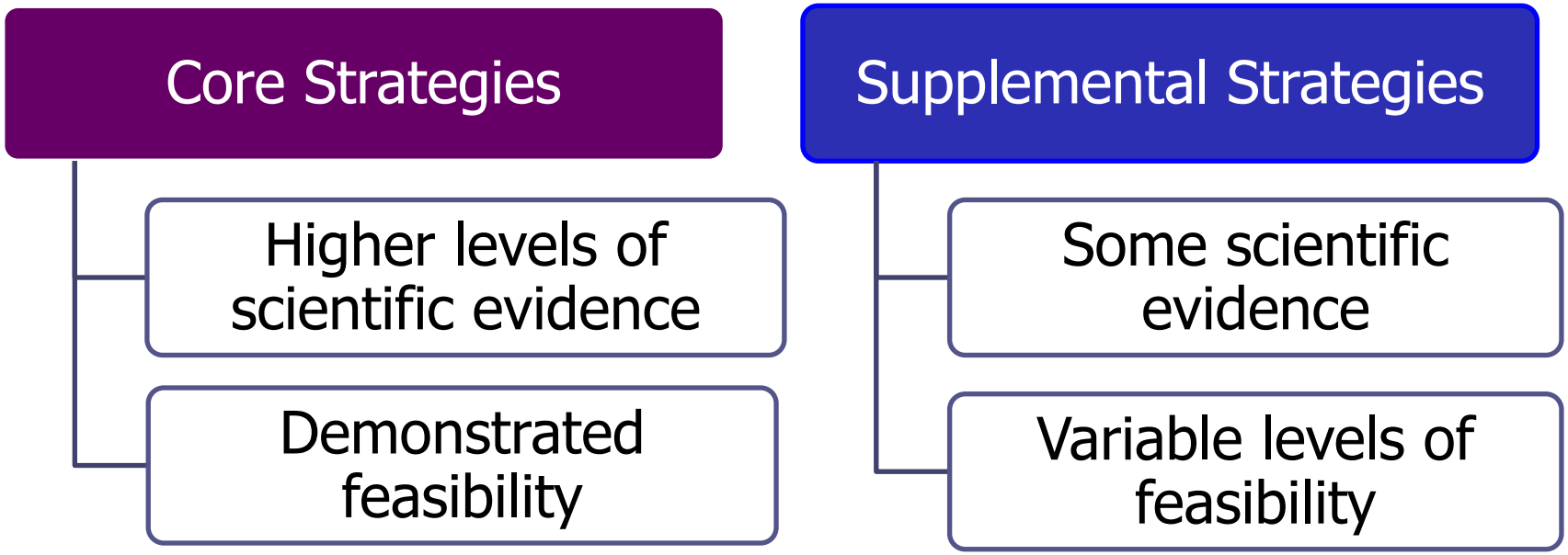
Recommendations for CDI Prevention

Four principals:

1. Improve antibiotic use
2. Early and reliable detection of CDI
3. Isolate symptomatic patients
4. Reduce contamination of healthcare environmental surfaces

IDSA/SHEA Clinical Guidelines for CDI in Adults, 2010 Update

CDC Prevention Strategies



- Should become standard practice

- Consider implementing <u>in addition to Core</u> when infections persist or rates are high

Strategies for CDI Prevention

Core Strategies

- Antimicrobial stewardship
- Rapid testing and immediate notification of positive test results
- Contact Precautions for duration of diarrhea
- Hand hygiene
- Cleaning and disinfection of equipment and environment
- Comprehensive CDI education

Supplemental Strategies

- Extend use of Contact Precautions beyond duration of diarrhea
- Presumptive isolation for patients with diarrhea
- Limit hand hygiene to only handwashing
- Universal glove use
- Sodium hypochlorite (bleach) agents for environmental cleaning

Antimicrobial Stewardship **(Core)**

- Goal is to minimize the **frequency** and **duration** of antimicrobials and the **number** of antimicrobials prescribed
- Target antimicrobials based on local epidemiology and *C. difficile* strain
  - Restricted use of cephasporin and clindamycin found most useful *(*may be used for surgical prophylaxis)
- Reduce use of broad-spectrum antibiotics
  - Enforcement of narrow-spectrum antibiotic policy with feedback to prescribing physician resulted in a significant reduction in CDI in 3 acute geriatric medical wards

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

California Antimicrobial Stewardship Initiative

- Component of the CDPH HAI Program
- Goal is to assist all California hospitals and long-term care facilities optimize antimicrobial use to improve patient outcomes
- www.cdph.ca.gov/programs/hai/pages/AntimicrobialStewardshipProgramInitiative.aspx

For more information, contact Dr. Kavita Trivedi at ktrivedi@cdph.ca.gov

Identify, Notify, and Isolate **(Core)**

- **Test** should be performed on symptomatic patients with unformed stool
  - Single specimen at onset of symptoms is sufficient
  - Repeat testing is of limited value and should be discouraged
- Laboratory-based system for **immediate notification** of positive CDI test results
- **Isolate** symptomatic patients with positive CDI test in private room
  - If unavailable, cohort but provide dedicated commode for each patient

Contact Precautions **(Core)**

- For duration of diarrhea
- Emphasize **glove use** and removal of gloves prior to exiting room of CDI patient
- Emphasize compliance with **hand hygiene**

- Extend Contact precautions beyond duration of diarrhea
  - e.g. 48 hour **(Supplemental)**
  - consider if rates of CDI persist

Universal Glove Use **(Supplemental)**

- Rationale: Spores difficult to remove even with hand washing
  - Asymptomatic carriers play a role in transmission (though magnitude of contribution unknown)
  - Practical CDI screening tests not available
- Adherence to glove use (with or without Contact precautions) critical to preventing *C. difficile* transmission via hands of HCW
- For facilities or units with high CDI rates, consider adopting routine glove use for ALL patient care ("universal")

"Presumptive" Isolation **(Supplemental)**

- Rationale: Patients with CDI may contaminate environment and hands of healthcare personnel before results of testing known
- For any patient with ≥3 unformed (i.e. taking shape of container) stools within 24 hours
  - Send stool specimen for *C difficile* testing
  - Isolate patient pending results
- For patient with possible recurrent CDI (isolate and test following first unformed stool)

Only Handwashing **(Supplemental)**

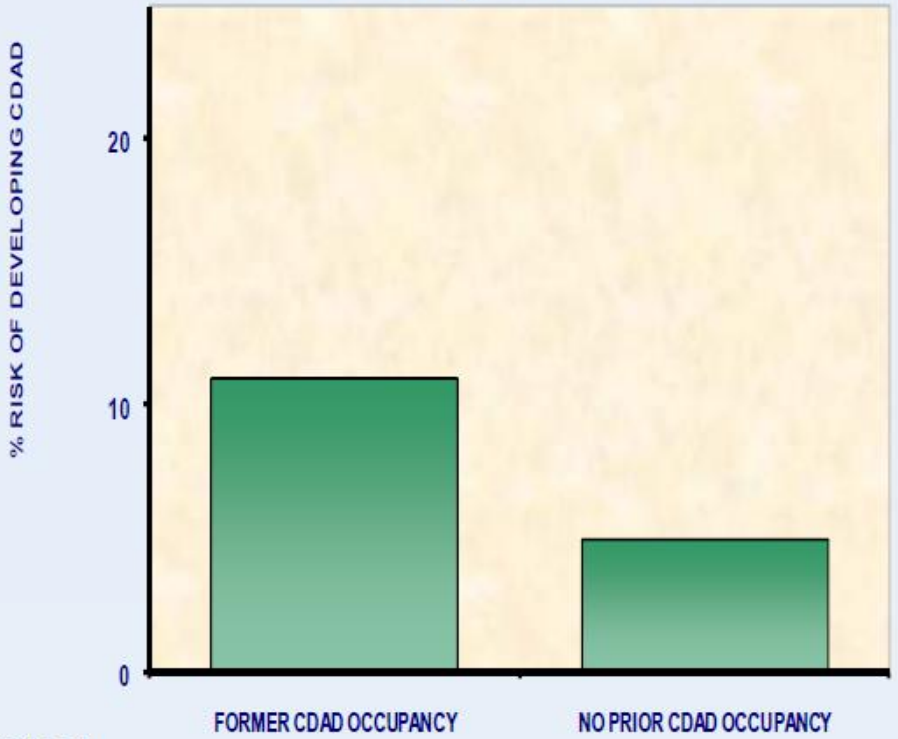
- **Soap and water handwash** instead of alcohol gel options
- Rationale: Physical removal with running water important. Alcohol hand gels not sporicidal
- Recommended after ANY contact with CDI patient or environment
- Hand washing with plain soap or antimicrobial agent are equally effective in removing *C.difficile* spores from hands of healthcare workers

Environmental Cleaning **(Core)**

- Ensure thorough cleaning of CDI patient care areas
  - Focus on high-touch surfaces and bathroom
- Identify and remove environmental sources of transmission
  - Replace electronic with single use disposable thermometers
- Assess **adequacy** of cleaning before making decisions to change cleaning products
  - Study in 3 hospitals used fluorescence to assess cleaning
    - Showed only 47% high-touch surfaces cleaned
    - Educational intervention with environmental services staff resulted in sustained improvement
  - Use of environmental markers a promising method to improve cleaning in hospital

Mayfield et al. Clin Infect Dis 2000;31:995-1000.
Wilcox et al. J Hosp Infect 2003;54:109-14.

C. difficile Transmission from Prior Room Occupants



110% Increased risk

Shaugnessey etal. Abstract K-4194
IDSA / ICAAC. October 2008

SHEA
The Society for Healthcare Epidemiology of America

Bleach for Routine Cleaning **(Supplemental)**

- Use if CDI outbreak or continued increased rates of CDI
- Bleach can kill spores - most other standard disinfectants cannot
  - Limited data suggest cleaning with bleach (1:10 dilution prepared fresh daily) reduces *C. difficile* transmission
  - Two before-after studies showed benefit on units with high endemic CDI rates
  - Bleach may be most effective in reducing burden where CDI rates high
- EPA has recently registered other sporicidal disinfectants

No Recommendation

- Probiotics
  - Naturally occurring live bacteria
  - Rationale for use is to prevent CDI by restoring normal flora
- Decolonization
  - No data to support decolonization
- Fecal transplants
  - Promising!

APIC Guide to the elimination of *Clostridium difficile,* 2008; updated 2013

Implementing a CDI Prevention Initiative

Use **Your Hospital's** favorite quality improvement model for the CDI Prevention "Technical Work"

(Most QI models follow same basic principles)

Translating Evidence Into Practice	Preventing CDI
1. Know the evidence-based practices 2. Identify local barriers to implementation 3. Measure performance • Infection data • Adherence to evidence-based clinical practices 4. Continue to ensure all patients get the evidence-based practice (evaluate)	Four principals: 1. Improve antibiotic use 2. Early and reliable detection of CDI 3. Isolate symptomatic patients 4. Reduce contamination of the healthcare environment
Technical Work	

Adapted from www.hopkinsmedicine.org/armstrong_institute

One Model:
Rapid Cycle Improvement

Concept

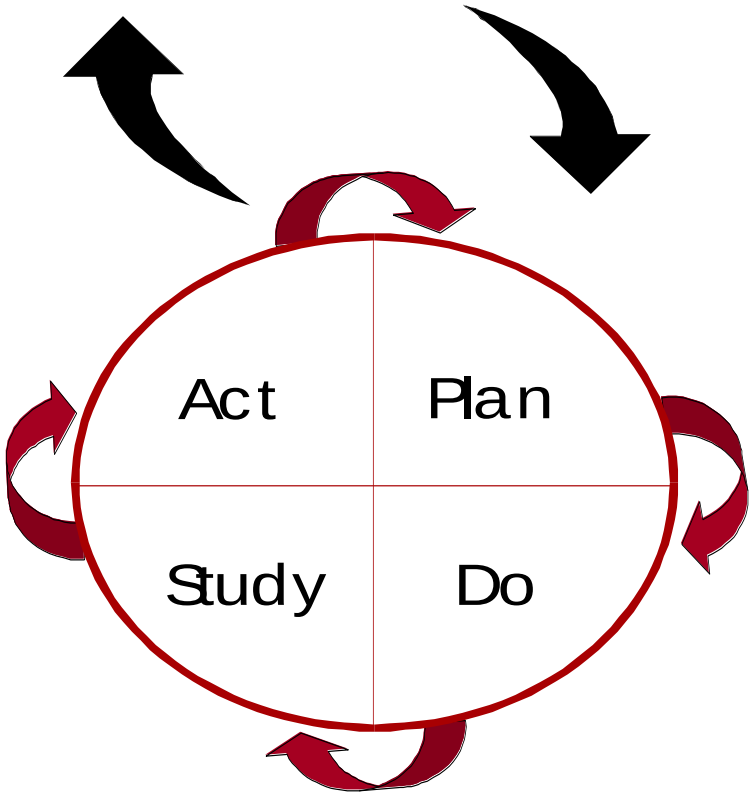
First try a change idea on a small scale to see how it works

Then modify it and try it again until it works very well for staff and patients

Then, and only then, does a change become a permanent improvement

Model for Improvement

What are we trying to accomplish?
How will we know that a change is an improvement?
What change can we make that will result in improvement?



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Monitor CDI Rates to Assess Prevention Progress **(Core)**

Perform surveillance

- LabID method is the nationally-recognized quality measure for the surveillance of CDI (NQF endorsed)
- Requires no clinical review or further evaluation of positive lab finding
- Include ALL *C. difficile* toxin-positive tests from inpatients, and ED patients if admitted to your hospital the same calendar day

CDI LabID Surveillance

NHSN algorithm categorizes CDI cases according to the admission and testing dates you enter

Community-Onset **(CO)**	For Inpatient surveillance, a LabID event collected ≤3 days after admission to the facility (i.e., days 1, 2, 3 or admission)
Healthcare Facility-Onset **(HO)**	LabID event collected >3 days after admission to the facility (on or after day 4)

Community-Onset Healthcare Facility - Associated **(CO-HCFA)**	LabID event collected from a patient who was discharged from the facility ≤4 weeks prior to current date of stool specimen collection

CDI LabID Surveillance

NHSN also tracks if CDI case is new or recurrent

- Considered **recurrent** if >2 weeks and ≤8 weeks after last CDI event reported for that patient

- There is no advantage to not identifying and entering into NHSN all CDI cases

Interpreting CDI Surveillance Data

- Has been limited benchmark data for comparing hospital CDI rates
- Differences/changes in laboratory testing method and patient populations make it difficult to compare CDI rates over time in the same hospital or among different hospitals
- **New in 2013**: NHSN analysis will include a CDI risk adjustment method
  - Adjusted for type of laboratory test, prevalence of CDI (community onset CDI rates), and hospital size

NHSN Patient Safety Manual – MDRO/CDI Module, Chapter 12

SHEA/IDSA Compendium of Recommendations

S81 INFECTION CONTROL AND HOSPITAL EPIDEMIOLOGY OCTOBER 2008, VOL. 29, SUPPLEMENT 1

SUPPLEMENT ARTICLE: SHEA/IDSA PRACTICE RECOMMENDATION

Strategies to Prevent *Clostridium difficile* Infections in Acute Care Hospitals

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CDI Checklist Example

Clostridium difficile Infection (CDI) Checklist

Hospital interventions to decrease the incidence and mortality of healthcare-associated *C. difficile* infections

Prevention Checklist

- **When an MD, PA, NP, or RN suspects a patient has CDI:**

Physician, Physician Assistant, or Nurse Practitioner:
- ☐ Initiate *Contact Precautions Plus*
- ☐ Order stool *C. difficile* toxin testing
- ☐ Discontinue non-essential antimicrobials
- ☐ Discontinue all anti-peristaltic medications

Registered Nurse:
- ☐ Obtain stool sample for *C. difficile* toxin test
- ☐ Place patient in single-patient room
- ☐ Place *Contact Precautions Plus* sign on patient's door
- ☐ Ensure that gloves and gowns are easily accessible from patient's room
- ☐ Place dedicated stethoscope in patient's room
- ☐ Remind staff to wash hands with soap and water following patient contact

Microbiology Laboratory Staff Person:
- ☐ Call relevant patient floor with positive *C. difficile* toxin test result
- ☐ Provide daily list of positive test results for Infection Control

Infection Control Practitioner:
- ☐ Check microbiology results daily for positive *C. difficile* toxin results
- ☐ Call relevant floor to confirm that patient with positive *C. difficile* toxin results is in a single-patient room and that the *Contact Precautions Plus* sign is on the patient's door
- ☐ Flag the patient's *C. difficile* status in the hospital's clinical information system or in the patient's paper chart
- ☐ Alert housekeeping that the patient is on *Contact Precautions Plus*

Environmental Services Staff Person:
- ☐ Prior to discharge cleaning, check for *Contact Precautions Plus* sign on the patient's door
- ☐ If *Contact Precautions Plus* sign is on the door, clean the room with a bleach-based cleaning agent
- ☐ Confirm for supervisor that bleach-based cleaning agent was used for discharge cleaning for every patient on *Contact Precautions Plus*

Treatment Checklist

- **When an MD, PA, or NP diagnoses mild CDI:** *All* of the following criteria are present: diarrhea (<6 BM/day), no fever, WBC<15,000, no peritoneal signs, and no evidence of sepsis

Physician, Physician Assistant, or Nurse Practitioner:
- ☐ Initiate oral metronidazole at dose 500mg every 8 hours
- ☐ If no clinical improvement by 48-72 hours after diagnosis, treat patient as moderate CDI
- ☐ Continue therapy for at least 14 days total and at least 10 days after symptoms have abated

- **When an MD, PA, or NP diagnoses moderate CDI:** *At least one* of the following criteria is present: diarrhea (6-12 BM/day), fever 37.5-38.5°C, WBC 15,000-25,000, or frankly visible stable lower gastrointestinal bleeding

Physician, Physician Assistant, or Nurse Practitioner:
- ☐ Initiate oral vancomycin at dose 250mg every 6 hours
- ☐ If no clinical improvement by 48 hours, add IV metronidazole at dose 500mg every 8 hours
- ☐ Consider obtaining infectious disease consultation
- ☐ Consider obtaining abdominal CT scan
- ☐ Continue therapy for at least 14 days total and at least 10 days after symptoms have abated

- **When an MD, PA, or NP diagnoses severe CDI:** *At least one* of the following criteria is present: diarrhea (>12 BM/day), fever >38.5°C, WBC >25,000, hemodynamic instability, marked & continuous abdominal pain, ileus, absence of bowel sounds, evidence of sepsis, or intensive care unit level of care required

Physician, Physician Assistant, or Nurse Practitioner:
- ☐ Obtain immediate infectious disease consultation
- ☐ Obtain immediate general surgery consultation
- ☐ Obtain abdominal CT scan
- ☐ Initiate oral vancomycin at dose 250mg every 6 hours together with IV metronidazole at dose 500mg every 6 hours
- ☐ Following consultation with general surgery regarding its use, consider rectal vancomycin
- ☐ Ask general surgery service to assess the need for colectomy

Abbreviations: MD=medical doctor, PA=physician assistant, NP=nurse practitioner, RN=registered nurse, BM=bowel movement, WBC=white blood cell count, CT=computed tomography, IV=intravenous

FIGURE 1. *Clostridium difficile* infection checklist at Brigham and Women's Hospital.

CDPH California Department of PublicHealth

Healthcare-associated Infections HAI Elimination

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Questions?

For more information, please contact any HAI Liaison Team member.

Thank you