Successes of a *Clostridium difficile* Infection Reduction Team and the Role of Sentri7®

Ed Eiland, Pharm.D., MBA, BCPS (AQ-ID)
Clinical Practice and Business Supervisor
Huntsville Hospital System
Huntsville Hospital System

- 881 licensed beds
- Located in North Alabama
- Consists of 650 beds in the adult Main hospital and 231 beds in a Women and Children Hospital
- Average Daily Census of ~600 patients
- Acute care regional referral hospital serving > 1.5M people
- Community teaching (340b)
Our Focus is on Improving Patient Outcomes with Resource Optimization
“Measure Not, Improve Not”
**Clostridium difficile**

- Anaerobic, spore forming, gram positive rod
- *Clostridium difficile* has surpassed MRSA as the leading cause of HAI's in community hospitals
- Transitions back and forth from the vegetative to spore form
- Vegetative form is susceptible to gastric acid, antibacterial soaps, and alcohol-based hand sanitizers

**Diagnosis of CDAD:**

- > 3 or more stools in < 24 hours and either:
  - Stool test positive for toxigenic *Clostridium difficile*
  - OR
  - Pseudomembranous colitis by colonoscopy or histopathology
**Clostridium difficile** associated diarrhea (CDAD)

- Most common cause of infectious diarrhea
- Agents implicated in causing CDAD include: antibiotics, chemotherapy, methotrexate, PPI’s, and amphotericin B
- *C. difficile* infection ranges from diarrhea to life-threatening colitis; mortality rates of up to 30% in outbreak settings
- Extends LOS by 3.6 days and increases overall hospitalization costs by $4,000 per episode, on average
- CMS is considering classifying CDAD as a never event
- Nursing Education: An unformed fecal specimen is needed to diagnose CDAD
Clostridium difficile infection results in variable clinical outcomes

- Mild diarrhea
- Pseudomembranous colitis
- Fulminant/refractory colitis
- Recurrent diarrhea
- Asymptomatic carriage
Disruption of protective colonic flora
Colonization with toxigenic Clostridium difficile
Toxin A & B production
Mucosal damage
Colitis and Diarrhea
CDI Process Improvement Timeline

- January 2005 - Initiated CDI education on the importance of hand hygiene and the need to use soap and water versus alcohol based cleaners.
- July 2008 - Carefusion MedMined implemented to calculate Nosocomial Infection Marker (NIM) rates measured as CDI cases per 10,000 patients days.
- August 2009 - PCR diagnostic technology from Mayo Laboratories was adopted to assess for the NAP1 strain.
- January 2010 - Cepheid GeneXpert® *C difficile* PCR replaced the Meridian Bioscience Premier Toxins A/B EIA kits housewide and the CDI rate began to double yet the severity and deaths due to infection were reduced.
- January 2010 - Microbiology laboratory policy was implemented that doesn’t allow PCR testing for 14 days after a positive result.
- January 2010 - Built *Clostridium difficile* dashboard tab in Pharmacy OneSource
- February 2010 - Initiated the CDI Clinical Pathway
- April 2010 - Environmental Services began utilizing Ultraviolet-C Light
- August 2011 - Updated the CDI Clinical Pathway

Continue to track and trend the CDI cases per 10,000 patient days and the CDI associated mortality rate.
**Clostridium difficile Infection (CDI) Clinical Pathway**

**Microbiology Lab Diagnostics:**
- Evaluate patient with persistent diarrhea or clinical suspicion of CDI.
- Obtain *Clostridium difficile* by PCR.
- Only liquid or unformed stools will be processed.
- Due to the high sensitivity and the negative predictive value of PCR, repeating the test will not be beneficial. If there remains a high index of suspicion for infection, further testing may be allowed with special request to the Microbiology Lab.

**Isolation Procedures:**
- Place patient on Contact Precautions based on known or suspected *Clostridium difficile* infection.
- Contact Precautions can be discontinued two (2) weeks after resolution of symptoms (diarrhea).
- Discontinue isolation ONLY after Infection Control consultation. Wash hands with soap and water as alcohol is not effective.
- Symptomatic patients with diarrhea on readmission to Huntsville Hospital will be isolated if on previous hospitalization CDI was diagnosed, the duration of isolation will be determined on a case by case basis.

**Treatment Recommendations:**

- **Initial episode, mild or moderate disease**
  - Metronidazole 500 mg PO every 8 hours for 10 days
  - (Fever, Leukocytosis < 15,000 and serum creatinine level<1.5 times prior to CDI)

- **Initial episode, severe**
  - Vancomycin 125 mg PO every 6 hours for 10 days
  - (Fever, Leukocytosis > 15,000 or serum creatinine level >1.5 x’s level prior to CDI)

- **Recurrent episode (non-NAP 1 strain)**
  - Fidaxomicin 200 mg PO twice daily for 10 days
  - (Fever, Leukocytosis > 15,000 or serum creatinine level >1.5 x’s level prior to CDI)

- Symptoms improving: Discontinue at 10 days if symptoms resolved.

- Symptoms worsening or not resolving: Continued worsening of symptoms, especially continued increase in WBC count and hypotension is an indication to consider Infectious Diseases consultation.

- **Initial episode, severe complicated**
  - CDI is confirmed/suspected with hypotension or shock and or known or suspected ileus or toxic megacolon

Consider Infectious Diseases and Surgical consults. Severe. No ileus; Consider...
- Vancomycin 500 mg PO every 6 hours for 14 days
- Severe ileus or megacolon:
  - Vancomycin 500 mg PO or by NG tube every 6 hours
- Metronidazole 500 mg IV daily every 8 hours plus
- Consider intercolonial delivery of Vancomycin 500 mg in 100 mL of normal saline every 6 hours for 14 days via retention enema

- **Recurrent episode (non-NAP 1 strain)**
  - Fidaxomicin 200 mg PO twice daily for 10 days
  - (Fever, Leukocytosis > 15,000 or serum creatinine level >1.5 x’s level prior to CDI)

- Symptoms improving: Discontinue at 10 to 14 days if symptoms resolved.

- Symptoms worsening or not resolving: Continued worsening of symptoms, increased WBC count and hypotension consider immediate Surgical and Infectious disease consults.

**Monitoring**
- Avoid antidiarrheal / antiperistaltic (Lomotil®, Imodium®, etc.) – may obscure symptoms and precipitate toxic megacolon
- Monitor PT/INR if on warfarin and metronidazole concurrently
- No need to repeat *Clostridium difficile* testing for test of cure
- Use caution when discontinue orders are written for patients who are on oral and intravenous Vancomycin concomitantly, as these two agents treat different infectious processes and intravenous Vancomycin is not effective for CDI
- Strongly consider the discontinuation of antibiotics not used for CDI treatment as soon as possible to allow normal intestinal flora to be reestablished.

**References:**
Why the *Clostridium difficile* Infection (CDI) Clinical Pathway was Implemented

- Health system initiative to decrease nosocomial infection rates from 3.29% to 3.12% as to ensure that we were ranked in the top 10% of hospitals.
- Stool cultures, for test of cures, were being routinely obtained versus realizing a negative test after a short treatment course was not a good predictor of cure.
- Effort to avoid the inappropriately abrupt discontinuation of therapy prior to or at hospital discharge in patients with proven or suspected CDI leading to readmissions and colectomies.
- Guidelines for *Clostridium difficile* Infection in Adults: 2010 Update by SHEA and IDSA were published.
- Discussions with the CDC: PCR increased our CDI numbers yet severity decreased and nursing home admissions significantly impact our CDI efforts.

The elements of the 'CDI Clinical Pathway' consist of surveillance, education, antimicrobial stewardship, environmental cleaning, hand hygiene, and contact isolation.
Cepheid GeneXpert™ Diagnostic System

- Real Time - PCR
- Detects toxin B gene (tcdB) - Cytotoxin
- ***NEW***: Xpert C. Difficile/Epi specifically calls out epidemic *C. difficile* 027/NAP1/BI strain from other toxigenic strains
- System requires instrument, computer, preloaded software and single use disposable cartridges
- Cross contamination is eliminated
- Specimen-------- Unformed stool in a clean container
- Specimen is stable ----- 5 days at 2-8° C
  ---- 24 hrs at 20-30° C
- Reporting: ------- Toxigenic *C. difficile* POSITIVE
  ------- 027-NAP1-BI PRESUMPTIVE POS
  ------- 027-NAP1-BI PRESUMPTIVE NEG
  ------- Toxigenic *C. difficile* NEGATIVE
- **Not** intended to be a test of cure
Successes of a Clostridium difficile Infection (CDI) Reduction Team

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David Crump
Vicki McCann
John Dinkel, M.D.

Huntsville Hospital System
Huntsville, Alabama

Introduction

Health-Care Facility
- Huntsville Hospital System
  - Adult care regional referral hospital
  - 151 licensed beds
  - 600 bed adult Main Hospital
  - 231 bed Women and Children's Hospital
  - Community teaching

Background
- Clostridium difficile infection (CDI) leads to increased patient morbidity and mortality
- Mortality rates up to 25% in outbreak settings
- Lengths of stay extended by 3.8 days
- Hospitalization costs increased by $4,000 per episode
- Common cause of infectious diarrhea, occurring in approximately 25% of hospitalized patients with antibiotic-associated diarrhea
- Treatment options are limited
- Paramount to strictly patient care therapies based on Guidelines for Clostridium difficile infection in Adults: 2010 Update by the Society for Healthcare Epidemiology of America and the Infectious Disease Society of America

Purpose
- Multidisciplinary quality team, Clostridium difficile infection (CDI) Reduction Team, was initiated as part of the Antimicrobial Stewardship Program
- Purpose is to implement CDI Clinical Pathway to reduce Clostridium difficile associated diarrhea

Description of the Program
- CDI Clinical Pathway was implemented due to:
  - Hospital system initiative to decrease nosocomial infection (NNI) rates from 3.68% to 3.12%
  - Short cultures being obtained for test of cure not realizing a negative test after a short treatment course was not a good predictor of cure
  - Avoid underdosing of therapy prior to or at discharge in patients with proven or suspected CDI resulting in readmissions and readmissions
- CDI Clinical Pathway consists of:
  - Surveillance
  - Education
  - Antimicrobial stewardship
  - Environmental cleaning
  - Hand hygiene
  - Contact isolation
- November 2008, polymeric chain reaction (PCR) diagnostic technology was adopted to assess for NAP-1
- May 2010, hospital system transitioned to all PCR CDI testing

Experience with the Program
- Matrices associated with CDI going back to 2004 are reviewed monthly

Total N/A Chart from 2004

Total N/A Chart from 2008

Total N/A Chart from 2009

Total N/A Chart from 2009

Experience with the Program (continued)
- August 2008, polymeric chain reaction (PCR) diagnostic technology was adopted to assess for NAP-1
- May 2010, hospital system transitioned to all PCR CDI testing
- Treatment guidelines advocate that CDI rate per 1,000 patient days is the most appropriate metric to use for internal and external benchmarking

Discussion
- The Antimicrobial Stewardship Program has fostered and facilitated:
  - More appropriate antimicrobial use
  - Development of infectious diseases related pathways and algorithms
  - Optimization of prevention and treatment strategies
- CDI Clinical Pathway guides clinical care
  - CDI has been reduced to an all time low since 2004 of 4.1 cases per 10,000 patient days
  - Mortality rate has been cut in half in fiscal year 2010 compared to 2006

Conclusion
- Recently published guidelines help to justify, support, and guide the continued efforts of the CDI Reduction Team while fostering the success of the CDI Clinical Pathway resulting in a positive impact on clinical outcomes and mortality for patients diagnosed with infectious diarrhea.

References

Authors of this presentation have the following to disclose:
- Concerning possible financial or personal relationships with commercial entities that may have direct or indirect interest in the subject matter of this presentation.
**CDI Rates per 10,000 patient days**

**Clostridium difficile Surveillance**
Rate is per 10,000 patient days

Benchmark for HO and CO-HCFA combined (NIMI) is 10.5 cases per 10,000 patient days
(Non-PCR)

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<th>Aug 10</th>
<th>Sep 10</th>
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## Protonix IV - PO (69)

### Patient Information

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<th>Diagnosis</th>
<th>Drug Matches</th>
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| 05160422   |      | S025C    | INT - IV-to-PO Tr., DUE: 10/21/2011  
INT - IV-to-PO Tr., DUE: 10/21/2011  
INT - IV-to-PO Tr., Closed 10/19/2011  
INT - IV-to-PO Tr., Closed 10/19/2011 | pedv train left clavicle | PROTONIX 40 mg VIAL (PXS) | ADR AE INT Review |
| 01953585   |      | S021C    | INT - IV-to-PO Tr., DUE: 10/21/2011  
INT - IV-to-PO Tr., DUE: 10/21/2011  
INT - IV-to-PO Tr., Closed 10/19/2011  
INT - IV-to-PO Tr., Closed 10/19/2011 | exp lap | PROTONIX 40 mg VIAL (PXS) | ADR AE INT Review |
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<td>Ceftaroline (Teflaro)</td>
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<td>Zvyox for &gt; 72 hours with no +MRSA culture</td>
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<td>Fidaxomicin (Dificid)</td>
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<tr>
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<td>④</td>
<td>AmBisome (Formulary Lipid Ampho B)</td>
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C. difficile Infx (CDI)

| Fidaxomicin (Dificid) | ④ | Vancomycin (Vancocin) | ④ |
| Oral Metronidazole (Flagyl) | ④ | IV Metronidazole (Flagyl) | ④ |
| C Diff PCR Obtained | ④ | Positive C Diff PCR Without Active Treatment | ④ |

No Dashboard Display

| Alvimopan (Entereg) * | ④ |
### Fidaxomicin (Difficid) (1)

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### Vancomycin (Vancocin) (0)

### Oral Metronidazole (Flagyl) (0)

### IV Metronidazole (Flagyl) (0)

### C Diff PCR Obtained (1)

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### Positive C Diff PCR Without Active Treatment (0)
### Fidaxomicin (Diffid) (1)

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### Vancomycin (Vancocin) (0)

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**Vancomycin (Vancocin)**

**Summary:**
Vancomycin (Vancocin) Displays patients where Drug Order Date ACTIVE AND Start Date IS ANY AND Drug Name CONTAINS VANCOCIN 125 mg cap, VANCOCIN 250 mg cap, vancomycin 500 mg/10 mL oral soln AND Route IS ANY AND Form IS ANY AND Rule created by: AMT - Antimicrobial Management Team
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<th>Patient ID</th>
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**Oral Metronidazole (Flagyl)**

**Summary:**
Oral Metronidazole (Flagyl) Displays patients where Drug Order Date ACTIVE AND Start Date IS IN THE LAST 2 Day AND Drug Name CONTAINS FLAGYL 250 mg tab, FLAGYL 375 mg cap, FLAGYL 50 mg/mL ORAL susp, FLAGYL 500 mg tab AND Route IS ANY AND Form IS ANY

Rule created by: AMT - Antimicrobial Management Team
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</table>
Positive C Diff PCR Without Active Treatment
Conclusions

- The elements of the 'CDI Clinical Pathway' consist of surveillance, education, antimicrobial stewardship, environmental cleaning, hand hygiene, and contact isolation.
- It is essential that the microbiology laboratory policy does not allow PCR testing for 14 days after a positive result.
- Sentri7® is an integral tool used to identify patients with CDAD and ensure appropriate pharmacotherapy.
- Metrics to track and trend include: CDI cases per 10,000 patient days and CDI associated mortality rate.
- It is optimal to practice prevention of CDI and once diagnosed to treat and provide supportive measures in a timely fashion.
Questions!

HOSPITAL
C.DIFFICILE
M.R.S.A
PATIENTS

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