






# Nurses Take Antibiotic Stewardship Action Initiative

## *Clostridioides difficile* 101 For Nurses







Slide Title and Commentary	Slide Number and Image
<p><b><i>Clostridioides difficile</i> 101 For Nurses</b></p> <p>SAY:</p> <p><i>Clostridioides difficile</i> 101 for nurses. This presentation will cover topics such as <i>C. difficile</i> colonization and infection as well best testing practices.</p>	<p><b>Slide 1</b></p>  <p><b><u><i>Clostridioides difficile</i> 101</u></b> <b><u>For Nurses</u></b></p> <p>Department of Antimicrobial Stewardship The Johns Hopkins Hospital Johns Hopkins University School of Medicine</p> <p>Valeria Fabre, MD Sara E. Cosgrove MD, MS</p> 
<p><b><i>Clostridioides difficile</i></b></p> <p>SAY:</p> <p><i>Clostridioides difficile</i> (or "C. diff") is a bacteria that lives in the gut. It has a spore form and a vegetative form and is transmitted to other humans by the fecal-oral-route. <i>C. difficile</i> spores are hardy and easily survive in the hospital environment. It is important to follow good hand hygiene practices and other infection prevention measures such as contact isolation and room cleaning to prevent spread of <i>C. difficile</i> from one patient to the other.</p> <p><i>C. difficile</i> causes infection of the colon when the spore form vegetates and the resulting bacteria multiply and produce toxins that lead to inflammation of the bowel wall.</p>	<p><b>Slide 2</b></p>  <p><b><i>Clostridioides difficile</i></b></p>  <ul style="list-style-type: none"><li>• A bacteria that lives in the gut with a spore form and a vegetative form</li><li>• Fecal-oral transmission</li><li>• Spores are hardy and survive in the hospital environment</li><li>• Colonic infection results when the spore form vegetates and the resulting bacteria produce toxins that lead to inflammation</li></ul>  <p><small>Crobach M et al. Clinical Microbiology Reviews Mar 2018, 31 (2) e00021-17</small></p>

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<p><b><i>C. difficile</i> infection</b></p> <p>SAY:</p> <p><i>C. diff</i> can cause mild diarrhea to severe fulminant colitis. Mild diarrhea may subside with stopping the offending antibiotic alone. In addition to diarrhea, patients may develop abdominal cramps and fever. Less commonly, they may develop vomiting if there is ileus in which motility of the gut slows down or stops). Toxic megacolon refers to significant distention of the colon due to inflammation that is associated with a risk of perforation.</p> <p>Therapy is based on the peripheral white cell count and creatinine and whether the patient has developed a complication such as ileus, megacolon or shock.</p>	<p><b>Slide 3</b></p>  <p><b><i>C. difficile</i> Infection</b></p> <ul style="list-style-type: none"><li>• Clinical presentation:<ul style="list-style-type: none"><li>– Mild diarrhea, may resolve with stopping antibiotic</li><li>– Diarrhea with abdominal cramps and fever</li><li>– Above presentation that continues to ileus or toxic megacolon</li></ul></li><li>• For the purpose of treatment:<ul style="list-style-type: none"><li>– Non-severe: white blood cell count <math>\leq 15000</math> cells/mL and serum creatinine level <math>&lt; 1.5</math> mg/dL</li><li>– Severe: white blood cell count of <math>\geq 15000</math> cells/mL or a serum creatinine level <math>&gt; 1.5</math> mg/dL</li><li>– Fulminant: Hypotension or shock, ileus, toxic megacolon</li></ul></li></ul> <p><small>• McDonald, C.L. et al. Clinical Practice Guidelines for Clostridium difficile Infection in Adults and Children: 2017 Update by the Infectious Diseases Society of America (IDSA) and Society for Healthcare Epidemiology of America (SHEA). Clinical Infectious Diseases, Volume 66, Issue 7, 1 April 2018, Pages e1–e8 • Lindsay M, Daniels B, Ruppel D, Kufel J (2018) Clinical review of Clostridium difficile infection: an update on treatment and prevention. Expert Opinion on Pharmacotherapy, 19(16), 1739-1750</small></p> 
<p><b><i>C. difficile</i> colonization</b></p> <p>SAY:</p> <p>Patients may harbor <i>C. diff</i> in their guts in a dormant form. We call these patients “asymptomatic carriers” or “colonized”. For example, Infants under age 2 are often colonized with <i>C. diff</i>. 15% of healthy adults have been observed to be colonized with <i>C. diff</i>. Higher rates of colonization are found in patients evaluated at hospital admission—approximately 30%—and long-term care residents—up to 45%.</p> <p>Risk factors associated with carrying <i>C. diff</i> include chronic dialysis, recent hospitalization, immunosuppression, gastric acid suppressants and antibiotics.</p> <p><i>C. diff</i> may persist in the gut for several months. For this reason, patients should not be re-tested after completing treatment.</p>	<p><b>Slide 4</b></p>  <p><b><i>C. difficile</i> Colonization</b></p> <ul style="list-style-type: none"><li>• Patients can be colonized with <i>C. difficile</i> without active infection (e.g., no diarrhea)<ul style="list-style-type: none"><li>– Infants</li><li>– Up to 15% of healthy adults</li><li>– ~30% of patients at hospital admission</li><li>– Up to 45% of long-term care residents</li></ul></li><li>• Risk factors:<ul style="list-style-type: none"><li>– Chronic dialysis</li><li>– Recent hospitalization</li><li>– Immunosuppression</li><li>– Gastric acid suppressants</li><li>– Antibiotic use</li></ul></li><li>• May persist for several months</li></ul> <p><small>• Orbach M et al. Clinical Microbiology Reviews Mar 2018, 31 (2)</small></p> 

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<p><b>Recommendations for <i>C. difficile</i> testing</b></p> <p>SAY: C diff testing should be considered in patients with 3 or more unexplained and new onset unformed stools over a 24 hour period. Note that most patients with <i>C. difficile</i> diarrhea will have frequent watery stool. As noted previously, rarely, patients can develop very severe colitis that can lead to ileus; these patients will not have diarrhea but will have systemic illness and abdominal pain and distension, and should be tested for C. diff.</p>	<p><b>Slide 5</b></p> <p> <b>Recommendations for <i>C. difficile</i> Testing</b> </p> <ul style="list-style-type: none"><li>• Patients with 3 or more unexplained and new onset unformed stools in 24 hours<ul style="list-style-type: none"><li>– Most patients with <i>C. difficile</i> diarrhea have persistent and frequent diarrheal episodes</li><li>– Rarely, patients can develop very severe colitis that leads to ileus; these patients will not have diarrhea but will have systemic illness and abdominal pain and distension</li></ul></li></ul> <p> <small>McDonald, C. L. et al. Clinical Practice Guidelines for Clostridium difficile Infection in Adults and Children: 2017 Update by the Infectious Diseases Society of America (IDSA) and Society for Healthcare Epidemiology of America (SHEA). Clin Infect Dis. 2018;66(4):e1-14. April 2018</small></p>
<p><b>Recommendations for <i>C. difficile</i> testing</b></p> <p>SAY:</p> <p>There are many reasons for hospitalized patients to have loose stools. Further, C. diff colonization is also common as we discussed previously. Hence, it is important to send C. diff tests in patients who are likely to have C. diff. to avoid detection of colonization.</p> <p>Some common examples of causes of diarrhea include laxatives, enteral tube feedings, chemotherapy, immunosuppressants, and chronic bowel diseases.</p>	<p><b>Slide 6</b></p> <p> <b>Recommendations for <i>C. difficile</i> Testing</b></p> <ul style="list-style-type: none"><li>• Other causes of loose stools in hospitalized patients<ul style="list-style-type: none"><li>– Laxatives</li><li>– Enteral tube feeding</li><li>– Chemotherapy</li><li>– Immunosuppressants: mycophenolate, sirolimus, tacrolimus, methotrexate</li><li>– Chronic bowel disease: inflammatory bowel disease, celiac disease, pancreatic insufficiency</li></ul></li><li>• It is estimated that only 30% of hospitalized patients with antibiotic-associated diarrhea will have CDI</li></ul> <p> <small>• McDonald, C. L. et al. Clinical Practice Guidelines for Clostridium difficile Infection in Adults and Children: 2017 Update by the Infectious Diseases Society of America (IDSA) and Society for Healthcare Epidemiology of America (SHEA). Clin Infect Dis. 2018;66(4):e1-14. April 2018 • Kortes E. and Hogobauer C. Diarrhea in the Immunocompromised Patient. Gastroenterol Clin N Am 41 (2012):677-701</small></p>

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### Stool color or odor do not correlate with *C. difficile* infection (CDI)

SAY:

There is a myth that people can identify *C. diff* based on the color and smell of stool. Studies have shown a lack of correlation between stool color and stool smell with CDI and *C. difficile* testing should not be based on these parameters.

One prospective study evaluated stool color in 80 controls and 4 cases of CDI. Each stool sample was imaged and given a color score on a color scale. Greenish stools were more common among the control cases.

Another study correlated nurses' response as to whether a stool was positive or not for *C. difficile* based on stool odor. The average correct was 45% and was not influenced by years of clinical experience or level of confidence on the ability to sniff *C. difficile*.

### Slide 7



### Stool Color/Odor are not Correlated with *C. difficile* Infection

- Green discoloration of stool is not associated with *C. difficile* infection (CDI)
  - 84 stool samples included, 4 from CDI cases
  - Samples were imaged and a color score was given
  - Green/greenish color was more common in control cases
- Smell of stool is not correlated with CDI
  - 18 nurses sniffed 10 stool samples (5 positive and 5 negative for *C. difficile*)
  - ~50% of nurses had >10 years of work experience
  - 61% felt confident in their the ability to detect *C. difficile* based on odor
  - No one performed better than chance



• Rao K, et al. The nose knows not: poor predictive value of stool sample odor for detection of Clostridium difficile. Clin Infect Dis. 2013;56(4):619-636.  
• Sugimoto H, et al. Assessment of stool color in Clostridium difficile infection: A pilot study. Infection Control & Hospital Epidemiology. 2012;37:832-835

### Risk factors for *C. difficile* infection

SAY:

Risk factors for CDI include current or recent exposure to antibiotics, particularly clindamycin, fluoroquinolones, ampicillin and amoxicillin, and cephalosporins. Other risk factors include host factors such as older age and immunosuppression, duration of hospitalization and chemotherapy

### Slide 8



### Risk Factors for *C. difficile* Infection






- Antibiotics (active or recent exposure)
  - Clindamycin
  - Fluoroquinolones
  - Ampicillin or Amoxicillin
  - Cephalosporins
- Host factors (e.g., age, immunosuppression)
- Duration of hospitalization
- Chemotherapy



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<p><b>Clinical vignette</b></p> <p><b>SAY:</b></p> <p>Let's review a case to highlight some of the concepts we learnt in this presentation.</p> <p>A 65 yo woman is admitted to the hospital with acute cholecystitis. She undergoes cholecystectomy. On post-operative day 3 she develops 3 loose stools. Abdominal exam is unremarkable except for mild tenderness over the incision site. She is afebrile. Her white count is mildly elevated but unchanged from admission. <i>What is the correct next step?:</i></p> <ul style="list-style-type: none"><li>a) Test for <i>C. difficile</i> right away</li><li>b) Call a colleague to inspect the stool with you, then decide</li><li>c) Stop laxatives and re-evaluate need for further work up in 72 hours</li></ul> <p>The correct next step is to stop laxatives and re-evaluate the need for further testing in 72 hours. As we described previously there are many reasons why hospitalized patients may have loose stools. In this case, where the patient has an alternative explanation and there are no clinical concerns for colitis, testing for <i>C. diff</i> is unnecessary. A positive <i>C diff</i> test may indicate presence of the bacteria but does not necessarily mean active disease. Hence, is important to select patients to test appropriately to avoid unnecessary treatment.</p>	<p><b>Slide 9</b></p>  <p><b>Clinical vignette</b></p> <p>A 65 yo woman is admitted to the hospital with acute cholecystitis. She undergoes cholecystectomy. On post-operative day 3 she develops 3 loose stools. Abdominal exam is unremarkable except for mild tenderness over the incision site. She is afebrile. Her white count is mildly elevated but unchanged from admission. <i>What is the correct next step?:</i></p> <ul style="list-style-type: none"><li>a) Test for <i>C. difficile</i> right away</li><li>b) Call a colleague to inspect the stool with you, then decide</li><li>c) Stop laxatives and re-evaluate need for further work up in 72 hours</li></ul> 
<p><b>Tips to avoid inappropriate <i>C. difficile</i> testing</b></p> <p><b>SAY:</b></p> <p>Some recommendations to avoid inappropriate testing include:</p> <ul style="list-style-type: none"><li>1. Don't test patients for <i>C. difficile</i> if they had &lt; 3 unformed stools in the past day</li><li>2. Don't test patients who received laxatives within the past 48 hours (stop laxatives and monitor)</li><li>3. Don't test patients in whom diarrhea has an alternative explanation (e.g., laxatives, tube feedings) in the absence of evidence of disease (persistent diarrhea, abdominal pain, leukocytosis, fever)</li><li>4. Don't retest within 7 days</li><li>5. Don't test for cure</li><li>6. Don't test based on smell or color of stool</li></ul>	<p><b>Slide 10</b></p>  <p><b>Tips to Avoid Inappropriate <i>C. difficile</i> Testing</b></p>  <ul style="list-style-type: none"><li>1. Don't test patients for <i>C. difficile</i> if they had &lt; 3 unformed stools in the past day</li><li>2. Don't test patients who received laxatives within the past 48 hours (stop laxatives and monitor)</li><li>3. Don't test patients in whom diarrhea has an alternative explanation (e.g., laxatives, tube feedings) in the absence of evidence of disease (persistent diarrhea, abdominal pain, leukocytosis, fever)</li><li>4. Don't retest within 7 days</li><li>5. Don't test for cure</li><li>6. Don't test based on smell or color of stool</li></ul> 

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