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## Clostridium difficile: Implications for nursing

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## *Clostridium difficile*: Implications For Nursing

*Clostridium difficile* (*C. difficile*) and its many complications has become a serious health care challenge in acute, long-term, and home care. Nurses can make a unique contribution with preventive health teaching in decreasing transmission, preventing complications, and expediting resolution of *C. difficile*.

*Clostridium difficile* (*C. difficile*) infection is becoming more of a health care challenge given the multiple complications it can cause, including hypovolemia, sepsis, pain, and peritonitis (Schroeder, 2005). Associated problems have led to development of a new diagnosis, *Clostridium difficile*-associated disease (CDAD), which impacts patients in acute care and long-term care as well as persons in the community. CDAD was believed to include only *C. difficile*-associated diarrhea but also is associated with such diagnoses as pseudomembranous colitis, toxic megacolon, and colon perforations which can lead to more life-threatening sepsis (Centers for Disease Control and Prevention [CDC], 2005). Patients at the highest risk for acquiring *C. difficile* and therefore CDAD include those with multiple co-morbidities, older adults, immunosuppressed persons, patients on chemotherapy, persons who have had recent abdominal surgery or antibiotic therapy, and individuals with previous *C. difficile* infection (Hooker, 2007).

### Pathophysiology

*C. difficile* is a gram-positive bacillus that colonizes in approximately 40% of hospitalized patients due to the spores frequently present in the institutional environment on floors, side rails, and bathrooms, as well as health care workers' hands. This spore-forming rod causes approximately 15%-20% of all antibiotic-related diarrhea (Hurley & Nguyen, 2002). Use of any antibiotic will cause a change in bowel flora, allowing *C. difficile* to grow proliferatively (Schroeder, 2005).

Two types of protein exotoxins are produced by the *C. difficile* bacillus: toxin A and toxin B. Toxin A stimulates the mast cells, thus triggering an inflammatory response manifested by a high white blood cell (WBC) count. This WBC count can escalate to 50,000 mm<sup>3</sup> once the *C. difficile* has colonized in the host, especially if the host has a poor IgG antibody immune response. Toxin B is extremely cytotoxic and has low enterotoxic activity. Together, the two toxins cause a large number of inflammatory mediators to descend on the colon, triggering more colitis and colonic ulcerations. Purulent debris then results, contributing to the development of a pseudomembrane. With the activation of the inflammatory response, the released mediators cause fluid secretion and increased permeability at the mucosal membrane and predispose the patient to diarrhea as well as drastic electrolyte and fluid shifts (Schroeder, 2005).

A new strain of *C. difficile* has been identified. The North American pulsed-field gel electrophoresis type I (NAP I) generates 16 times more toxin A and approximately 23 times more toxin B than prior strains of the bacterium (Sunenshine & McDonald, 2006). Development of this virulent strain is a direct result of fluoroquinolone use (Pépin et al., 2005). Nurses can assist by noting if patients who contract *C. difficile* have received a fluoroquinolone, and increasing awareness of this fact among other members of the health

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care team. Because many persons receive a fluoroquinolone, transmission of the *C. difficile* bacillus via the fecal-oral route is relatively easy in both acute health care and home settings.

### Diagnosics and Manifestations

Suspicion of *C. difficile* infection requires the provider to complete a thorough medical history to determine if the patient has risk factors for developing infection. The enzyme immunoassay for *C. difficile* toxins A and B is used sometimes because it is easy to perform and results can be generated within 3-4 hours. Specificity is approximately 93%-100% but sensitivity is 63%-99%, requiring careful surveillance to prevent false-negative findings. Stool specimens also must be rushed to the laboratory for immediate testing after collection because the specimen is generally liquid and will produce a false-negative test if stored at room temperature. *C. difficile* diagnosis now frequently is determined by use of a cytotoxin assay with high specificity and sensitivity. However, results of this test are not available for 1-2 days, a potentially negative factor when rapid diagnosis is desired (Quest Diagnostics, 2009).

Certainly a CT scan will assist further in showing changes indicative of *C. difficile*. If appropriate, a sigmoidoscopy or colonoscopy can be performed with immediate determination of pseudomembranes (Schroeder, 2005). Diagnostics should be delayed if signs of dehydration or infection are present. The complications of *C. difficile* are life-threatening and must be addressed to prevent further patient deterioration (Hardman & Tufts, 2007).

### Patient Symptoms

Patients complain of foul-smelling diarrhea as well as abdominal cramping and distention. Persons with more severe *C. difficile* infection will have blood in their stools. They also tend to have a fever, poor skin turgor, dry mucous membranes secondary to the dehydration, and nausea. If there is a delay in identifying the causative organism and beginning management, patients may display

**Table 1.**  
**Signs and Symptoms**  
**of *C. difficile***

|                                 |
|---------------------------------|
| Abdominal fullness              |
| Abdominal discomfort            |
| Malodorous frequent loose stool |
| Elevated white blood count      |
| Elevated temperature            |
| Signs of dehydration            |

Schroeder, 2005

life-threatening symptoms of *C. difficile* colitis, including peritonitis, toxic megacolon, sepsis, acute renal failure, and systemic inflammatory response syndrome. If patients are immunocompromised or immunosuppressed, have received recent immunosuppressive therapy (e.g., antineoplastic treatment), had surgery, or have a history of positive *C. difficile* cultures, they are especially vulnerable to these life-threatening complications (Schroeder, 2005).

The WBC count is a good indicator of the degree of *C. difficile* present because it will rise dramatically [even to 50,000 per mm<sup>3</sup>] when the colitis is most acute (Hurley & Nguyen, 2002). See Table 1 for signs and symptoms that may indicate the need for testing a patient for *C. difficile*. Any of these symptoms may indicate the need for additional evaluation by a gastroenterologist, especially if patients also manifest signs of dehydration and infection.

### Nursing Management of Patients

Nursing management of patients with confirmed *C. difficile* infection will most likely require discontinuation of the currently prescribed antibiotic (Oriola, 2006) and administration of a different antibiotic to treat the infection (Pépin et al., 2005). The nurse should ensure patients are not only taking the newly prescribed antibiotic but also responding to the treatment by showing a decrease in symptoms. Because symptoms can recur despite antibiotic therapy (Sunenshine & McDonald, 2006), close monitoring is essential. Demonstrating awareness of the risk for previously mentioned com-

**Table 2.**  
**Most Frequent Antibiotics**  
**Involved in Development**  
**of *C. difficile* Infection**

|                               |
|-------------------------------|
| Clindamycin (Cleocin®)        |
| Broad-spectrum penicillins    |
| Broad-spectrum cephalosporins |
| Fluoroquinolones              |

Pépin et al., 2005; Wilcox, 2003

plications (Oriola, 2006) also is a large part of nursing management in patients with *C. difficile* infection. Nursing interventions thus would include careful assessment of WBC count, temperature, and hydration status; meticulous skin care and assistance with bowel elimination given the loose frequent stools; and management of abdominal discomfort.

### Pharmacologic Treatment

Approximately 90% of patients who acquire *C. difficile*-associated disease have received antibiotics for another illness. Use of antimicrobial agents (other than aminoglycosides) has been linked to increased incidence of CDAD (Sunenshine & McDonald, 2006). Therefore, the first line of treatment for CDAD is to discontinue the antibiotic therapy. See Table 2 for most frequently used antibiotics which are believed to be linked to *C. difficile* infection (Pépin et al., 2005; Wilcox, 2003)

When antibiotics are stopped, the disease will resolve itself within 2-3 days in 23% of patients with CDAD (CDC, 2005), and no further treatment should be necessary (Sunenshine & McDonald, 2006). However, some patients have *C. difficile* for extremely long periods of time; some do not have resolution and may be recommended for immunoglobulin therapy (Wilcox, 2004) or donor stool transplant involving replacement of a patient's stool with normal bowel flora (Aas, Gessert, & Bakken, 2003).

In addition to discontinuing antibiotic therapy, many patients with mild-to-moderate CDAD require treatment with oral antibiotics for 10-14 days (Oriola, 2006). The drugs of choice are metronidazole (Flagyl®) or



vancomycin (Vancocin<sup>®</sup>) (CDC, 2005; Sunenshine & McDonald, 2006). Historically, metronidazole was considered just as effective as, yet less expensive than vancomycin. However, one study suggested metronidazole only had a response rate of 78%, significantly lower than response rates in prior studies (Sunenshine & McDonald, 2006). The literature also suggests patients treated with metronidazole may have a CDAD recurrence rate of 30% or more. In addition, although vancomycin may be used for more severe cases, treatment of CDAD with vancomycin may increase drug resistance to other organisms (Gerding, 2007).

Symptoms from CDAD should start to resolve within several days of beginning pharmacological therapy. Within 24-48 hours, fever should subside; diarrhea should resolve within 2-5 days. Patients should be monitored closely even after the original antibiotics have been discontinued and treatment for the CDAD has been initiated. If symptoms progress despite treatments, a surgical consult may be recommended to rule out toxic megacolon, peritonitis, or sepsis (Sunenshine & McDonald, 2006).

Antiperistaltic drugs, antidiarrheals, and opiates are contraindicated in patients with *C. difficile* as they can predispose the client to toxic megacolon (Oriola, 2006; Sunenshine & McDonald, 2006). By reducing gastric acidity and providing an environment conducive to colonization, proton pump inhibitors also appear to be associated with an increased risk of developing community-acquired CDAD (Stapleton, 2006).

### **Treatment for Fever, Diarrhea, Abdominal Pain, and Cramping**

Besides administration of medications to resolve the infection, nursing care involves managing symptoms associated with *C. difficile* (fever, diarrhea, abdominal pain, and cramping) as well as additional symptoms that may arise. For example, dehydration and electrolyte imbalance may occur related to diarrhea and fever, and may require the administration of intravenous fluids. Abdominal pain and cramping may result in decreased appetite and

weight loss. Skin care is essential to avoid impairment for patients who have frequent, loose bowel movements (Oriola, 2006).

Discontinuation of an antibiotic is one of the first interventions in treating *C. difficile* (CDC, 2005). In addition to managing the current *C. difficile* infection, nurses should monitor the status of patients' initial infections for which they received antibiotic treatment. For example, an antibiotic regimen may have been initiated for a urinary tract infection, with the antibiotic discontinued at the onset of *C. difficile* infection. In situations such as this, caution is needed to assure the primary infection does not recur.

Nursing management also includes use of contact precautions as appropriate to avoid person-to-person/person-to-object contamination with *C. difficile* and the spores that may persist for weeks to months on dry surfaces (Sunenshine & McDonald, 2006). Surfaces in patients' rooms should be kept clean and should be disinfected with a hypochlorite-based cleanser. Household bleach diluted with water (1:10) is effective for the home care setting; however, alcohol-based disinfectants are ineffective against *C. difficile* in all settings and should not be used for cleaning surfaces or hands (CDC, 2005). Medical equipment, such as stethoscopes or blood pressure cuffs, should be left in patients' rooms; equipment that cannot be left should be cleaned before it is used for other patients (Oriola, 2006). The CDC (2005) recommends cleaning equipment with a standard hypochlorite-based disinfectant. The following case studies depict common scenarios involving nursing management of patients with *C. difficile* infection.

### **Case Study 1: Older Adult Patient with a History of Antibiotic Use**

Mrs. M., age 76, had left eye and maxillary sinus infection treated initially with clarithromycin XL (Biaxin<sup>®</sup>) 500 mg twice daily for 14 days without resolution. She lives at home, has no significant medical history, and is not taking any other medications. The infection presented as constant tearing and itching of the left eye, with the left cheek ede-

matous and erythematous. After unsuccessful treatment with clarithromycin, a successful course of amoxicillin/clavulanate (Augmentin<sup>®</sup>) 800 mg tablets twice daily for 14 days was used. Approximately 2 weeks after finishing the second antibiotic treatment, she developed severe abdominal cramping, frequent watery stool, and frank rectal bleeding. The severe pain and bleeding prompted her to go to the emergency department of a local hospital, where she was found to have a high WBC count ( $25.8 \times 10^9$ ) and a fever (102.2°F). She continued to pass large amounts of bright red blood. Mrs. M. received intravenous fluids and her hydration level improved. During a subsequent colonoscopy, the patient hemorrhaged and lost consciousness. Fluid resuscitation with intravenous fluids succeeded in increasing her blood pressure and stabilizing the patient. Although the initial diagnosis was colitis, within 1 day of hospitalization the diagnosis was changed to *C. difficile* colitis. Treatment was changed to oral metronidazole 500 mg three times per day for 10 days. She was discharged home with a prescription for a 14-day regimen of oral antibiotics and a referral for home care services.

### **Case Study 2: Immunosuppressed Patient with Recurring *C-difficile* Infection**

Mr. L., age 31, is in his last phase of chemotherapy for Hodgkin's lymphoma. He lives alone at home. Mr. L. was treated recently with clindamycin 300 mg by mouth four times daily for 10 days for a severe bacterial infection after dental surgery. Within 7 days of completing the antibiotic, he developed a low-grade fever (99.9°F) with mild abdominal cramping and tenderness, and mild diarrhea three to four times per day. Symptoms worsened until he saw his physician, who diagnosed *C-difficile* colitis related to the prior antibiotic therapy. The patient was treated with metronidazole 250 mg four times daily for 14 days, a regimen that appeared successful in treating the disease. Approximately 2 weeks after finishing the antibiotics, Mr. L.'s symptoms resumed with more



severity. He was restarted on metronidazole and a home care nursing referral was initiated. At the first visit, the visiting nurse found evidence Mr. L. may have become re-infected with *C. difficile* spores in his home due to unclean bathroom surfaces, improper handwashing, and soiled linens. Nursing care included teaching about the possibility of re-infection, and home health aide and homemaking services were initiated to assist the patient with personal care needs until the infection was gone.

### Case Study 3: Long-Term Care Facility Resident with UTI and Co-Morbidities

Mrs. R., a 94-year-old resident of a long-term care facility, was admitted to a local hospital 3 months ago following a hip fracture. Her medical history includes heart failure, hypertension, osteoarthritis, osteoporosis, left mastectomy, and recent wrist fracture. She has had recurrent urinary tract infections (UTIs) over the last few months, the most recent treated with sulfamethoxazole/trimethoprim (Bactrim®) one tablet twice daily for 7 days. After 6 days of antibiotic therapy, she developed mild diarrhea and a low-grade fever. Because several residents on her unit had been diagnosed with *C. difficile*, a stool culture was obtained with positive results. The antibiotic was discontinued and the patient was monitored for several days. Diarrhea and fever resolved, and no further treatment was indicated for the *C. difficile*. She will continue to be monitored for recurrence of UTI.

### Health Teaching for Patients and Families

Nursing management for patients and their families, whether in a home care or inpatient setting, also involves health teaching. Because *C. difficile* spores can live on dry surfaces for long periods of time, teaching must include the importance of cleaning surfaces and washing hands appropriately (CDC, 2005). In the home, this teaching also includes wiping surfaces with a hypochlorite-based solution (CDC, 2005; Oriola, 2006). Hand hygiene must be stressed not only with patients, families, and other visitors, but also with anyone entering patients' residential

areas. All involved individuals should be reminded that alcohol-based hand cleansers are not effective against *C. difficile*; proper hand hygiene thus includes use of soap and water (CDC, 2005). Soiled linens and personal articles should not come into direct contact with hands or surfaces to avoid the spread of the bacteria and the spores that exist with *C. difficile* (Oriola, 2006).

Teaching for patients and families should include a list of signs and symptoms to be reported immediately to a health care provider, such as increased abdominal discomfort, cramping, mild-to-moderate non-bloody diarrhea with mild disease; or profuse diarrhea, abdominal pain, nausea, and fever with more severe disease. Additionally, they should be aware of any prior *C. difficile* infection and the possibility of recurrent or worsening infection, though it is difficult to diagnose whether or not it is a relapse or a new infection (Sunenshine & McDonald, 2006). Teaching about antibiotic use is critical to ensure patients take the full dose for the prescribed number of days to avoid recurrence of disease and development of possible resistant bacterial strains.

### Conclusion

The most common treatment regimen for *C. difficile* infection has been discussed, including discontinuing current antibiotic therapy when indicated, prescribing a *C. difficile*-sensitive antibiotic, and managing possible complications of CDAD. Nurses are in a unique position to manage patients with *C. difficile* infection, prevent complications, and provide health teaching for patients and families. Nursing interventions can help to expedite treatment and improve resolution of this high-frequency patient problem. ■

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