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International Foundation for Gastrointestinal Disorders (www.iffgd.org)

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Clostridioides difficile or *C. difficile* is the major cause of infectious colitis and diarrhea in healthcare settings around the world. Infectious colitis is redness, swelling, and inflammation of the colon. (It was formerly known as *Clostridium difficile*; however, was renamed as after it was reclassified in 2016.)

The *C. difficile* infection is able to grow within the gastrointestinal (GI) system. The bacteria and its spores resist heat, acid and antibiotics. For most people infected by CDI, symptoms will begin in 2-3 days. In some cases, CDI may take greater than one week and up to 28 days to become symptomatic. Some patients can have the bug inside and not

How common is *C. difficile* infection (CDI)?

According to the Centers for Disease Control and Prevention (CDC), almost half a million of cases of CDI occurred in 2011 in the United States. It is the most common hospital-acquired infection in the U.S. and is occurring more often each year. Recently, it has been found that about a third 35% of CDI cases occur in the community, rather than in the hospital.

The number of children diagnosed with CDI has also steadily risen in since 2000. A research study conducted between 1991 and 2009 showed a rise in the number of pediatric CDI cases from 2.6 to 32.6 per 100,000 children.

In 2011, CDI caused nearly 29,000 deaths. Most of them occurred in adults over 65 years of age. The overall mortality of CDI is 2-6%. In older adults admitted to intensive care units (ICU) and those with inflammatory bowel disease (IBD) the rate tends to be 15% or more. It has been estimated that healthcare costs related to CDI range from \$1.9 to 7 billion USD each year. CDI prolongs hospital stays by 2.8 to 10.4 days. This raises hospital stay costs at over \$42,000 per admission.

How does CDI spread?

CDI is most often spread from one person to another from direct exposure to the bacteria. In the environment this is often due to personal hygiene, specifically lack of hand washing. CDI spreads from the stool in one patient and ingested by the mouth of another. This type of spread is termed 'fecal-oral'. Thorough hand washing with soap and water is important as hand sanitizers cannot kill CDI.

be aware or have any symptoms. This is referred to as being 'colonized' by the bacteria. CDI secretes several toxins, or poisonous substances in the colon (large intestine). These toxins cause inflammation in the GI tract and diarrhea.

What are Risk Factors to getting CDI?

The main risk factor for CDI is exposure to the bacteria and use of antibiotics. Exposure most often occurs in a hospital setting. Antibiotics are given to treat a specific infection in a person. In addition to this, these drugs also suppress the normal gut bacteria. A healthy and diverse number of gut bacteria is necessary for health. Suppressing healthy bacteria allows *C. difficile* to grow and colonize the large intestine. Even after stopping

antibiotics, the risk for CDI remains for up to one month. There is even a risk of CDI with a single dose of any antibiotic. Long-term treatment or taking multiple antibiotics at a time can further increase the risk for CDI. Age is also an important factor in CDI risk. This may be related to a higher chance of having other medical conditions and longer hospital stays.

Risk Factors which can lead to worse outcomes associated with CDI may include:

- cancer chemotherapy
- severe illness of any kind
- stomach (gastric) acid suppression
- small bowel obstruction
- GI surgery

The Centers for Disease Control and Prevention (CDC) is a national public health institute in the United States. It is a United States federal agency, under the Department of Health and Human Services, and is headquartered in Atlanta, Georgia.

CDC's Role

- Detecting and responding to new and emerging health threats
- Tackling the biggest health problems causing death and disability for Americans
- Putting science and advanced technology into action to prevent disease
- Promoting healthy and safe behaviors, communities, and environment
- Developing leaders and training the public health workforce, including disease detectives
- Taking the health pulse of our nation

- tube feedings
- obesity
- IBD
- solid organ transplant
- cirrhosis of the liver (live scarring and damage)
- recent or soon to occur childbirth
- chronic kidney disease

Risk factors for dying from CDI may include

- older age
- acute renal failure (occurs when the kidneys are suddenly unable to filter blood)
- presence of other medical illnesses
- infection by ribotype 027 (most infectious CDI)

Risk factors for CDI in children are similar to those in adults.

Some of them include

- recent antibiotic exposure
- recent hospital stay
- presence of feeding tubes
- malignancy – cancerous cells that have spread
- solid organ transplant
- IBD

Recurrence

CDI recurrence is the reappearance of symptoms within eight weeks after treatment ends after initial improvement.

It is estimated that between 13 and 50% of patients with CDI will have at least one recurrence. This is often the result of a failure to kill all the spores, rather than a new infection.

Clinical Features of CDI

CDI has a wide range of clinical features, from asymptomatic colonization to life-threatening infection. According to the Infectious Diseases Society of America (IDSA) along with the Society for Healthcare Epidemiology of America (SHEA) the first case of CDI should be classified as non-severe, severe, or fulminant CDI.

Non-Severe CDI - The most common form of CDI seen is either mild colitis, or simple diarrhea. This diarrhea is watery and contains mucus but generally not blood. A sigmoidoscopy usually shows normal tissue in the colon. This test involves placing an endoscope through the anus and into the last part of the colon. An endoscope is a long flexible tube with a camera and light on the end. The camera allows your healthcare provider to see inside your GI tract during the test. With non-severe CDI, diarrhea may resolve by simply stopping the antibiotics. In others, a healthcare provider will prescribe antibiotic pills.

Severe CDI - Severe colitis is often present with a case of severe CDI or full-blown *C. difficile*-associated colitis. Severe CDI occurs when the patient has very bad diarrhea and possible dehydration as well as abnormal lab tests and/or X-rays. Sometimes, 'plaques' (pseudomembranes) can be seen with a camera during sigmoidoscopy in the lower colon. These plaques can also imply a severe case of CDI.

Fulminant CDI - This is the most serious type of CDI and is often seen with very serious complications. This can be life-threatening and occurs in 3% of patients. Most of those affected by this type are elderly and/or debilitated from other diseases. Patients with this form of the disease feel severe

lower abdominal pain, diarrhea, high fever with chills, and rapid heartbeat.

They usually have markedly abnormal blood tests and can have low blood pressure.

Diagnosis in Adults

Generally, testing for CDI should be done in any patient who has new unexplained diarrhea. This is defined as three or more unformed bowel movements a day without the use of laxatives. Currently there are many laboratory testing options for detecting the presence of *C. difficile* in a patient's stool. These tests usually check for presence of toxin or genes from the bacteria, rather than culturing the bacteria itself. In fact, the name 'difficile' was applied as the bacteria is quite difficult to culture.

Diagnosis in Children

For children, diagnostic testing recommendations are based on age.

- Children younger than 12 months of age should not be tested. *C. diff* can be a normal finding in newborns and not cause illness
- Children older than 12 months may be tested if they have prolonged diarrhea, have other risk factors (e.g. IBD, cystic fibrosis, malignancy) and other causes of diarrhea have been ruled out.
- Children older than 3 years, diagnostic recommendations are the same as adults. It is recommended to test for other possible causes of the diarrhea at the same time. This includes viral infections or other conditions.

Treatment

The primary treatment for *C. difficile* is an antibiotic that kills the bacteria itself. The choice of antibiotics depends on the severity and recurrence status of the infection. Sometimes, if symptoms are severe, antibiotic use before test results are available. Supportive care, and close monitoring in a hospital setting is necessary for severe cases.

In some cases of recurrent disease, Fecal Microbiota Transplant (FMT) may be recommended. With FMT, stool from a healthy donor is placed in the patient in an effort to add more of the 'good' bacteria. This can be highly effective in difficult cases. Surgery may be needed in a small subset of patients with toxic megacolon, colonic perforation, or necrotizing colitis.

Prevention

Prevention strategies should be used in every suspected case, not only in confirmed patients. These include proper use of personal protective equipment (PPE). Gloves and disposable gowns should be used by anyone in contact with the patient during the duration of symptoms.

- Proper hand washing by the patient and anyone in contact with him/her. (Note: alcohol-based hand sanitizer does not kill *C. difficile* well, but soap and water work very well on our hands, and bleach works well in the environment)
- Patients with CDI should be isolated in single rooms. These rooms should be cleaned with chlorine-based solutions.

- In the community, patients with CDI should wash their hands with water and soap often. This includes after using the bathroom, before eating or preparing food, and when hands are visibly dirty.
- Patients with CDI should avoid sharing toilets with other family members when possible.
- Bathrooms should be sanitized with bleach-containing cleaners.

Note: All of these measures seek to prevent spreading the infection. The best prevention of all is to avoid getting the infection, largely by 'antibiotic restraint' (ie only using when clearly required).

About IFFGD

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