

**CONSUMERS UNION POLICY BRIEF
HOSPITAL-ACQUIRED *C. DIFFICILE* INFECTIONS (CDI)
11-08**

The growth of infections caused by *Clostridium difficile* (*C.diff*) is a highly alarming trend in hospitals today. In 1993 an estimated 86,000 patients were discharged from hospitals with *C. diff* infections. By 2005 there were more than 300,000 CDI hospital discharges.¹ Death from CDI has doubled in the past few years as one strain of *Clostridium difficile* has developed antibiotic resistance and evolved greater toxicity.² A large-scale national prevalence study in 2008 revealed the CDI rate was 6.5 to 20 times greater than previous estimates.³

Poor sanitary conditions and inadequate infection control in hospitals and healthcare settings are the cause of *C.diff* infection and must be addressed to halt its growth. The bacteria *C. diff* is found on surfaces throughout hospitals and nursing homes. During antibiotic therapy, beneficial bacteria in the colon are killed off but *C. diff* survives and multiplies. The bacteria release toxins that cause inflammation and damage the mucosal lining of the colon leading to severe diarrhea. Serious infections can result in colitis, sepsis and death.⁴

Elderly patients, patients with severe underlying illness and patients undergoing immunosuppressive therapy are at higher risk for becoming infected since their immune response to the bacteria and its toxins is diminished. But the picture is changing with the emergence of a new strain that strikes patients who do not fit this description.

INFECTION RATES AND MORTALITY HAVE SPIKED

C. diff infections (CDI) are not nationally reportable in the U.S. so published rates may underestimate the true prevalence of the disease. However, numerous reports of individual epidemics as well as national data document the rising frequency and severity of CDI. According to data from the National Hospital Discharge Survey and the National Inpatient Sample, the number of cases tripled between 1993 and 2005 and has been growing at an increasing rate, more than doubling in just four years between 2001 and 2005.^{1,5} While reporting on a state-wide level is just beginning, Pennsylvania reported a tripling of CDI hospitalizations between 1995 and 2005.⁶ This enormous growth rate of CDI resulted in 301,200 cases nationwide in 2005.

In 2008 the Association of Professionals in Infection Control and Epidemiologists (APIC) conducted the first large scale national prevalence survey which estimated that 13

out of every 1000 hospital patients - approximately 7178 patients – on any one given day were infected or colonized with *C.diff* (94% were infected).³

As infection rates have increased, so have mortality rates. According to data from death records and the National Inpatient Sample, fatality rates rose from 1.2% in 2000 to 2.2% in 2004, indicating this infection is becoming more dangerous and deadly.² The APIC study estimated between 165 and 438 patients die from CDI every day.³

The rise in *C. diff* infections has taken a disproportionate toll on the elderly. In 2000, the rate of hospital discharges with CDI for patients over the age of 65 was more than four times higher than the next youngest age group. By 2003 it was more than seven times higher.

EXPOSURE TO *C. DIFF* OCCURS IN HEALTHCARE FACILITIES

A North Carolina study found around 80% of patients who become infected pick up the bug in a healthcare facility, usually a hospital or a nursing home.⁷ APIC's 2008 national prevalence study found that 73% of CDIs were health care acquired. The risk of becoming infected has been reported as 1,300 times greater in acute care hospitals than outside of healthcare facilities.⁸ One study found that the risk of becoming colonized by *C. diff* bacteria was directly related to the length of a hospital stay, ranging from a 10% chance for a stay between 1 and 2 weeks to a 50% chance for a stay greater than 4 weeks in duration.⁹ *C. diff* occurs naturally in only 3% of healthy adults.¹⁰

In order to cause symptoms *C. diff* bacteria or spores must be ingested. The bacteria and the spores that it forms are initially released into the environment from an infected patient's feces. The bacteria's spores can last in the environment for weeks to months. Studies have found *C. diff* contamination of almost all objects in the hospital environment, ranging from stethoscopes and blood pressure cuffs to mops.¹¹

Healthcare workers and patients spread the bacteria through contact with hospital surfaces and each other. Ironically, it is healthcare workers that are thought to be responsible for spreading most of the germs. And when hospital patients touch anything in their rooms and then touch their mouths, *C. diff* can easily enter their bodies.

In one study, *C. diff* was been found on the hands of nearly 60% of doctors and nurses caring for infected patients.¹² The same study found that 20% of people entering the hospital without the bacteria were exposed to the bacteria during their stay. While most people who are colonized will not experience a full-blown infection, hospital patients are at significant risk.

ANTIBIOTICS AND GASTRIC ACID SUPPRESSION PROMOTE *C. DIFF* INFECTIONS

Being on antibiotics is the greatest risk factor for CDI since some of the most commonly used antibiotics kill the normal bacteria of the colon but allow *C. diff* to grow. Cephalosporins, clindamycin, ampicillin and amoxicillin are antibiotics frequently

associated with developing *C. diff* infections.¹³ The current epidemic *C. diff* strain, BI/NAP1, is also resistant to a class of antibiotics known as fluoroquinolones. Doctors over-prescribing antibiotics contribute to large numbers of avoidable CDI as well as increased antibiotic resistance in *C. diff*. According to the CDC, up to one third of physician prescriptions for antibiotics in the U.S. may be unnecessary.¹⁴

The use of gastric acid suppression medications is also a risk factor for *C. diff* infection. The use of proton pump inhibitors such as Nexium, Prilosec and Prevacid is associated with three times the risk of CDI. The use of H₂-receptor agonists, another class of gastric acid suppressants, which includes Zantac and Pepcid, is associated with twice the risk of CDI. These acid suppressants may make it easier for *C. diff* to survive in the digestive tract.¹⁵ Like antibiotics, the overuse of these gastric acid suppression medications in hospitals has been documented. One study found that almost half of hospitalized patients taking these medications may be taking them unnecessarily.¹⁶

Major financial incentives for pharmaceutical companies to market these drugs are behind this dangerous trend. Direct-to-consumer advertisement was responsible for 12% of the increase in prescription drug sales in 2000, and proton pump inhibitors like Nexium and Prilosec were among the most heavily advertised.¹⁷

***C. DIFF* INFECTIONS CAUSE MAJOR HEALTH CONSEQUENCES AND ECONOMIC COSTS**

The standard treatment for *C. diff* infection is to stop administering the antibiotics that made the patient more susceptible and treat the patient with alternative antibiotics, such as metronidazole or vancomycin. This prevents further complications in the vast majority of cases. However, as is true in an increasing number of cases due to the more virulent strain, *C. diff* infections can become extremely serious. Pseudomembrane colitis and sepsis result directly from the bacteria and the severe diarrhea that this disease is known for can cause dehydration and change electrolyte balance in the blood enough to cause renal failure or heart attack.¹⁸

As a whole, patients with *C. diff* infections have around 4.5 times the average death rate, are sicker and have more complex cases than patients without the disease. Over the period from 1993 to 2005, forty-six percent of people with CDI were at major or extreme risk of death, compared to 11.9% of all hospital patients. Infected patients also had hospital stays that averaged 13 days, as compared to 5 days for patients as a whole.

Another consequence of *C. diff* infections are their potential for recurrence. One study in Massachusetts Hospitals found that 14% of patients who survive the disease had one or more readmissions for *C. diff* infections within the following two years.¹⁹ A 2008 national study found that about half of CDI patients were infected when admitted; however, 73% were health care acquired infections.³ Recurrence of the disease adds to the suffering of patients and increases the costs of treatment. This tendency to recur highlights the importance prevention plays in stopping the spread of *C. diff* infections.

The economic costs of *C. diff* are major. CDI costs as much as \$12,000 to treat as a primary diagnosis and can add up to \$13,700 to the cost of a hospital stay when it is a secondary diagnosis. Studies have estimated the national cost of *C. diff* treatment to be between \$1 billion and \$3.2 billion, conservatively.^{19, 20} The 2008 APIC study estimated the daily cost of CDI ranges between \$17.6 million and \$51.5 million.³ These figures do not take into account health care costs outside of the hospital or nursing home, lost productivity, pain and suffering of patients or the time that medical professionals must spend treating them.

HOSPITALS CAN PREVENT *C. DIFF* INFECTIONS

Several studies show that hospitals that make an active effort to reduce *C. diff* infections can achieve strong results. Staff education, improved environmental cleaning, improved isolation of CDI patients and more cautious use of antibiotics have all proven to be effective in significantly reducing the rate of CDI. In St. Louis, MO during 2002, an intervention that used many of these strategies together decreased the rate of *C. diff* infections by 50% in just two months.²¹ The problem is that in most hospitals these strategies are employed only in response to *C. diff* epidemics and are not used consistently to prevent infections in the first place.

The most basic way to prevent CDI is to keep patients from being colonized by *C. diff*. The CDC's *Guidelines for Infection Control in Health Care Facilities* places hand hygiene first in its list of strategies to combat infections from *C. diff* and similar pathogens.²² Unfortunately, studies have documented hand washing compliance among doctors in as few as 18% of cases and among nurses in less than half of cases.²³ While the introduction of alcohol-based hand rubs has improved hygiene practices in many hospitals, these cannot help in the case of *C. diff*, where hand washing must be done with soap and water. Since the bacteria's spores can survive the alcohol disinfectant, health care workers who may have been exposed to *C. diff* must wash their hands with soap and water for at least 15 seconds to prevent the spread of this bug.^{24, 25}

Improved cleanliness in hospital wards is also necessary to limit the spread of *C. diff*. Use of a hypochlorite (bleach) cleaning solution is the most effective way to eliminate the bacteria. Hospitals that have stepped up efforts to more thoroughly clean hospital wards have effectively controlled the spread of *C. diff*.²⁶ However, reports show that hospital cleaning budgets are being cut every year and that these reduced numbers of cleaning staff are often inadequately trained.²⁷

Antibiotic regulation within hospitals has proven effective in responding to *C. diff*. The restriction of use of the antibiotic clindamycin following an outbreak in one Virginia hospital resulted in a 70% reduction in CDIs. Using this strategy, the hospital recorded a net savings of around \$150,000 per year from 1994 to 1996 from avoided CDIs.²⁸ Restriction of the use of fluoroquinolones and cephalosporins in response to the epidemic BI/NAP1 strain of *C. diff* may also be an important aspect of infection control. [see later discussion]

Probiotic therapy is another measure that may reduce rates of *C. diff* infections in hospitals. The treatment involves the addition of beneficial bacteria to the diets of patients undergoing antibiotic therapy. The introduced bacteria replace natural bacteria that would otherwise counteract *C. diff* by competing for resources in the colon. Probiotics have been associated with diminished rates of CDI and reduced costs associated with treatment of these infections.²⁹ One study found that probiotic treatment using *Lactbacillus* and *Bifidobacterium* resulted in half the occurrence of CDI when compared to a placebo.³⁰ Vaccination and antibody therapy to neutralize toxins are also possible future therapeutic options.³¹

C. DIFF INCREASINGLY THREATENS NEW POPULATIONS

The rise of community-acquired *C. diff* infections is an alarming trend that may be related to the rise of CDI in hospitals. A study of *C. diff* in Massachusetts documented a five-fold increase in the percentage of community-acquired cases since the 1970s. Data from North Carolina found that 20% of 2005 cases were the result of *C. diff* acquired in the community. While this categorization may have involved transmission from a household member who was exposed to *C. diff* in a healthcare setting, it also applies to cases where the patient was not admitted to a healthcare facility with 4 months of a *C. diff* infection diagnosis.

Community-acquired *C. diff* is also striking younger and healthier patients. In a 2006 Connecticut study 88% of hospitals in the state reported at least one case of community-acquired *C. diff* infection. Across the state 25% of community-acquired cases involved patients who had no underlying conditions that would make them susceptible.³²

In addition to community-acquired infections, reports of infections in pregnant women have been rising. Case reports include the death from *C. diff* infection of one 31-year-old woman who was 14 weeks pregnant with twins. She had received antibiotic therapy three months earlier for a urinary tract infection.³³

CDI IS BECOMING AN EPIDEMIC SUPERBUG

In 2005, CDC researchers documented the presence of a strain of *C. diff* that was found in hospitals from six states. This strain, known as BI/NAP1, was also found to be resistant to fluoroquinolones, unlike other *C. diff* strains. BI/NAP1 also produces about twenty times as much of each of the two main toxins of *C. diff* as well as an additional toxin.³⁴ Since *C. diff* toxins are the mechanism by which it damages the lining of the colon and causes sepsis, a 20-fold increase in the amount of toxin produced leads to significantly more damage to patients. As of October 2008, the more toxic strain has been documented in 40 states in the U.S.³⁵

The BI/NAP1 epidemic may have arisen because of the overuse of fluoroquinolones in hospital settings since the use of these antibiotics would selectively favor the growth and spread of this strain. The strain was found to be at fault in an epidemic in Quebec during the first half of 2004 that killed 118 and infected more than 1,700 patients.³⁶ The strain,

which Europeans refer to as PCR ribotype 027, has been responsible for epidemics throughout Western Europe and has been isolated in several Eastern European countries.³⁷

MEDICARE AND STATES ARE TARGETING *C. DIFF*

In June 2008, the Centers for Medicare and Medicaid Services (CMS) proposed to add *C. diff* infections to the list of preventable hospital acquired conditions for which Medicare will not compensate hospitals for additional costs of treatment. The federal insurance program's goal was to create a major financial incentive for hospitals to reduce CDI rates.³⁸ However, CMS ultimately decided not to put *C. diff* infections on the list because many commenters claimed there were no evidence-based prevention guidelines and a difficulty distinguishing between infections occurring in the community and in hospitals. CMS indicated it might consider this proposal in the future because of strong support from consumers and health care purchasers.³⁹

C. diff infections are not on the CDC's list of diseases that must be reported nationally but some states are passing legislation to require reporting CDI. A 2008 California law requires hospitals to report *C. diff* infections specifically, as well as the rates of several other hospital-acquired infections.⁴⁰ Twenty-five states have hospital-acquired infection reporting laws, upon which *C. diff* reporting could be built. Consumers Union has issued a summary of state hospital acquired infection laws as of Oct 2008.⁴¹ Mandatory public disclosure of hospital-specific *C. diff* infection rates will allow consumers to see which hospitals offer better protection against CDI and will motivate hospitals to improve their infection control practices in the case of this particularly prevalent infection.

This brief was prepared by Syed Sayeed, Lisa McGiffert and Michael McCauley; November, 2008.

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