

PHC4

Research
Briefs

Clostridium difficile Infections in Pennsylvania Hospitals

Infections caused by *Clostridium difficile* (commonly referred to as *C. diff*) are a growing public health concern. A new strain of the bacterium has emerged that demonstrates resistance to conventional antibiotics and is associated with an increase in the severity of symptoms and cost of treatment. This brief does not distinguish between community-acquired and hospital-acquired infections.

Highlights

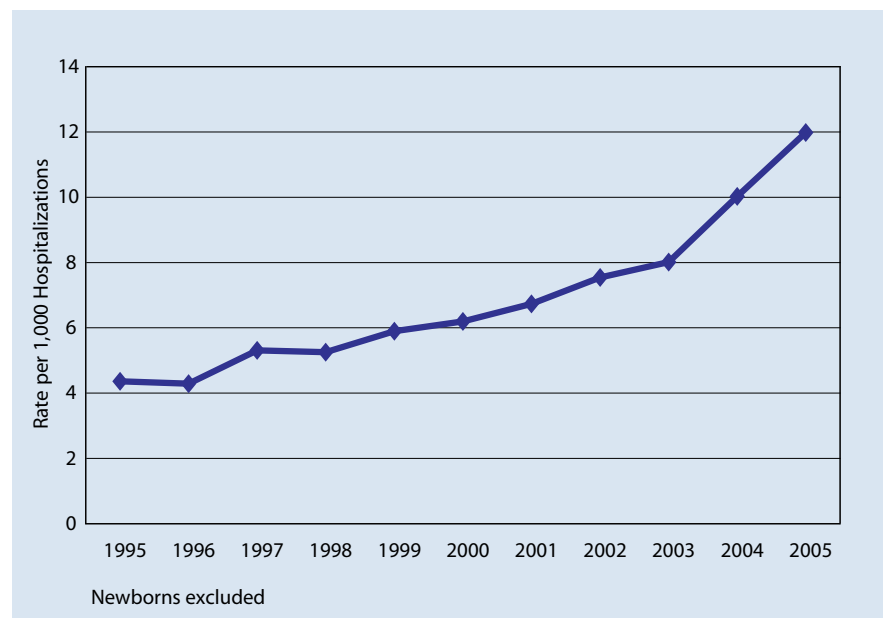
- The number of Pennsylvania hospitalizations for *Clostridium difficile*-associated disease (CDAD) increased from 7,026 in 1995 to 20,941 in 2005.
- The hospitalization rate for CDAD increased by 173%, from 4.4 cases per 1,000 hospitalizations in 1995 to 12.0 per 1,000 hospitalizations in 2005.
- Patients with CDAD were hospitalized two and a half times longer, charged more than twice as much, and were four times as likely to die as patients without CDAD.
- In 2005, Southwestern Pennsylvania had the highest rate of CDAD hospitalizations, while Northeastern Pennsylvania had the lowest rate.

What is *Clostridium difficile*-Associated Disease?

Clostridium difficile (*C. difficile*) is a spore-forming bacterium that can live in the intestine, often causing no symptoms.¹ *Clostridium difficile*-associated disease (CDAD), however, is a potentially life-threatening infection resulting from *C. difficile*.

Treatment with antibiotics can affect the “healthy” bacteria in the intestine, which allows *C. difficile* bacteria to multiply. Therefore, the majority of CDAD cases involve people who have had recent treatment with antibiotics. CDAD can be spread by health care workers who have contact with CDAD patients or by touching surfaces that are contaminated with *C. difficile* spores.

**Pennsylvania Hospitalization Rate for CDAD
1995 to 2005**



Symptoms may appear upon starting antibiotic therapy, or they may take several weeks to develop.² Symptoms include watery diarrhea, bloody diarrhea, fever, nausea, loss of appetite and abdominal pain. The disease caused by *C. difficile* infections can range from mild cases of diarrhea to more severe conditions, such as colitis (a digestive disease characterized by inflammation of the colon), bloodstream infections or death.^{2,3}

CDAD has been increasing in frequency and intensity across Pennsylvania, North America and Europe.^{4,5,6} A new, more virulent strain of *C. difficile*

The mortality rate for CDAD patients increased by 50% from 5.8% in 1995 to 8.7% in 2005.

that produces much higher concentrations of toxins has been identified and may be responsible for the rise in incidence and severity of cases, as well as the increased

mortality rate.⁵ This research brief focuses on CDAD in Pennsylvania's acute care hospitals where the majority of cases are identified and where *C. difficile* spores can be easily transmitted.^{4,7}

CDAD Hospitalizations

In Pennsylvania, the hospitalization rate for CDAD (defined as a hospitalization containing either a principal or secondary diagnosis of a *C. difficile* infection) increased by 173%, from 4.4 cases per 1,000 hospitalizations in 1995 to 12.0 per 1,000 hospitalizations in 2005.

There were 20,941 CDAD hospitalizations in 2005, up from 7,026 in 1995.

The hospitalization rate for CDAD increased by 173% from 1995 to 2005.

Compared to patients without CDAD, patients with CDAD in 2005 stayed in the hospital almost two and a half times longer, were charged more than twice as much, and were four times as likely to die. The mortality rate for CDAD patients increased by 50% from 5.8% in 1995 to 8.7% in 2005.

The table on page 3 shows data for select high-volume, high-cost acute care conditions with and without a *C. difficile* infection. For each condition, the average length of stay and average charge were much higher (1.6 to 2.8 times) when a *C. difficile* infection was present. The likelihood of dying with a specified condition was two to five times greater among CDAD patients.

Hospitalization Summary, 2005

	Number of Hospitalizations	Average Length of Stay in Days	Average Charge	Percent Died
Without CDAD	1,868,087	4.7	\$30,833	2.1
With CDAD	20,941	11.4	\$73,576	8.7

Pennsylvania Hospitalizations By Condition, 2005

	Number of Hospitalizations	Average Length of Stay in Days	Average Charge	Percent Died
CHF w/out CDAD	57,520	5.1	\$25,364	3.1
CHF w/ CDAD	586	10.4	\$53,492	10.8
COPD w/out CDAD	31,026	4.7	\$19,987	1.3
COPD w/ CDAD	244	9.8	\$45,877	6.6
Kidney Failure w/out CDAD	18,457	6.1	\$31,229	6.0
Kidney Failure w/ CDAD	644	9.9	\$51,134	12.1
Pneumonia w/out CDAD	47,958	5.2	\$21,871	3.2
Pneumonia w/ CDAD	815	10.1	\$44,855	7.9
Stroke-Non Hemorrhagic w/out CDAD	20,737	5.3	\$30,666	5.7
Stroke-Non Hemorrhagic w/ CDAD	130	13.1	\$84,816	15.4

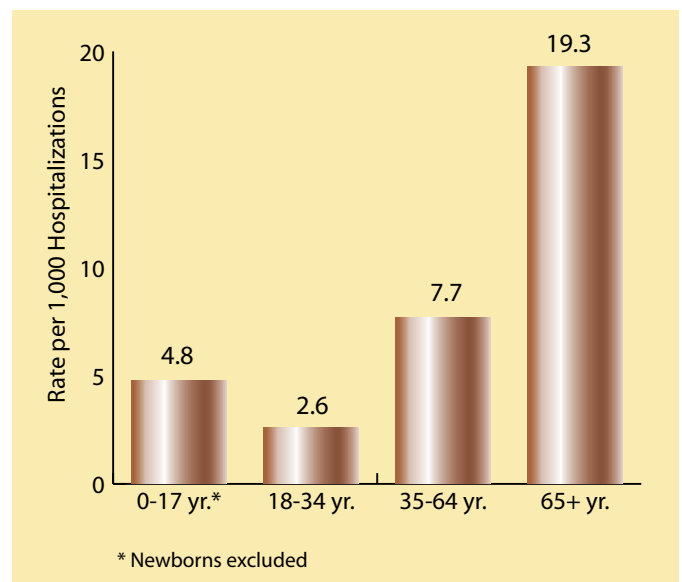
CHF = Congestive Heart Failure

COPD = Chronic Obstructive Pulmonary Disease

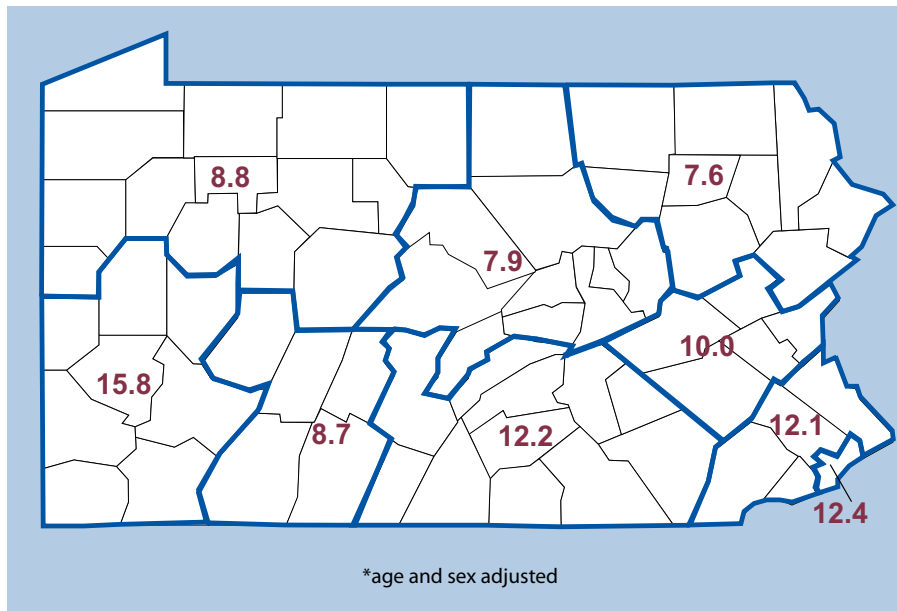
CDAD by Age

In Pennsylvania, age was an important characteristic among CDAD hospitalizations. In 2005, patients aged 65 years and older had the highest rate of CDAD with 19.3 cases per 1,000 hospitalizations. Compared to other age groups, patients aged 65 and older have had the highest rates of CDAD hospitalizations consistently since 1995. The CDAD hospitalization rate for this age group increased 172%, from 7.1 cases per 1,000 hospitalizations in 1995 to 19.3 per 1,000 hospitalizations in 2005. The high rate of CDAD hospitalizations for patients aged 65 and older is consistent with national reports on CDAD hospitalization rates.^{4,7}

Pennsylvania CDAD Hospitalization Rate by Age 2005



CDAD Rate* per 1,000 Hospitalizations by Region, 2005



One simple yet effective way to prevent the spread of *C. difficile* infections in health care settings is proper hand washing with soap and water by anyone who has patient contact. It is worth noting that alcohol-based hand sanitizers may not be effective in killing the spores associated with the transmission of CDAD.³

For more information about issues related to infections, visit PHC4's Web site at www.phc4.org.

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CDAD by Region

There are geographic differences in the rate of CDAD hospitalizations. In 2005, the Southwestern region (Allegheny, Armstrong, Beaver, Butler, Fayette, Greene, Washington and Westmoreland counties) had the highest rate of CDAD with 15.8 cases per 1,000 hospitalizations, while the Northeastern region (Bradford, Lackawanna, Luzerne, Monroe, Pike, Sullivan, Susquehanna, Wayne and Wyoming counties) had the lowest rate with 7.6 per 1,000 hospitalizations.

Prevention

In Pennsylvania, both the incidence of CDAD hospitalizations and the mortality rate for CDAD patients increased from 1995 to 2005. This highlights the need for meticulous infection control practices and enhanced surveillance statewide. The CDC also recommends that individual facilities reassess their compliance with prevention guidelines whenever their rate or severity of CDAD increases.³

References

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2. Kelly, C.P., Pothoulakis, C., LaMont, J.T. *Clostridium difficile* Colitis. *NEJM* 1994; 330 (4): 257-62.
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4. McDonald LC, Owings M, Jernigan DB. *Clostridium difficile* infection in patients discharged from US short-stay hospitals, 1996-2003. *Emerging Infectious Diseases*. 2006; 12(3):409-415.
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6. Archibald LK, Banerjee SN, Jarvis WR. Secular trends in hospital-acquired *Clostridium difficile* disease in the United States, 1987-2001. *The Journal of Infectious Diseases*. 2004; 189:1585-9.
7. Loo VG, Poirer L, Miller MA, et al. A predominantly clonal multi-institutional outbreak of *Clostridium difficile*-associated diarrhea with high morbidity and mortality. *NEJM*. 2005; 353(23):2442-2448.