HEALTHCARE COST AND UTILIZATION PROJECT

Agency for Healthcare Research and Quality

STATISTICAL BRIEF #50

April 2008

Clostridium Difficile-Associated Disease in U.S. Hospitals, 1993–2005

Anne Elixhauser, Ph.D. and Michael Jhung, M.D., M.P.H.

Introduction

Healthcare-associated infections (HAIs) are an important public health problem in the U.S. One type of infection that is primarily regarded as an HAI, is Clostridium difficile-associated disease (CDAD). CDAD describes a broad spectrum of patient illness, ranging from uncomplicated diarrhea in its mildest form, to fulminant sepsis, resulting in colectomy and even death, in its most severe manifestations. CDAD is recognized as an important cause of diarrhea in healthcare facilities where it has been associated with excess lengths of stay and substantial increases in healthcare costs.[1] Transmission to patients occurs primarily via the hands of healthcare personnel or from a contaminated environment. Previous antimicrobial therapy is a well-established risk factor for CDAD and is thought to suppress the normal flora of the colon, allowing growth of Clostridium difficile after exposure occurs. Recent evidence suggests that the epidemiology of CDAD may be changing, resulting in increases in both disease incidence and severity.[2]

This Statistical Brief presents data from the Healthcare Cost and Utilization Project (HCUP) on the trend in CDAD from 1993 to 2005 and provides details on CDAD hospitalizations for 2005. A recent evaluation of surveillance for CDAD in hospitals found high sensitivity (78%) and specificity (99.7%) when using International Classification of Diseases, 9th Revision (ICD-9) codes.[3] Although it is not possible to determine whether these infections originated in a healthcare setting or were community acquired, this report provides information on the national burden of CDAD in hospitalized patients, and describes the types of patients affected, and their associated outcomes in the hospital. All differences between estimates noted in the text are statistically significant at the 0.05 level or better.

Highlights

- The number of hospital discharges with CDAD more than doubled from 2001 to 2005, a trend that was considerably steeper than the prior 8-year period, during which the number of cases increased by 74 percent.
- CDAD primarily affects elderly patients—over two-thirds of patients with CDAD were 65 years and older.
- The rate of CDAD infection in the Northeastern U.S. was higher than any other region—144 CDAD hospital stays per 100,000 population. The Northeastern rate was two times higher than in the West, which had the lowest rate. The rates in the Midwest and South were 69 percent and 42 percent higher than the Western rate, respectively.
- CDAD patients were considerably sicker and CDAD cases were more complex than the average inpatient on every measure. CDAD patients had lengths of stay that were nearly three times higher than average. Their death rate in the hospital was about 4.5 times higher than average.
- Less than one half of one percent of all CDAD patients received subtotal colectomy (treatment for bowel perforation and peritonitis resulting from fulminant CDAD)—about 1,100 patients in 2005.

[1]Dubberke ER, Reske KA, Olsen MA, McDonald LC, Fraser VJ. Short- and long-term attributable costs of Clostridium difficile-associated disease in nonsurgical inpatients. Clin Infect Dis. 2008 Feb 15; 46(4):497-504.

[2]McDonald LC, Killgore GE, Thompson A, Owens RC, Jr., Kazakova SV, Sambol SP, et al. An epidemic, toxin gene-variant strain of *Clostridium difficile*. N Engl J Med. 2005 Dec 8; 353(23):2433-41.

[3] Dubberke ER, Reske KA, McDonald LC, Fraser VJ. ICD-9 codes and surveillance for *Clostridium difficile*-associated disease. Emerg Infect Dis. 2006 Oct; 12(10):1576-9.

Findings

Figure 1 shows the trend in CDAD from 1993 through 2005. During the 8-year period from 1993 until 2001, the total number of hospital discharges with CDAD increased from approximately 85,700 to 148,900 per year—a 74 percent increase. However, during the following 4-year period from 2001 to 2005, the rate of increase for CDAD escalated, when the numbers of cases more than doubled to 301,200 (a 102 percent increase in 4 years). In most cases CDAD was a secondary diagnosis, particularly in the later years. There were a total of 2,037,900 hospital discharges with CDAD during this 12 year period.[4]

Figure 2 shows the number of CDAD discharges per 10,000 hospital discharges from 1993 through 2005. The findings are similar. From 1993 to 2001, the rate of CDAD per 10,000 discharges increased by 60 percent while the rate of increase from 2001 to 2005 was considerably steeper—92 percent. Thus the recent sharp rise in CDAD was not attributable solely to an increase in the number of hospital discharges.

Demographic characteristics of discharges with CDAD

Table 1 provides detailed information on discharges with CDAD. In 2005, about one-quarter of cases with CDAD were in the hospital with CDAD as a principal diagnosis while the majority of cases had this infection as a secondary diagnosis. CDAD was predominantly a condition afflicting elderly patients, regardless of whether it was a principal or secondary diagnosis. The average age of CDAD patients was 68.3 years. (About 49 percent of CDAD patients were 65-84 years and 19 percent were 85 years or older—thus about two-thirds of CDAD patients were over 65 years.) The distribution by primary expected payer was consistent with the age distribution with most hospital stays covered by Medicare. Overall, 58.5 percent of discharges with CDAD were female, although females made up a larger proportion of cases with CDAD as a principal diagnosis (64.5 percent).

Figure 3 reveals substantial differences across regions of the U.S. in the CDAD rate. The Northeast had the highest rates (regardless of whether the denominator was the region's population or hospital discharges), followed by the Midwest, the South, and the West. The Northeastern rate of CDAD cases in the hospital per 100,000 population was more than twice as high as in the West (144 versus 67 per 100,000). The rate in the Midwest (113 per 100,000) was about 67 percent higher and the Southern rate was about 42 percent higher (95 per 100,000) than in the West. Comparable, though smaller differences were found when looking at the number of CDAD cases per 10,000 discharges.

Complexity of cases with CDAD

Over 60 percent of cases with CDAD entered the hospital through the emergency room and as emergency admissions—considerably higher than for all inpatients (Table 1). Patients with CDAD stayed in the hospital an average of 12.9 days and 9.5 percent died during their stay. However, patients with secondary CDAD had longer hospitalizations on average (14.8 days) and a larger proportion died (11.3 percent). In total, among all discharges with a diagnosis of CDAD, there were 28,600 deaths in 2005. Among only those discharges with a principal diagnosis of CDAD, there were 3,100 deaths.

CDAD patients are more complex than the average inpatient on every measure. The number of diagnoses provides an indication of the complexity of the cases—on average, CDAD cases had over 10 diagnoses compared with 6 diagnoses for cases without CDAD. Compared with all patients, those with CDAD had twice as many comorbidities. In addition, severity of illness (measured using All Patient Refined Diagnosis Related Groups (APR-DRGs)) for CDAD patients was considerably higher than for patients overall. About three-fourths of CDAD patients had major or extreme loss of function, compared with only about 1 in 5 of all hospitalizations. Similarly, 46.4 percent of CDAD patients were at major or extreme risk of dying, compared with 11.9 percent of all hospitalized patients.

Table 2 lists the most common principal diagnoses among patients with CDAD as a secondary diagnosis. These top 20 conditions comprised about two-thirds of all cases with a secondary diagnosis of CDAD. Four of these conditions were infections (sepsis, pneumonia, urinary tract infection, and skin infection). Many of the other conditions were serious, debilitating diseases that reflect the high severity of illness of CDAD patients (e.g., renal failure, congestive heart failure, respiratory failure, and acute myocardial infarction).

[4] An earlier paper (Ricciardi R, Rothenberger DA, Madoff RD, Baxter NN. Increasing prevalence and severity of Clostridium difficile colitis in hospitalized patients in the United States. Arch Surg. 2007 July; 142(7): 624-631) reported similar discharge rates for CDAD but the absolute numbers were considerably lower than the numbers of cases reported here. It appears that the numbers of discharges reported by Ricciardi et al. were unweighted as they were approximately one-fifth the number reported here.

Surgical treatment of cases with CDAD
In 2005, approximately 1,100 cases with CDAD received a subtotal colectomy (removal of the cecum, colon and sigmoid)—the standard surgical treatment for fulminant, complicated infection—representing less than half a percent of all patients hospitalized with CDAD (Table 3). For 35.9 percent of these patients receiving subtotal colectomy, CDAD was a secondary diagnosis. Thus, the majority of CDAD patients undergoing a subtotal colectomy were admitted principally for treatment of the infection.

Measures of mortality, severity and complexity suggest that patients undergoing subtotal colectomy were considerably sicker than CDAD patients without colectomy. The mean length of stay for patients receiving subtotal colectomy was 24.7 days, compared with 12.7 days for those without subtotal colectomy. Almost a third of subtotal colectomy patients died in the hospital (29.9 percent), compared with 9.3 percent among CDAD patients without colectomy. All Patient Refined DRG (APR-DRG) severity and risk of mortality scores were significantly higher for those undergoing subtotal colectomy.

Data Source

The estimates in this Statistical Brief are based on data from HCUP. Historical data were drawn from the 1993-2005 NIS.

Definitions

Diagnoses, ICD-9-CM, and Clinical Classifications Software (CCS)
The principal diagnosis is that condition established after study to be chiefly responsible for the patient's admission to the hospital. Secondary diagnoses are concomitant conditions that coexist at the time of admission or that develop during the stay.

ICD-9-CM is the International Classification of Diseases, Ninth Revision, Clinical Modification, which assigns numeric codes to diagnoses. There are about 12,000 ICD-9-CM diagnosis codes.

CCS categorizes ICD-9-CM diagnoses into 260 clinically meaningful categories.[5] This "clinical grouper" makes it easier to quickly understand patterns of diagnoses and procedures.

Case Definition
Clostridium difficile was defined using ICD-9-CM diagnosis code 008.45, intestinal infection due to Clostridium difficile.
Subtotal colectomy was defined using ICD-9-CM procedure code 45.8, total intra-abdominal colectomy (excision of cecum, colon, and sigmoid).

Types of hospitals included in HCUP
HCUP is based on data from community hospitals, defined as short-term, non-Federal, general and other hospitals, excluding hospital units of other institutions (e.g., prisons). HCUP data include OB-GYN, ENT, orthopedic, cancer, pediatric, public, and academic medical hospitals. They exclude long-term care, rehabilitation, psychiatric, and alcoholism and chemical dependency hospitals, but these types of discharges are included if they are from community hospitals.

Unit of analysis
The unit of analysis is the hospital discharge (i.e., the hospital stay), not a person or patient. This means that a person who is admitted to the hospital multiple times in one year will be counted each time as a separate "discharge" from the hospital.

Payer
Payer is the expected primary payer for the hospital stay. To make coding uniform across all HCUP data sources, payer combines detailed categories into more general groups:
– Medicare includes fee-for-service and managed care Medicare patients.

[5] HCUP CCS. Healthcare Cost and Utilization Project (HCUP). August 2006. U.S. Agency for Healthcare Research and Quality, Rockville, MD. www.hcup-us.ahrq.gov/toolssoftware/ccs/ccs.jsp

– Medicaid includes fee-for-service and managed care Medicaid patients. Patients covered by the State Children's Health Insurance Program (SCHIP) may be included here. Because most state data do not identify SCHIP patients specifically, it is not possible to present this information separately.
– Private insurance includes Blue Cross, commercial carriers, and private HMOs and PPOs.
– Other includes Worker's Compensation, TRICARE/CHAMPUS, CHAMPVA, Title V, and other government programs.
– Uninsured includes an insurance status of "self-pay" and "no charge."

When more than one payer is listed for a hospital discharge, the first-listed payer is used.

Region
Region is one of the four regions defined by the U.S. Census Bureau:
– Northeast: Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, and Pennsylvania
– Midwest: Ohio, Indiana, Illinois, Michigan, Wisconsin, Minnesota, Iowa, Missouri, North Dakota, South Dakota, Nebraska, and Kansas
– South: Delaware, Maryland, District of Columbia, Virginia, West Virginia, North Carolina, South Carolina, Georgia, Florida, Kentucky, Tennessee, Alabama, Mississippi, Arkansas, Louisiana, Oklahoma, and Texas
– West: Montana, Idaho, Wyoming, Colorado, New Mexico, Arizona, Utah, Nevada, Washington, Oregon, California, Alaska, and Hawaii

Admission source
Admission source indicates where the patient was located prior to admission to the hospital. Emergency admission indicates the patient was admitted to the hospital through the emergency department. Admission from another hospital indicates the patient was admitted to this hospital from another short-term, acute-care hospital. This usually signifies that the patient required the transfer in order to obtain more specialized services that the originating hospital could not provide. Admission from long-term care facility indicates the patient was admitted from a long-term care facility such as a nursing home.

Discharge status
Discharge status indicates the disposition of the patient at discharge from the hospital, and includes the following six categories: routine (to home), transfer to another short-term hospital, other transfers (including skilled nursing facility, intermediate care, and another type of facility such as a nursing home), home health care, against medical advice (AMA), or died in the hospital.

Severity of illness
All Patient Refined Diagnosis-Related Groups (APR-DRG) software was applied to the data to measure severity of illness. The APR-DRG classification expands the DRG classification (used for Medicare reimbursement) to be applicable to non-Medicare populations and for uses beyond those related to resource consumption (i.e., for risk of mortality and severity of illness). Each admission is assigned an APR-DRG, a Severity of Illness subclass (minor, moderate, major or extreme loss of function) and a Risk of Mortality subclass (minor, moderate, major, or extreme) within the APR-DRG.

Comorbidities
Comorbidities were measured using software that assigns variables identifying comorbidities in hospital discharge records using the diagnosis coding of ICD-9-CM (International Classification of Diseases, Ninth Edition, Clinical Modifications). These comorbidities were developed to assess a broad array of patients' underlying, pre-existing conditions that are not directly related to the principal diagnosis. The algorithm was developed to predict resource use and mortality in a wide range of conditions.[6] More information on the algorithm and programs can be found at http://www.hcup-us.ahrq.gov/toolssoftware/comorbidity/comorbidity.jsp.

About HCUP

HCUP is a family of powerful health care databases, software tools, and products for advancing research. Sponsored by the Agency for Healthcare Research and Quality (AHRQ), HCUP includes the largest all-

[6] Elixhauser A, Steiner C, Harris R, Coffey RM. Comorbidity measures for use with administrative data. Medical Care, 1998; 36:8-27.

payer encounter-level collection of longitudinal health care data (inpatient, ambulatory surgery, and emergency department) in the United States, beginning in 1988. HCUP is a Federal-State-Industry Partnership that brings together the data collection efforts of many organizations—such as State data organizations, hospital associations, private data organizations, and the Federal government—to create a national information resource.

HCUP would not be possible without the contributions of the following data collection Partners from across the United States:

Arizona Department of Health Services
Arkansas Department of Health & Human Services
California Office of Statewide Health Planning & Development
Colorado Health & Hospital Association
Connecticut Integrated Health Information (Chime, Inc.)
Florida Agency for Health Care Administration
Georgia GHA: An Association of Hospitals & Health Systems
Hawaii Health Information Corporation
Illinois Health Care Cost Containment Council and Department of Public Health
Indiana Hospital & Health Association
Iowa Hospital Association
Kansas Hospital Association
Kentucky Cabinet for Health and Family Services
Maryland Health Services Cost Review Commission
Massachusetts Division of Health Care Finance and Policy
Michigan Health & Hospital Association
Minnesota Hospital Association
Missouri Hospital Industry Data Institute
Nebraska Hospital Association
Nevada Division of Health Care Financing and Policy, Department of Human Resources
New Hampshire Department of Health & Human Services
New Jersey Department of Health & Senior Services
New York State Department of Health
North Carolina Department of Health and Human Services
Ohio Hospital Association
Oklahoma Health Care Information Center for Health Statistics
Oregon Association of Hospitals and Health Systems
Rhode Island Department of Health
South Carolina State Budget & Control Board
South Dakota Association of Healthcare Organizations
Tennessee Hospital Association
Texas Department of State Health Services
Utah Department of Health
Vermont Association of Hospitals and Health Systems
Virginia Health Information
Washington State Department of Health
West Virginia Health Care Authority
Wisconsin Department of Health & Family Services

About the NIS

The HCUP Nationwide Inpatient Sample (NIS) is a nationwide database of hospital inpatient stays. The NIS is nationally representative of all community hospitals (i.e., short-term, non-Federal, non-rehabilitation hospitals). The NIS is a sample of hospitals and includes all patients from each hospital, regardless of payer. It is drawn from a sampling frame that contains hospitals comprising about 90 percent of all discharges in the United States. The vast size of the NIS allows the study of topics at both the national and regional levels for specific subgroups of patients. In addition, NIS data are standardized across years to facilitate ease of use.

About HCUPnet

HCUPnet is an online query system that offers instant access to the largest set of all-payer health care databases that are publicly available. HCUPnet has an easy step-by-step query system, allowing for tables and graphs to be generated on national and regional statistics, as well as trends for community hospitals in the U.S. HCUPnet generates statistics using data from HCUP's Nationwide Inpatient Sample (NIS), the Kids' Inpatient Database (KID), the State Inpatient Databases (SID) and the State Emergency Department Databases (SEDD).

For More Information

For more information about HCUP, visit www.hcup-us.ahrq.gov.

For additional HCUP statistics, visit HCUPnet, our interactive query system, at www.hcup.ahrq.gov.

For information on other hospitalizations in the U.S., download *HCUP Facts and Figures: Statistics on Hospital-based Care in the United States in 2005*, located at http://www.hcup-us.ahrq.gov/reports.jsp.

For a detailed description of HCUP, more information on the design of the NIS, and methods to calculate estimates, please refer to the following publications:

Steiner, C., Elixhauser, A., Schnaier, J. The Healthcare Cost and Utilization Project: An Overview. *Effective Clinical Practice* 5(3):143–51, 2002.

Design of the HCUP Nationwide Inpatient Sample, 2005. Online. June 13, 2007. U.S. Agency for Healthcare Research and Quality. http://www.hcup-us.ahrq.gov/db/nation/nis/reports/NIS_2005_Design_Report.pdf

Houchens, R., Elixhauser, A. *Final Report on Calculating Nationwide Inpatient Sample (NIS) Variances, 2001*. HCUP Methods Series Report #2003-2. Online. June 2005 (revised June 6, 2005). U.S. Agency for Healthcare Research and Quality. http://www.hcup-us.ahrq.gov/reports/CalculatingNISVariances200106092005.pdf

Houchens R.L., Elixhauser A. *Using the HCUP Nationwide Inpatient Sample to Estimate Trends. (Updated for 1988-2004)*. HCUP Methods Series Report #2006-05 Online. August 18, 2006. U.S. Agency for Healthcare Research and Quality. http://www.hcup-us.ahrq.gov/reports/2006_05_NISTrendsReport_1988-2004.pdf

Suggested Citation

Elixhauser, A. (AHRQ), and Jhung, MA. (Centers for Disease Control and Prevention). *Clostridium Difficile-Associated Disease in U.S. Hospitals, 1993–2005*. HCUP Statistical Brief #50. April 2008. Agency for Healthcare Research and Quality, Rockville, MD. http://www.hcup-us.ahrq.gov/reports/statbriefs/sb50.pdf

* * *

AHRQ welcomes questions and comments from readers of this publication who are interested in obtaining more information about access, cost, use, financing, and quality of health care in the United States. We also invite you to tell us how you are using this Statistical Brief and other HCUP data and tools, and to share suggestions on how HCUP products might be enhanced to further meet your needs. Please e-mail us at hcup@ahrq.gov or send a letter to the address below:

Irene Fraser, Ph.D., Director
Center for Delivery, Organization, and Markets
Agency for Healthcare Research and Quality
540 Gaither Road
Rockville, MD 20850

Table 1. Characteristics of hospital discharges with Clostridium difficile-associated disease (CDAD), in U.S. hospitals, 2005

	CDAD			All discharges
	In any diagnosis field	As a principal diagnosis	As a secondary diagnosis	
Number of discharges	301,200	76,400	224,800	
	0.8% of all discharges	25.4% of CDAD discharges	74.6% of CDAD discharges	39,164,000
Age, mean years	68.3	67.8	68.5	47.2
Percentage female	58.5	64.5	56.4	58.7
Expected payer, percentage				
Medicare	70.1	68.2	70.8	37.2
Medicaid	7.7	6.5	8.1	19.5
Privately insured	18.6	22.0	17.5	34.9
Uninsured	1.7	1.6	1.7	5.4
Admission source, percentage				
Emergency dept	61.8	70.0	59.0	42.5
Another hospital	7.6	2.2	9.5	3.5
Long term care	4.7	3.0	5.3	1.4
Emergency admission, percentage	64.5	69.2	62.9	39.0
Length of stay (LOS), mean days	12.9	7.1	14.8	4.6
Percentage died	9.5	4.1	11.3	2.1
Number of diagnoses listed	10.2	8.4	10.8	6.0
Number of comorbidities	2.9	2.9	2.8	1.5
APR-DRG severity of illness, mean score	3.0	2.5	3.3	1.8
Percentage with APR-DRG severity of illness score: major or extreme loss of function	76.9	47.3	86.8	21.8
APR-DRG risk of mortality, mean score	2.5	2.0	2.6	1.5
Percentage with APR-DRG risk of mortality score: major or extreme likelihood of dying	46.4	26.3	53.2	11.9

Source: AHRQ, Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project, Nationwide Inpatient Sample

Table 2. Most common principal diagnoses among discharges with a secondary diagnosis of Clostridium difficile-associated disease in U.S. hospitals, 2005

Condition	Number of discharges	Percentage of all cases with CDAD as a secondary diagnosis
1. Sepsis	28,000	12.5%
2. Pneumonia	15,000	6.7%
3. Rehabilitation care	11,500	5.1%
4. Fluid and electrolyte disorders	10,700	4.8%
5. Acute and unspecified renal failure	8,700	3.9%
6. Congestive heart failure	8,000	3.6%
7. Urinary tract infection	8,000	3.6%
8. Respiratory failure or arrest	7,400	3.3%
9. Complication of device, implant, or graft	6,600	2.9%
10. Aspiration pneumonia	6,000	2.7%
11. Complications of surgical procedures or medical care	5,600	2.5%
12. Acute myocardial infarction	3,600	1.6%
13. Gastrointestinal hemorrhage	3,500	1.6%
14. Chronic obstructive pulmonary disease	3,500	1.6%
15. Intestinal obstruction without hernia	3,300	1.5%
16. Diabetes mellitus with complications	3,200	1.4%
17. Diverticulosis or diverticulitis	3,100	1.4%
18. Acute cerebrovascular disease	3,100	1.4%
19. Cardiac dysrhythmias	2,800	1.2%
20. Skin and subcutaneous infections	2,700	1.2%
Top 20 principal diagnoses	--	64.2%

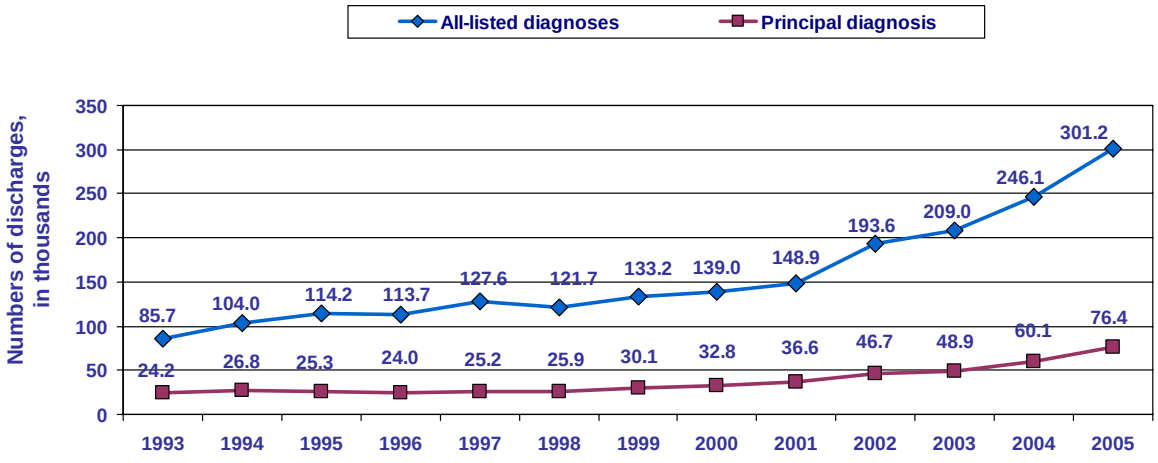
Source: AHRQ, Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project, Nationwide Inpatient Sample

Table 3. Characteristics of hospital discharges with Clostridium difficile-associated disease, by surgical treatment in U.S. hospitals, 2005

	Among CDAD discharges:	
	Subtotal colectomy	**No colectomy**
Number of discharges	1,100	297,200
	0.4% of CDAD discharges	98.7% of CDAD discharges
Age, mean years	67.3	68.3
Percentage female	56.9	58.5
Expected payer, percentage		
Medicare	67.6	70.1
Medicaid	7.8	7.7
Privately insured	21.9	18.6
Admission source, percentage		
Emergency dept	66.2	61.9
Another hospital	8.1	7.7
Long term care	4.5	4.7
Emergency admission, percentage	64.2	64.6
LOS, mean days	24.7	12.7
Percentage died	29.9	9.3
Number of diagnoses listed	11.9	10.2
Number of comorbidities	2.9	2.9
APR-DRG severity of illness, mean score	3.8	3.0
Percentage with APR-DRG severity of illness score: major or extreme loss of function	97.4	76.6
APR-DRG risk of mortality, mean score	3.4	2.4
Percentage with APR-DRG risk of mortality score: major or extreme likelihood of dying	84.1	46.1

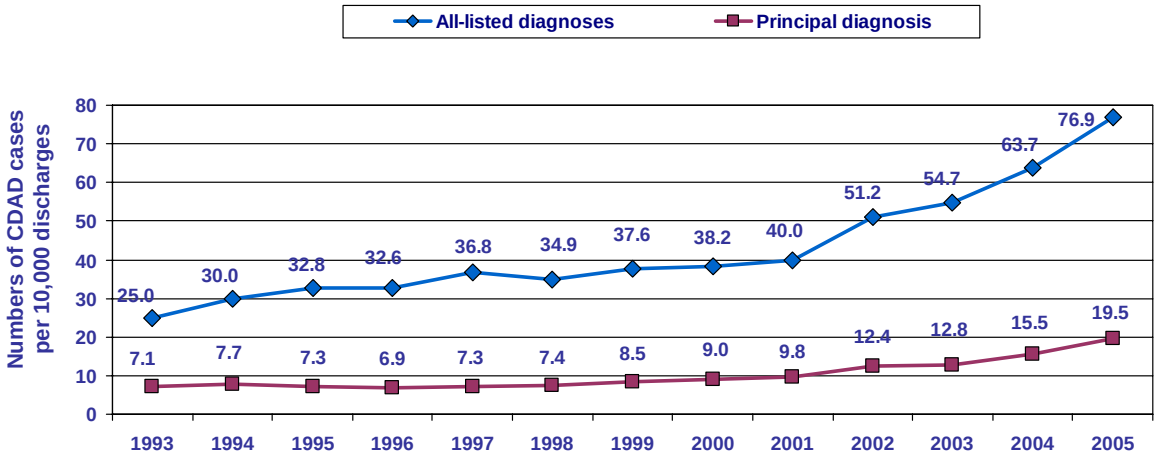
Source: AHRQ, Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project, Nationwide Inpatient Sample

Figure 1. Trends in hospital stays associated with Clostridium difficile-associated disease, 1993-2005



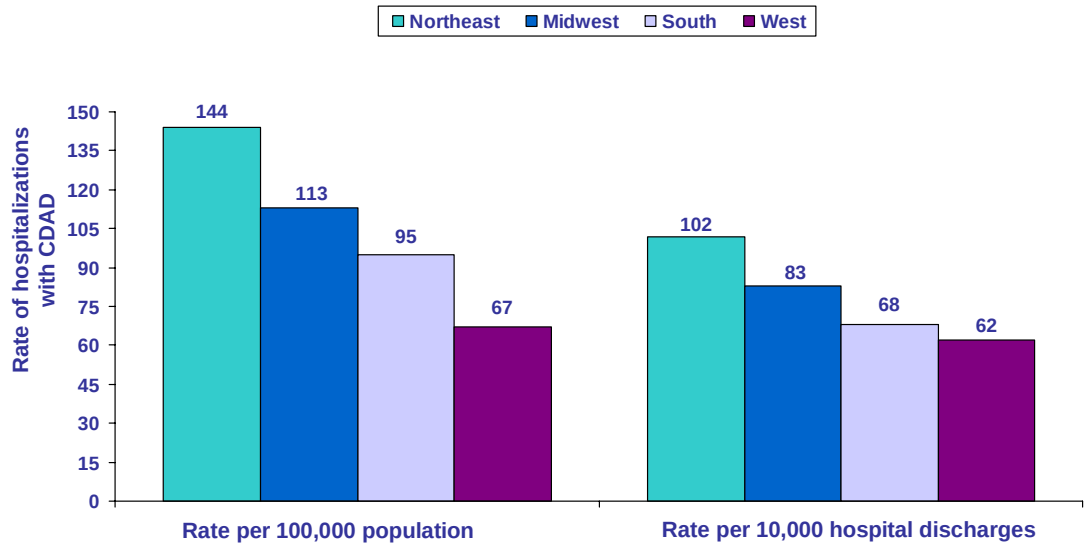
Source: AHRQ, Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project, Nationwide Inpatient Sample

Figure 2. Discharge rate for Clostridium difficile-associated disease, per 10,000 hospital discharges, 1993-2005



Source: AHRQ, Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project, Nationwide Inpatient Sample

Figure 3. Rates of hospitalization with Clostridium difficile-associated disease *, per 100,000 population and per 10,000 hospital discharges, by region, 2005



Source: AHRQ, Center for Delivery, Organization, and Markets, Healthcare Cost and Utilization Project, Nationwide Inpatient Sample

* Based on all-listed diagnoses.