

## **KEY FINDINGS AND PUBLIC HEALTH ACTIONS**

### ***Clostridium difficile* Infections in California Hospitals, 2012**

#### **Introduction**

*Clostridium difficile* (*C. difficile*) is a common cause of diarrhea in health care settings. Infection with *C. difficile* results in longer hospital stays and higher hospital costs [1-4]. The *C. difficile* bacteria are usually acquired in a healthcare setting and infection most often occurs following the administration of antimicrobial agents. Virtually all patients with *C. difficile* infection received antimicrobial agents between two weeks and three months prior to onset of their infection [5]. Rates of *C. difficile* infection (CDI) have increased over the past several years, along with increased severity of illness and an increase in mortality. These changes may be due to the emergence of a new *C. difficile* strain that produces more toxin and is resistant to more antimicrobial agents. This report, covering the period January through December 2012, is the fourth by the California Department of Public Health (CDPH) and the third using data submitted by hospitals to the Centers for Disease Control and Prevention (CDC) National Healthcare Safety Network (NHSN) [6]. Hospital reporting of laboratory-based CDI data to NHSN ensures accurate classification of CDI cases as either hospital-onset or community-related.

New in this report, for general acute care hospitals (other than long-term and rehabilitation acute care hospitals), we provide the NHSN hospital-onset (HO) CDI standardized infection ratio (SIR), which adjusts for significant risk factors. The SIR is calculated by comparing the number of CDI that occurred (or were observed) in the hospital in 2012 to the number that would be predicted based on the national referent CDI rate data. CDI cases are classified as HO when the positive stool sample is obtained on day four or later during the hospital stay. Risk factors found to be significant in predicting HO CDI incidence include the type of CDI test used by the hospital, if the hospital is affiliated with a medical school, hospital bed size, and the burden of community-onset CDI in patients admitted to the hospital. Adjusting for these factors provides for a more accurate comparison of hospitals' infections. For more precise comparisons, NHSN only calculates a SIR when at least one HO CDI is predicted, which is determined by patient volume and other factors predictive of acquiring CDI.

For each hospital with a CDI SIR, we performed a statistical analysis to determine if the observed number of infections was significantly different than the predicted number (Table 1). Based on our statistical analysis we labeled each hospital's CDI SIR as indicating:

- N - no difference in number of observed and predicted infections,
- H - high or more infections than predicted, or
- L - low or fewer infections than predicted.

For long-term acute care (LTAC) and rehabilitation acute care hospitals, NHSN does not have a risk adjustment methods for these hospital types and an SIR therefore can't be calculated. We provide both a HO CDI rate and a hospital-associated (HA) CDI rate. Both HO and HA rates may reflect factors in the hospital that can affect the occurrence of CDI, such as transmission of the *C. difficile* bacteria and use of antimicrobials. The HA CDI case counts include the HO cases plus cases in which a patient who was discharged from a hospital within the previous four weeks was readmitted to the same hospital with a new positive stool test for CDI. For HA cases, the CDI could have occurred as a result of the recent hospitalization or could be related to other healthcare exposures after leaving the hospital, including exposure to antibiotics. HO and HA CDI rates in long-term acute care (LTAC) hospitals are provided separately from the rates in rehabilitation acute care hospitals. Patients in LTAC hospitals have longer lengths of stay, an established risk factor for CDI [7]. In 2012, the average length of stay for a patient in

California long-term acute care hospitals was 28.5 days, compared with 13.3 days in rehabilitation acute care hospitals.

Also, specifically for LTAC and rehabilitation acute care hospitals, we include whether a hospital uses the polymerase chain reaction test (PCR) to detect CDI as in previous reports. Several laboratory testing methods exist for detecting CDI infection in hospitalized patients, including PCR, enzyme immunoassay (EIA), glutamate dehydrogenase (GDH) antigen, and several others. The sensitivity of PCR, i.e. the ability of the test to detect CDI when present, can be as much as two times greater than other laboratory testing methods. In this report, hospital rates of CDI infections for LTAC and rehabilitation acute care hospitals have not been adjusted to account for the differences in sensitivity between PCR and other laboratory testing methods; therefore, rates from hospitals using different types of laboratory tests are not comparable.

Given that antimicrobial use is associated with many CDI cases, judicious use of antimicrobial agents is also important in preventing infections. Antimicrobial stewardship programs promote the appropriate use of antimicrobial agents by optimizing the appropriate agent, dose, duration, and route of administration. These strategies strive to improve antimicrobial use in order to decrease secondary pathogenic infections such as CDI. CDPH has an Antimicrobial Stewardship Initiative that is developing a process to evaluate hospital adoption of stewardship practices and will provide targeted assistance to hospitals for developing and enhancing their antimicrobial stewardship programs [8].

### **Key Findings**

- 388 hospitals operated continuously for the reporting period January 1, 2012 through December 31, 2012. Of these, 23 were defined as LTAC and 7 as rehabilitation acute care hospitals.
- 386 (99.5%) general acute care hospitals reported CDI data for all 12 months of 2012, compared to 93.8% of hospitals in 2011. Two hospitals, including one LTAC, reported fewer than 12 months of data.
- 100% of hospitals reporting the type of laboratory testing method used via the NHSN Annual Hospital Survey in 2012, compared to 93.5% in 2011.
- 12 (12/358, 3.3%) hospitals reported extreme outlier community-onset CDI prevalence rates for one or two quarters of the year. NHSN excluded data in those time periods from further analyses. The CDI SIR for these hospitals is presented for 2012 but includes only 6 or 9 months of data (Table 1).
- 324 of 358 hospitals (90.5%) hospitals had a risk-adjusted CDI SIR calculated. Of these, 46 hospitals had fewer CDIs than predicted (lower SIRs), and 54 hospitals had more CDIs than predicted (higher SIRs).
- 34 of 358 hospitals (9.5%) hospitals had no SIRs calculated due to having an NHSN-predicted number of HO CDI cases less than one. Three of these hospitals reported extreme outlier community-onset CDI prevalence rate for certain quarters of the year and one hospital reported less than 12 months of data.
- 54 of 374 hospitals with 12 months of data (14.4%) reported zero CDI.

### *LTAC and rehabilitation acute care hospitals*

- In LTAC hospitals, the pooled mean HO CDI incidence rate was 17.6 per 10,000 inpatient days (range of 9.0 to 31.7), and the pooled mean HA (HO + HA) incidence rate was 17.7 per 10,000 inpatient days (range 9.0 to 31.7).
- In rehabilitation acute care hospitals, the pooled mean HO CDI incidence rate was 4.6 per 10,000 inpatient days (range of 2.0 to 7.8), and the pooled mean HA CDI incidence rate was 4.8 per 10,000 inpatient days (range 2.0 to 8.3).
- For LTAC and rehabilitation acute care hospitals, the CDI rates are not adjusted for significant risk factors. Differences in rates can result from differences in laboratory testing methods, patient populations, infection and transmission prevention practices, antibiotic utilization, and/or community onset rates of CDI.
- LTAC and rehabilitation acute care hospitals using different types of laboratory tests are not comparable because there can be as much as a two-fold difference in test sensitivity. Some hospitals may also have changed laboratory testing methods from one reporting period to the next. Therefore, hospital-specific rates from different reporting periods may also not be comparable.

### **Public Health Actions**

In follow up to this report, CDPH will:

- Continue to work with hospitals to implement strategies to prevent transmission of *C. difficile*, and reduce inappropriate use of antimicrobials through enhanced antimicrobial stewardship efforts.
- Continue to monitor accuracy and completeness of reported data, including laboratory testing methods reported to NHSN.
- Continue our prevention collaborative efforts with LTAC hospital personnel to explore opportunities for preventing CDI.

All hospitals should review these data and consider:

- Reviewing hospital CDI prevention activities and ensuring consistency with recommendations from the CDC [4, 9], Society for Healthcare Epidemiology of America /Infectious Diseases Society of America [10], and/or Association for Professionals in Infection Control and Epidemiology [11].
- Identifying antimicrobials and prescribing practices most strongly associated with CDI at their facilities and targeting antimicrobial stewardship strategies.
- Performing active monitoring of adherence to infection control practices known to decrease risk of transmitting *C. difficile* among patients, including contact precautions, hand hygiene, and environmental cleaning.
- Ensuring accuracy and completeness of reported data by strictly following NHSN protocols and definitions for all CDI positive specimens.
- Reporting accurate laboratory testing methods in the annual hospital survey for appropriate adjustment of CDI data.
- Reviewing CDPH's quarterly quality control reports to confirm that CDPH has correct and complete data and to identify additional data errors.

The public should consider:

- Reviewing the CDI information presented for your hospital, including the context and limitations of the data.

- Asking your health care provider about the actions your hospital is taking to ensure patient safety and CDI prevention, including an antimicrobial stewardship program to ensure appropriate use of antibiotics.
- Asking your health care provider about the actions you can take to ensure your safety in the hospital and protect yourself against CDI.

## **References**

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