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Brief Report

Substantial reduction of healthcare facility-onset *Clostridioides difficile* infection (HO-CDI) rates after conversion of a hospital for exclusive treatment of COVID-19 patients



Eric Ochoa-Hein MD, MSc^a, Sandra Rajme-López MD^b, Juan Carlos Rodríguez-Aldama MD^b, Martha Asunción Huertas-Jiménez RN^a, Alma Rosa Chávez-Ríos RN^a, Roxana de Paz-García RN^a, Anabel Haro-Osnaya RN^a, Karla Karina González-Colín RN^a, Ricardo González-González Engr^a, María Fernanda González-Lara MD, MSc^{b,c}, Alfredo Ponce-de-León MD^b, Arturo Galindo-Fraga MD, MSc^{a,*}

^a Department of Hospital Epidemiology, Instituto Nacional de Ciencias Médicas y Nutrición Salvador Zubirán, Mexico City, Mexico

^b Department of Infectious Diseases, Instituto Nacional de Ciencias Médicas y Nutrición Salvador Zubirán, Mexico City, Mexico

^c Microbiology Laboratory, Instituto Nacional de Ciencias Médicas y Nutrición Salvador Zubirán, Mexico City, Mexico

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Healthcare facility-onset *Clostridioides difficile* infection rates substantially dropped in a Mexican hospital after its conversion to a full COVID-19 setting, despite heavy contamination of the environment the previous year. Better adherence to hand hygiene and contact precautions may help explain this finding.

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BACKGROUND

Clostridioides difficile infection (CDI) is the most frequent healthcare-associated infection in the United States.¹ It is associated with unfavorable individual, societal and financial outcomes.²

Antibiotic stewardship, hand hygiene, contact precautions, and environmental cleaning and disinfection are preventive measures fully supported by evidence.^{3,4}

Incidentally, after this hospital was fully converted to treat COVID-19 patients on March 16, 2020, a substantial drop in the HO-CDI rate was noticed. The main objective is to report the factors related to this reduction.

MATERIAL AND METHODS

A before-after observational study was conducted. Approval from the Institutional Review Board was obtained.

* Address correspondence to Arturo Galindo-Fraga, MD, MSc, Department of Hospital Epidemiology, Instituto Nacional de Ciencias Médicas y Nutrición Salvador Zubirán, Vasco de Quiroga 15, Col. Belisario Domínguez Sección XVI, Tlalpan, Mexico City 14080, Mexico.

E-mail address: arturo.galindof@incmnsz.mx (A. Galindo-Fraga).

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A healthcare facility-onset CDI (HO-CDI) event was diagnosed when 3 or more unformed stools occurred during 24 or fewer consecutive hours after day 4 of hospital admission,³ plus a positive glutamate dehydrogenase test (VIDAS *C. difficile* GDH, Biomérieux, Marcy-l'Étoile, France) followed by a positive PCR test (GeneXpert *C. difficile*/Epi test, Cepheid, Sunnyvale, California).

The HO-CDI monthly rates adjusted to 10,000 patient-days were calculated before and after hospital conversion up to July 2020. Location of attribution and transfer rules were applied as per NHSN surveillance standards⁵ to create a cumulative map of CDI cases in the hospital.

Before hospital conversion, adherence to hand hygiene was calculated following standards reported elsewhere.⁶ Adherence to contact precautions was considered an “all or none” event: use of gown, gloves, and hand hygiene before donning and after doffing personal protective equipment were all required. In both cases, the percentage resulting from dividing the number of events by the number of opportunities, multiplied by 100, was reported on a monthly basis. Direct observations were done daily in the majority of hospitalization wards. After conversion, due to straining of human resources, self-reporting with the use of a standardized electronic questionnaire was used as a proxy: healthcare workers that volunteered for a screening program (unpublished results) were asked to rate their overall adherence to hand hygiene and contact precautions in every patient encounter on a

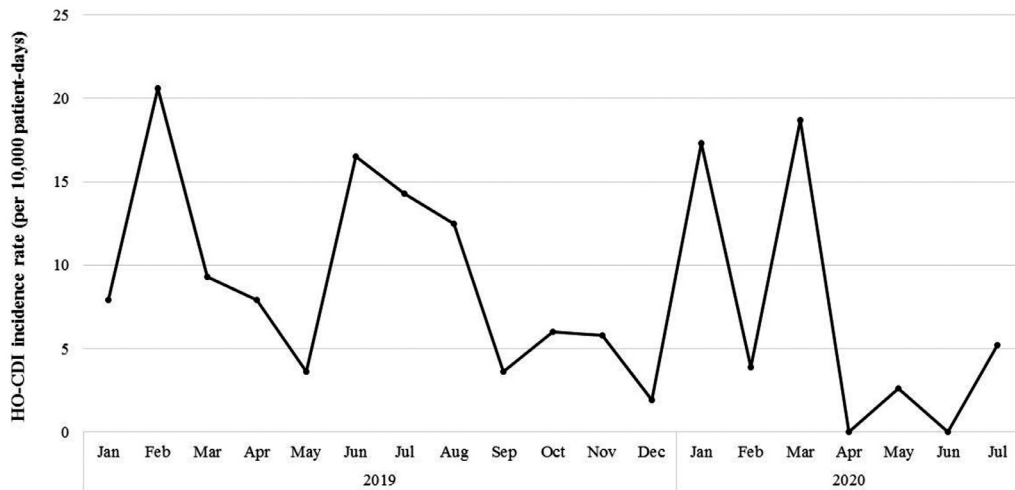


Fig. 1. Healthcare facility-onset *Clostridioides difficile* infection (HO-CDI) incidence rate per 10,000 patient-days.

percentage scale ranging from 0 to 100; pooled percentages were then calculated.

Cleaning and disinfection procedures were unchanged (5,000 ppm of sodium hypochlorite was used before and after conversion). Encounters with hospitalized patients were restricted after conversion. Surgical procedures and gastrointestinal endoscopies were halted. Use of antibiotics was compared between the HO-CDI cases and a random sample of patients admitted after conversion.

RESULTS

From January 1, 2019 to February 29, 2020, 56 HO-CDI cases were identified (9.3 cases per 10,000 patient-days; monthly range, 1.9–20.6). From April to July 2020, 2 cases were identified (1.4 cases per 10,000 patient-days; monthly range, 0–5.2). Figure 1 depicts the incidence rate across the study time period.

Mean adherence to hand hygiene before and after conversion was 66.1% and 94.7%, respectively. Before conversion, of 67,560 patients-days, contact precautions were in place a total of 16,586

patient-days (24.6%). After conversion, contact precautions were applied to all patients, but only 52.3% of 976 questionnaire respondents reported full compliance with contact precautions all the time; 66.3% used gloves and 58.9% used gowns in every patient encounter.

Mapping of cases (Fig. 2) revealed that a great number of rooms had been occupied by CDI patients before conversion.

Before conversion, 46.3% of HO-CDI cases were women, median age was 47.5 years (interquartile range, 36–64) and the median Charlson index score was 3 (interquartile range, 2–6); 90.7% had been hospitalized the previous month, 29.6% had recent abdominal surgery and 25.9% had active solid organ neoplasia. Antibiotics and proton pump inhibitors were prescribed to 90.7% and 73.5% of HO-CDI cases the previous month, respectively. Regarding outcomes, 16.7% had a severe episode, 3.8% failed initial treatment (100% used oral vancomycin), 3.7% developed megacolon, 1.9% required admission to the Intensive Care Unit, 13% had at least 1 CDI recurrence, 35.4% were readmitted to the hospital and 9.6% died. The 2 HO-CDI cases detected after conversion were women with COVID-19 who had previously used antibiotics: one also had generalized lupus

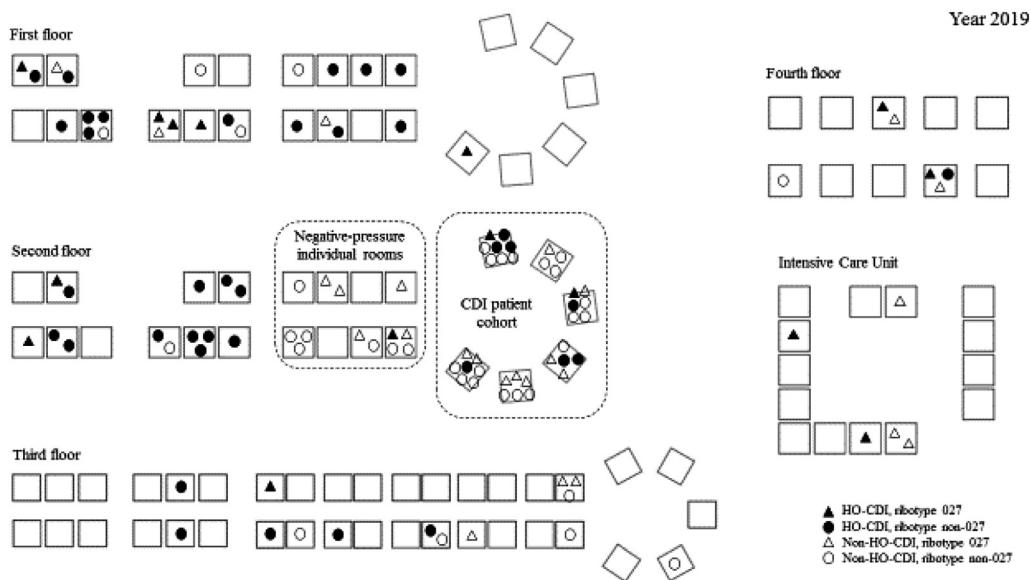


Fig. 2. Map of the spatial distribution of healthcare facility-onset *Clostridioides difficile* infection (HO-CDI) and non-HO-CDI cases in hospital rooms, 2019.

erythematosus and the other had diabetes mellitus; the latter received tocilizumab for COVID-19. Both had uneventful recoveries.

Use of antibiotics was similar among HO-CDI cases and a paired random sample of patients without HO-CDI after conversion (90.7% vs 92.5%, respectively).

DISCUSSION

The reduction in the HO-CDI rate was related to an interplay of many factors.

Better adherence to infection prevention and control practices was noted, as reported in another study.⁷ Increases in the adherence to hand hygiene and use of contact precautions, along with environmental cleaning and disinfection, are paramount to prevention of horizontal transmission of *C. difficile*.^{3,4} No modification of our cleaning and disinfection process was needed; the high concentration of sodium hypochlorite used was active against *C. difficile*.

The type of patients differed. The most frequent comorbidities in Mexican COVID-19 patients are hypertension, obesity and diabetes, unlike patients admitted to this hospital before conversion.⁸ Following conversion, no external patients with preexisting CDI were hospitalized, reducing environmental contamination. These features seemed to overcome the deleterious effect of the high rate of antibiotic use in patients after conversion.

We acknowledge limitations. Although adherence rates to hand hygiene and contact precautions were self-reported after hospital conversion, significant deviations from the reported estimations are considered unlikely (healthcare workers would not have benefited in any way from providing inaccurate estimates, and it is improbable that healthcare workers would have neglected the aforementioned preventive measures in the face of the risks imposed by treating patients with COVID-19). Lack of a concurrent control group was unavoidable due to the hospital conversion put in practice.

Standardized measurements of antibiotic consumption with defined daily doses were not possible due to active hospital changes during and after conversion. Nonetheless, the main strength of this study is the active, real-time search of CDI cases that was not modified during the study time period.

CONCLUSIONS

Improvements in infection prevention and control practices imposed by the COVID-19 pandemic, especially those related to the prevention of transmission by contact, were favorable in terms of HO-CDI control.

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