

Decontamination with Ultraviolet Radiation to Prevent Recurrent *Clostridium difficile* Infection in 2 Roommates in a Long-Term Care Facility

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Clostridium difficile infection (CDI) is the most common cause of nosocomial diarrhea. Residents of long-term care facilities (LTCFs) are an especially vulnerable population. Translating infection control measures successfully applied at hospitals to LTCFs poses challenges.¹⁻³ *C. difficile* spores may survive on surfaces for months and are difficult to eradicate with routine disinfectants. Environmental cleaning with a 10% bleach solution reduces the incidence of CDI⁴ but requires manual application and is thus operator dependent.⁵ Automated disinfection methods have been proposed, although their impact on clinical outcomes has not been established. We used UV radiation to prevent further CDI episodes in 2 roommates in a LTCF with 2 coincident CDI recurrences.

Patient 1 is a 65-year-old man who, during his 1-month stay in an acute care facility, had multiple exposures to intravenous antibiotics. He was transferred to the LTCF for rehabilitation and, 7 weeks later, developed CDI that was treated with oral vancomycin (Figure 1). Patient 2 is a 56-year-old man who received several courses of antibiotics and developed severe CDI while in the acute care setting. Patient 2 was then transferred to the LTCF where he was assigned to share a room with patient 1.

Within days of completing oral vancomycin therapy, patient 2 developed recurrent CDI. Other medical issues prompted patient 2 to be transferred back to the acute care facility, where he was exposed to additional antibiotics. He returned to the LTCF having been prescribed an oral vancomycin taper. Two days later, patient 1 also developed recurrent CDI and initiated therapy with oral vancomycin. Both patients recovered from their CDI, but days after patient 1 finished

his vancomycin regimen, both patients simultaneously developed diarrhea.

Both patients were largely bed-bound and required assistance with bathing, dressing, and toileting. Routine environmental cleaning measures were employed, including the use of 10% bleach disinfectant between each CDI episode. Despite these measures, the coincident timing of the patients' CDI recurrences suggested a heavy environmental burden of *C. difficile* spores. We surveyed multiple surfaces in the patients' room for *C. difficile* spores using sterile swabs.⁵ Within 5 hours, the swab samples were used to inoculate pre-reduced agar with media selective for *C. difficile* (cycloserine-cefoxitin-brucella agar containing 0.1% taurocholic acid and lysozyme 5mg/mL).⁶ *C. difficile* was detected on bed rails (1 colony on each bed), a bedside table (2 colonies), the shower handrail (1 colony), and the trash can (25 colonies). It was not found on the mattresses, sinks, call buttons, night tables, shower chair, or toilet.

In an effort to prevent additional CDI recurrences, we used an automated UV radiation device (Tru-D Rapid Room Disinfection device), which has been shown to reduce the environmental burden of *C. difficile*.⁷ The UV radiation device was run for a full cycle in both the bathroom and patient room (22,000 mWs/cm² for ~90 min) at a time when both patients were absent. Afterward, a second set of environmental swab samples were obtained. *C. difficile* was detected only on a bed rail (1 colony). Five weeks after UV radiation, rectal swab samples obtained from both patients were negative for *C. difficile*. In the subsequent months, neither patient had additional episodes of CDI.

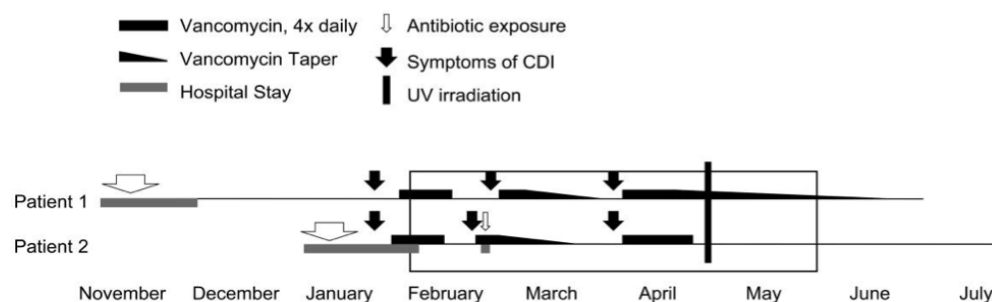


FIGURE 1. Time line of recurrent *Clostridium difficile* infection (CDI). Patient 1 was admitted to a long-term care facility (LTCF) in December and developed CDI in late January. Patient 2 received a diagnosis of *C. difficile* infection during his initial hospitalization. Upon admission to the LTCF, he became the roommate of patient 1 for 4 months (box). Both patients had 2 recurrences of CDI that were temporally coincident. Since their room was irradiated with UV light in late April, neither patient has had a recurrence.

The coincident timing of the patients' CDI recurrences suggests the possibility of cross infection. McFarland et al⁸ described an increased risk for *C. difficile* acquisition in the first 48 hours after becoming a roommate of a patient with a culture positive for *C. difficile*. Among isolates obtained from 23 patients whose cases of CDI were thought to have developed after exposure to a roommate, 87% were identical to isolates obtained from the patient's roommate.⁸ Although our patients clearly both acquired their initial infection before becoming roommates, assigning the patients to the same room may have resulted in each patient becoming exposed to a new strain of *C. difficile* and increased their risk for recurrent CDI.

Infection control measures aimed at reducing the incidence of CDI are based primarily on successful practices employed in hospitals. Using these same measures in LTCFs presents challenges because of the shared dining, bathing, toileting, and rehabilitation facilities. Furthermore, the long-term care setting, in which patients reside for weeks to years, makes it difficult to implement the same disinfection measures that are routinely used in hospitals.

Although a measurable impact on patient outcomes has not yet been reported, automated disinfection devices are able to

reduce the number of organisms in places that are easily missed by or inaccessible to human cleaning. The UV radiation device that we used requires less than 1 hour per bed for a typical cycle and is easy to use. Routine use of UV radiation devices to decrease the environmental burden of pathogens is a feasible addition to current infection control and housekeeping measures and may ultimately help to reduce rates of CDI among patients in hospitals and LTCFs.

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