

The Effect of Pulsed Xenon Ultraviolet Disinfection and Enhanced Chemical Disinfection of Surfaces on Incidence and Recurrence of *Clostridium difficile* Cases within a Skilled Nursing Facility

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Abstract

The role of the environment in infection transmission in long-term care facilities may be greater than in acute care settings. Patient-to patient contact and extended length of stay add increased colonization pressure of common hospital associated pathogens, such as *Clostridium difficile* (*C. difficile*). Because patient rooms can be inhabited for weeks to months at a time, thorough disinfection remains a challenge for environmental services. With the goal of preventing hospital-acquired (HA) *C. difficile* infection and recurrence, a skilled nursing facility implemented pulsed xenon ultraviolet disinfection (PX-UV) in order to enhance environmental disinfection practices.

Incident and recurrent *C. difficile* infection was defined using NHSN definitions. Three prevention programs were implemented: staff retraining on hand hygiene practices was conducted in June/July of 2014, followed by the implementation of sodium hypochlorite cleaning in August. No immediate change in infection rates were identified with these two interventions, so ultraviolet disinfection using a pulsed-xenon disinfection robot was added at the start of September 2014. PX-UV was performed in all isolation rooms on a daily basis, as well as in common areas. Bleach cleaning continued in isolation rooms daily, and at patient discharge.

In the 8 month period prior to PX-UV implementation, the number of HA-*C. difficile* cases was 30, with 22 of these being recurrences. Following the implementation of PX-UV, the number of HA-*C. difficile* cases was 8, with 5 being recurrences. This represents a statistically significant reduction of 76.8% (p=0.03).

The success of this intervention could be a result of high environmental disinfection compliance, driven by the ease of integration of the PX-UV system and hypochlorite wipes by patients and staff into daily hospital operations within the long term care setting.

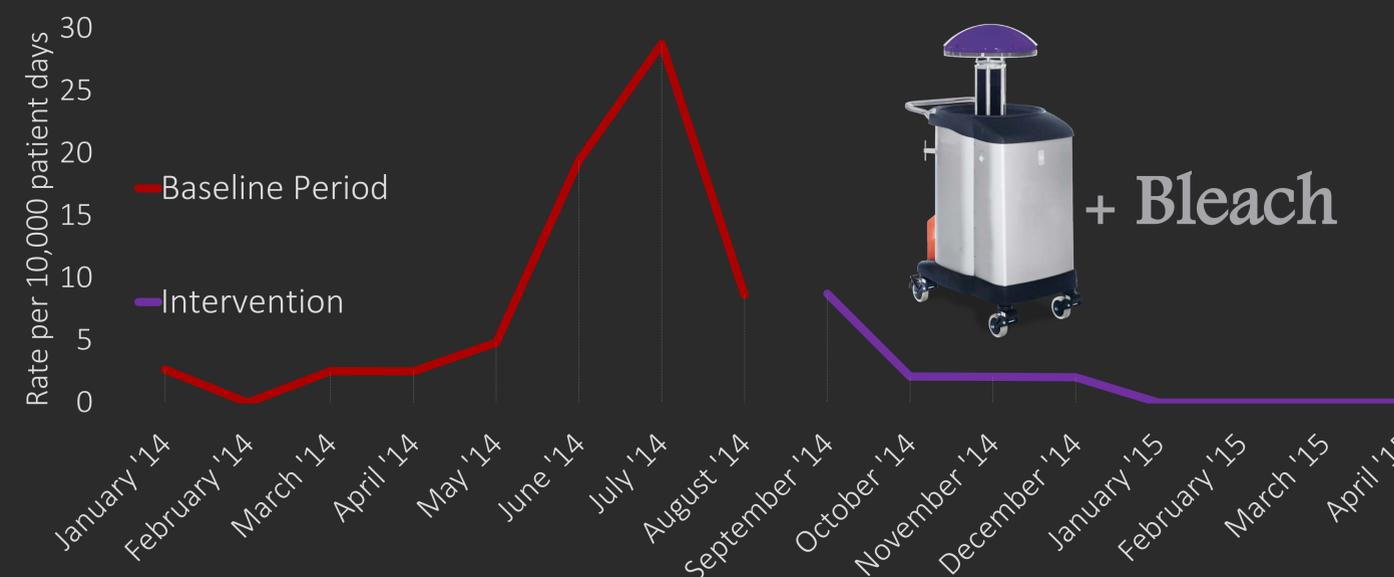
References

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Table 1. Comparison of HA-*C. difficile* infection rates and cases before and after the implementation of PX-UV and sodium hypochlorite wipes.

	# of months	HA-CDI cases	HA- CDI recurrent cases	HA-CDI rate per 10,000 pt. days	% change	p-value
Baseline	8	30	22	9.18	-76.8%	0.03
Intervention	8	8	5	2.13		

Figure 1. HA-*C. difficile* infection rate, by month, as a result of enhanced environmental disinfection practices. Rates include incident and recurrent infections, presented per 10,000 patient days.



Background

- ✓ HA-*C. difficile* infection can be linked to environmental contamination and prior room occupancy risk.
- ✓ Following initial acquisition, this recurrence risk can increase 20%, 45% and 65% after 1, 2 and more than 2 episodes, respectively.
- ✓ Pulsed xenon ultraviolet disinfection (PX-UV) has been linked to reductions in HA-*C. difficile* infection rates in acute care settings.

Methods

- ✓ Morningside Ministries at The Manor is a 190-bed skilled nursing facility in San Antonio, TX, with length of stay ranging from 5 to 100 days.
- ✓ A *C. difficile* infection is considered hospital acquired when clinical symptoms are present and the patient has GHD/EIA positive laboratory results.
- ✓ One PX-UV system was implemented from September 2014 through April 2015 as an adjunct to sodium hypochlorite wipes. PX-UV was performed in all isolation rooms on a daily basis, as well as in common areas. Bleach cleaning continued in isolation rooms daily, and at patient discharge.
- ✓ A non-parametric, two sample Wilcoxon rank-sum test (Stata Corp, College Station, TX) was used to identify significant changes in incident and recurrent infection rates.

Results

- ✓ HA-*C. difficile* decreased 76.8% house wide (p=0.03) within the 8 month intervention.
- ✓ 4 of the 8 total post-intervention cases occurred within the first month of implementation.
 - ✓ Following September 2014, only 4 HA-*C. difficile* infections (2 recurrent) occurred within the final 7 intervention months.

Discussion

- ✓ The simultaneous implementation of PX-UV with sodium hypochlorite wipes limits the ability to isolate the effect of one intervention alone. A bundled approach was necessary in this case in to adhere to accepted *C. difficile* outbreak protocols. This study provides additional evidence that enhanced environmental disinfection has the potential to drastically reduce HA – *C. difficile* incidence and recurrence within the long-term care setting.