



Routine Incorporation of Pulsed Xenon UV (PX-UV) after Standard Cleaning of Rooms Previously Occupied by Patients with *C. difficile* (*C. diff.*) or Vancomycin Resistant Enterococci (VRE) Infections or Colonizations.

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Abstract

Background: Contamination of the patient environment by *C. difficile* (*C. diff.*) or VRE is a challenge that poses an increased risk for transmission to the next occupant. The standard for *C. diff.* surface decontamination is 1:10 bleach solution, which may yield damage to materials and toxic environment to workers; and standard cleaning has been shown not to remove all VRE from patient rooms. PX-UV can quickly produce germicidal UV that has been shown effective against *C. diff.* and VRE in environmental settings. The aims of this study were to determine if the use of PX-UV in place of bleach would adversely impact the incidence of *C. diff.* infections; and to also determine its impact on HA-VRE rates.

Methods: PX-UV was routinely used over 15 min in 3 positions in *C. diff.* rooms facility-wide instead of bleach and after terminal cleaning of VRE rooms on the leukemia and stem cell transplants units. These changes were implemented in Jan 2013, and current rates are available through Mar 2013. Rates were calculated according to facility diagnostic criteria, which remained unchanged during the implementation period and were compared to the previous 3 months before the intervention by Wilcoxon rank sum test

Results: For the *C. diff.* and VRE rooms, a downward trend in the hospital acquired colonization and infection rates was noted after a period of 3 months.

Conclusions: PX-UV method may be a promising means to reduce the transmission of VRE and *C. diff.* in healthcare settings and may be an alternative to the use of bleach for *C. diff.* terminal cleaning.

Introduction

- *Clostridium difficile* (*C. diff.*) causes over 300,000 healthcare associated infections annually in the United States with an estimated attributable cost of \$2,500 to \$3,500 per episode, excluding the cost of surgical interventions.¹
- According to current *C. diff.* control guidelines, rooms previously occupied by *C. diff.* positive patients should be cleaned with an EPA-approved disinfectant registered as effective against *C. diff.*^{1, 2, 3}
- Drees et al, demonstrated that if the prior room occupant was infected or colonized with VRE, the next patient in that room had an increased risk of VRE acquisition (HR:3.8; $p < .001$). The same is true if VRE-positive room cultures were found prior to admission (HR 4.35, $p = .007$).⁴
- Germicidal ultraviolet irradiation (UVGI) has been shown effective in deactivating *C. diff.* endospores in laboratory and clinical settings.^{5, 6, 7}
- A preliminary study on the environmental impact of using the PX-UV device in patient rooms was completed in April of 2010. This resulted in a statistically significant reduction in bacterial heterotrophic plate count and an elimination of VRE from the high-touch surfaces after using the PX-UV device.⁸

Objective

- The purpose of this study was to determine if the use of PX-UV in place of bleach would adversely impact the incidence of *C. diff.* infections; and to also determine its impact on HA-VRE rates.

Methods

- PX-UV was routinely used over 15 min in 3 positions in *C. diff.* rooms facility-wide instead of bleach and after terminal cleaning of VRE rooms on the leukemia and stem cell transplants units.
- Changes were implemented in Jan 2013, and current rates are available through Mar 2013. Rates were compared from 3 months before to 3 months after the intervention.



Results

Table 1: Impact of standard cleaning and PX-UV disinfection on *Clostridium difficile* counts in patients' rooms with comparison of *Clostridium difficile* counts according to room cleaning status

Room Status	No. of samples	C. diff. positive N(%)	CFU Min	CFU Mean	CFU Median	CFU Max	CFU iqr	% reduction	p-value
Pre bleach clean	74	26(35)	0	2.39	0	81	11	70	0.13
Post bleach clean	74	18(24)	0	0.71	0	18	0		
Pre PX-UV	75	34(45)	0	22.97	0	300	33	95	0.002
Post PX-UV	75	18(24)	0	1.19	0	26	0		
Pre PX-UV ¹	70	29(41)	0	4.61	0	71	2	83	0.007
Post PX-UV ¹	70	16(23)	0	0.80	0	13	0		

Notes: ¹ Outliers removed

Results (continued)

Table 2: Impact of Pulsed-Xenon Ultraviolet (PX-UV) Disinfection on incidence of *Clostridium difficile* and on HA-VRE rates.

Unit	HA-VRE Infection/1000 pt.-days before PX-UV	HA-VRE Infection/1000 pt.-days after PX-UV	p-value	reduction
Leukemia	0.45	0.32	0.7137	29%
SCT	0.35	0.00	0.08	100%
Unit	HA-VRE colonization/1000 pt.-days before PX-UV	HA-VRE colonization/1000 pt.-days after PX-UV	p-value	reduction
Leukemia	0.99	0.64	0.29	35%
SCT	2.62	1.33	0.08	49%
Unit	C. diff infection/10,000 pt.-days before PX-UV	C. diff infection/10,000 pt.-days after PX-UV	p-value	reduction
Facility-wide	3.3	2.2	0.5	33%

- For the *C. diff.* and VRE rooms, a downward trend in the hospital acquired colonization and infection rates was noted after a period of 3 months.

Conclusions

PX-UV method may be a promising means to reduce the transmission of VRE and *C. difficile* in health-care settings and maybe an alternative to the use of bleach for *C. difficile* terminal cleaning.

References

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