Using Pulsed Xenon Ultraviolet to Decrease Contamination in Operating Rooms During Terminal Cleaning

Maurice Croteau[1] CEH HEM, Sarah Simmons[2] MPH, CIC, Mark Stibich[2], PhD, MHS, Julie Stachowiak[2], PhD, MPH, MIA,

[1] St. Joseph's Hospital and Medical Center, Phoenix, AZ; [2] Xenex Healthcare Services, LLC, San Antonio, TX

St. Joseph's Hospital and Medical Center. A Dignity Health Member

350 West Thomas Road, Phoenix, AZ

Abstract

Introduction: Daily terminal cleans are part of the Association of periOperative Registered Nurses (AORN) guidelines, and consist of a thorough cleaning of all surfaces in the room. Completing a terminal clean properly requires a significant investment of hospital resources, and may not always be done in compliance with AORN standards due to limitations of time and personnel. New cleaning methods that are capable of achieving similar levels of disinfection as the approved standard terminal clean would enhance the ability to comply with the AORN standards. Pulsed xenon ultraviolet (PX-UV) technology has been used in the hospital setting to terminally clean patient rooms at discharge, and may be of use in terminal cleaning of ORs. This study assesses the level of bacterial contamination in a terminally-cleaned OR as compared with a modified turnover (between case) clean plus PX-UV.

Methods: Five surfaces were selected for sampling after terminal cleaning in 16 ORs and after Turnover Clean+PX-UV disinfection in 22 ORs for a total of 190 samples. Contamination levels for the two cleaning methods were compared using negative binomial regression.

Results: The mean plate count for terminal cleaning was 2.73 colony forming units (CFU) per sample. In the Turnover Clean+PX-UV arm, the mean plate count was 1.05 CFU per sample (see Table 1). Contamination levels were significantly lower in the rooms that received a Turnaround Clean+PX-UV (p<0.001).

Conclusions: This study indicates that Turnover Clean+PX-UV method should be considered as an alternative to standard terminal cleaning for operating rooms, but further study is warranted.

Introduction

- Per AORN guidelines, operating rooms should be terminally cleaned every 24 hours. This cleaning is necessary to reduce the microbial burden on the environment in operating rooms.[1]
- Studies have shown that only 47% of operating room surfaces are cleaned throughout the day.[2] Pathogens such as MRSA, Acinetobacter spp., Pseudomonas spp. and E. coli can be recovered from OR surfaces after cleaning. [2,3]
- Pulsed Xenon has been used to enhance environmental cleaning in patient rooms, and may be useful to terminally clean operating rooms. [4,5]

Objective

- The purpose of this study was to compare the contamination levels after standard terminal cleaning with a modified Turnover Clean +PX-UV.

Methods

- Environmental samples were taken from five surfaces in 16 ORs after standard terminal cleaning, and from the same five surfaces in 22 ORs after Turnover Clean + PV-UV.
- Turnover Cleaning + PX-UV consisted of a standard between case clean, plus removal of visible soil. There was no routine disinfection of surfaces that did not have visible soil. After cleaning, the PX-UV device was run for 5 minutes in two different positions.
- The surfaces selected for sampling were the top and bottom of the anesthesia cart, the OR light, the OR table, and the floor.
- Samples were taken using contact plates (Hardy Diagnostics P34). Samples were collected, incubated and read per the manufacturers instructions.
- The data was analyzed using negative binomial regression.

Table 1: Comparison of Heterotrophic plate counts, According to Room Cleaning Status

Disinfection	Number of Samples	Mean	Median	IQR	Min	Max	p-value
Standard Terminal Clean	78	2.73	1	4	0	17	<0.001
Turnover Clean + PX-UV	110	1.05	0	1	0	19	

Table 2: Comparison of Contamination Levels of Different Surfaces, According to Room Cleaning Status

Room Surface	Cleaning Method	Number of Samples	Mean HPC	% reduction
Anesthesia Cart Top	Standard Clean / Quick Clean + PX-UV	16 / 22	1.88 / 0.68	63.8%
Anesthesia Cart Bottom	Standard Clean / Quick Clean + PX-UV	15 / 22	1.60 / 0.68	57.5%
OR Light	Standard Clean / Quick Clean + PX-UV	16 / 22	2.06 / 0.27	86.9%
OR Table	Standard Clean / Quick Clean + PX-UV	15 / 22	2.43 / 0.14	94.2%
Floor	Standard Clean / Quick Clean + PX-UV	16 / 22	5.75 / 3.45	40%

Sample Site Selection

Samples were taken from:

1. The anesthesia cart, center top.

2. The anesthesia cart, outside center of the bottom drawer.

3. The operating room light, halfway between the center point and the edge on the top surface.

4. The operating table, top center

5. The floor, within a 4 foot radius of the operating table.

XENEX® ROOM POSITIONS

Results

- A total of 188 samples were analyzed with two samples missing because of laboratory error.
- In the terminal cleaning arm of the study, the mean plate count was 2.73 colony forming units (CFU) per sample.
- In the Turnover Clean+PX-UV arm, the mean plate count was 1.05 CFU per sample.
- The bacterial contamination levels were significantly lower in the rooms that received a turnaround clean+PX-UV (p<0.001).

Conclusions

- The Turnover Clean+PX-UV method was shown to be superior to standard terminal cleaning. Turnover Clean + PX-UV is a promising alternative to standard terminal cleaning methods. Additional research is warranted to verify these results.

References

1. Perioperative Standards and Recommended Practices. Association of Perioperative Registered Nurses 2013.
2. C Edminston, et al. Molecular Epidemiology of Microbial Contamination in the Operating Room Environment: Is there a risk of infection? Surgery. 2005;138(4):573-582.
3. R Loftus, et al. Transmission of Pathogenic Bacterial Organisms in the Anesthesia Work Area. Anesthesiology 2008; 109(3):399-407.
4. Stibich M, Stachowiak J, Tanner B, Berkheiser M, Moore L, Raad I, Chemaly R. Evaluation of a Pulsed-Xenon Ultraviolet Room Disinfection Device for Impact on Hospital Operations and Microbial Reduction. Infect Control Hosp Epidemiol. 2011;32:286-288.
5. Quezada R, Huber T, Copeland L, Zeber J, Jinadatha C. Evaluation of a pulsed-xenon ultraviolet room disinfection device for impact on contamination levels of methicillin-resistant staphylococcus aureus [manuscript under review, Infect Control Hosp Epidemiol; abstract presented at Central Texas VA Research Day, April 2012].