Impact of UV Light Disinfection on CLABSI and CAUTI Rates in a Major Medical Teaching Hospital’s MICU

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Abstract
Ultra Violet-C (UV-C) light disinfection was consistently applied to the MICU/CCU from 03/2015 through 07/2015. UV-C light disinfection of the unit was an adjunct to the routine chemical disinfection program already in existence. NHSN SIR metrics were used to measure the impact of UV-C light disinfection. The MICU/CCU experienced a statistically significant reduction in CAUTI incidence and a measurable reduction in CLABSI incidence, although not statistically significant for the 5 month study period that UV-C light disinfection was consistently used. When UV-C light disinfection was withdrawn and delivered as a less vigorous intervention, CAUTI and CLABSI increased, although not statistically significant.

Methods
Each discharge room was effectively chemically disinfected, curtain changed, terminally cleaned, and treated with UV-C light. UV-C light was available for use in the MICU/CCU as needed for every discharge during the study period. Protocols for MICU/CCU, Housekeeping, and Bed Management impacting admission and discharge were altered to accommodate this technology. Working collaboratively with MICU/CCU staff regarding these processes, proved to be instrumental in outcomes. The UV-C light disinfection system was consistently applied to the MICU/CCU from 03/2015 through 07/2015 in addition to the housekeeping program already in place. NHSN SIR metrics were used to measure the impact of UV-C light disinfection on CAUTI and CLABSI rates before and after the intervention.

Objective
Here we evaluated the efficacy of an automated UV-C triple emitter system, which has been designed to accomplish room disinfection more effectively and in less time. CAUTI and CLABSI rates were evaluated in the MICU/CCU before and after the consistent application of UV-C light disinfection as an Infection Control and Housekeeping intervention. Initially brought on board to JSUMC as a test device through the Crothall Healthcare Products Committee, the UV-C triple emitter matured from a "test and trial" program into a "daily addition" disinfection process in the MICU/CCU. UV-C light disinfection was used in conjunction with the chemical disinfection program deployed by Housekeeping.

Results
Prior to the study period, the 2014 YTD CAUTI data was unfavorably statistically significant (SIR=1.93, p<0.00, SIR95CI=1.214, 2.933) (Figure 1). During the study period when UV-C light disinfection was consistently used, the MICU experienced a statistically significant reduction in CAUTI incidence (SIR=0.00, p<0.01, SIR95CI = 0.673) and a measurable reduction in CLABSI incidence (SIR=0.036, p=0.29, SIR95CI = 0.018, 1.763). After the study period when UV-C light disinfection was less consistently applied, CAUTI and CLABSI increased, although not statistically significant (CAUTI SIR=1.44, p=0.41, SIR95CI=0.527, 3.190; CLABSI SIR=1.81, p=0.21, SIR95CI=0.662, 4.004).

Key Terms:
- CAUTI = Catheter Associated Urinary Tract Infection
- CLABSI = Central Line Associated Blood Stream Infection
- NHSN = National Healthcare Safety Network
- SIR = Standardized Infection Ratio

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Conclusion
Prior to the new UV-C light disinfection program at Jersey Shore University Medical Center (JSUMC), the Infection Control Committee was striving to reduce the incidence of both CAUTI and CLABSI for over a year. A CAUTI Action Plan had been in place since fourth quarter 2014, secondary to unfavorable year end data (Figure 1). Several nursing improvements to patient care had already been implemented prior to the addition of the triple emitter UV-C system. The addition of the automated UV-C disinfection system further reduced both CAUTI and CLABSI incidence when applied consistently in the MICU.

Environmental contamination of the patient care area is a potential contributing factor to HAI incidence. Several studies demonstrate how the environment of care is integral to preventing transmission of pathogenic organisms. Chemical disinfection has been the gold standard for healthcare, heavily relying on quaternary ammonium and bleach based disinfectant preparations. Previous studies have demonstrated that less than 50% of contaminated surfaces actually make contact with the chemical disinfectant. Establishing a housekeeping program with reliable chemical disinfection efficacy can be challenging. It is speculated that the dedicated UV-C light disinfection program tested in the MICU/CCU was decreasing bioburden for safer delivery of patient care related to CAUTI and CLABSI prevention, more so than just chemical disinfection alone.

References