Presentation Number 2-115

Determination of Ultraviolet Light Doses Needed to Inactivate Bacteria and Viruses on Hard

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BACKGROUND: Most of the existing data for doses needed to inactivated bacteria and viruses by ultraviolet light was developed in solution and little quantitative data has been developed for doses needed on hard surfaces. The goal of this study was to determine the doses of ultraviolet (UV) light needed for a 90 to 99.999% reduction of the test organism on various inanimate surfaces (fomites) using a collimated beam.
METHODS: A collimated beam apparatus was used to determine the dose required to inactivate bacteria and viruses on hard surfaces. UV light does were measured with the use of a precision calibrated radiometer. Stainless steel and Formica substrates were chosen as they are the most common surfaces found in the healthcare setting. Methicillin-resistant staphylococcus aureus (MRSA), Vancomycin resistant Enterococcus (VRE), Clostridium difficile were chosen as the test bacteria since they are major causes of nosocomial infections in health care settings. Two human surrogate viruses, coliphage MS-2 and murine norovirus were also evaluated to represent some of the enteric and respiratory viruses of importance. The fomites were inoculated with 106 to 108 bacteria or viruses per mL and exposed to a range of UV doses.
RESULTS: The test organisms were exposed to a range of UV doses (1,597 $\mu Ws/cm^2$ to 35,014 $\mu Ws/cm^2$) (Table 1). As expected higher doses were required to inactivate the viruses than the bacteria. The inactivation curve with increasing doses was not found to be linear and tended to taper off after a 3 to 4 log reduction of the test organism. This is in contrast to what has been observed in solutions where the inactivation curve tends to be linear.

Table 1. UV light doses required to inactivate 99.9% stainless steel fomites

Organism	UV Dose ($\mu Ws/cm^2$)
MRSA	5,786-6,540
VRE	5,052-12,581
C. difficile spores	16,000
MS-2	29,055
Murine norovirus	30,000

CONCLUSIONS: The doses required for inactivation depends on the type of organism, type of fomite and is not linear on hard surfaces.

Presentation Number 2-116

Reducing the Risk of Bloodborne Pathogen Transmission Associated with Blood Glucose Monitoring in the Hospital Setting

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BACKGROUND: Glucometers are used in healthcare settings to evaluate patients on insulin or hypoglycemic agents. The Centers for Disease Control and Prevention (CDC) warns about the risks for transmitting bloodborne pathogens (BBPs) during assisted blood glucose monitoring (BGM). The CDC emphasizes that glucometers should not be shared whenever possible. If they must be shared, devices should be disinfected after every use. Assisted BGM poses a patient safety concern if healthcare workers (HCWs) fail to follow basic principles of infection prevention and control.
METHODS: The study was quasi-experimental with pre-post design. A baseline survey of nurses and patient care technicians (PCTs) in 33 inpatient and ancillary departments was administered throughout an 804-bed tertiary care hospital. Survey questions assessed knowledge of cleaning and disinfection protocols and other measures to prevent the transmission of BBPs. In addition, random audits of nurses and PCTs were performed before and after education. Audits consisted of observing the BGM process and evaluation through demonstration of the steps. Education was developed based on gaps identified from the survey and baseline audits. Feedback on performance was directly provided to the HCW. Data was analyzed using Pearson's chi-square test.
RESULTS: 242 HCWs completed the baseline survey which showed poor knowledge and practice of safe steps for BGM (Table). Of 197 HCWs audited for performance, 106 were pre-education and 91 post-education. Pre-education, glucometers were disinfected after each use 81% of the time compared to 98% post-education ($P < .001$). Compliance with the proper disinfection procedure increased from 48% to 86% ($P < .001$). Disinfection of the port improved from 38% to 89% ($P < .001$).

Survey Question	Nurses (%)	PCTs (%)
Glucometer is disinfected 100% of the time when performing BGM	59/158 (37)	31/68 (46)
Coworker disinfects glucometer 100% of the time when performing BGM	13/136 (10)	18/59 (31)
Test strip port is disinfected when there is no visible blood or soil present	123/157 (69)	56/67 (31)
If testing is repeated, HCW washes hands and changes gloves as a first step	42/141 (30)	12/54 (22)

CONCLUSIONS: BGM practices need to be regularly evaluated to ensure safe processes are in place. Hospitals should establish a protocol for BGM focusing on reducing risk for BBP exposure. Compliance with established protocols is enhanced by HCW education and feedback on performance.