

Cleaning assessment of disinfectant cleaning wipes on an external surface of a medical device contaminated with artificial blood or *Streptococcus pneumoniae*

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BACKGROUND

Improperly cleaned, disinfected, or sterilized reusable medical devices are a critical cause of health care-associated infections. Device-associated HAIs (DA-HAIs) are among the main causes of patient morbidity and mortality within hospital intensive care units. It has also been suggested that DA-HAIs account for 60-80% of all bloodstream, urinary tract, and pneumonia-related HAIs, signifying a need for new infection control measures to reduce the involvement of medical devices in such infections. One of the critical issues that need to be considered when designing new infection control measures is the influence of physical design and materials used in fabrication on the reprocessing of reusable medical devices. More effective studies are required to address the improvement of cleaning and disinfection instructions, as well as selection of cleaning and disinfecting agents, for surfaces of reusable devices and equipment.

METHODS

Six commercially available disinfectant cleaning wipes were evaluated for their effectiveness to remove a coagulated blood test soil or *Streptococcus pneumoniae* bacteria from the surface of a reusable medical device. The following 6 wipes were tested: **1:** ProSpray wipe, **2:** CleanCide Ready-To-Use, **3:** Clorox Germicidal Wipes, **4:** HypeWipe Bleach Towelette, **5:** Oxivir Tb Disinfectant

Wipes, **6:** CaviWipe.

The effectiveness of each wipe was assessed using 3 methods. O-phthaldialdehyde analysis measured the average amount of residual protein left on the surface by each of the wipes. Next, using Ruhof's ATP bioluminescence swabs and assay, bacterial debris (*Streptococcus pneumoniae*) left on the machine's surface after wiping measured bacterial survival. Lastly, force measurements required to remove the dried blood spot from the surface were measured. The anesthesia machine was placed on top of a piezoelectric force plate and the force was plotted against the time required by the wipe to clean the blood spot from the surface.

RESULTS

The results of the OPA method showed that the best performing wipe was the Clorox Germicidal Wipes with Oxivir Tb Disinfectant Wipes performing comparably. The wipe that performed the worst (HypeWipe Bleach Towelette) has an active ingredient similar to Clorox Germicidal Wipe (Sodium hypochlorite) however at a higher concentration. Three of the remaining wipes (ProSpray wipe, CleanCide Ready-To-Use, CaviWipe) left similar residual levels of protein debris to one another.

Next, the force associated with cleaning the blood spot from the surface was calculated. Clorox Germicidal Wipes was most effective in removing the coagulated blood spot and cleaning the surface also requiring the least amount of time and force to do so, followed by ProSpray wipe and HypeWipe Beach Towelette. Oxivir Tb Disinfectant Wipes placed next, requiring the most amount of force to clean the blood spot, CleanCide Ready-To-Use Detergent Wipe placed next in regards to both time and force and lastly, CaviWipe required the most amount of time to clean the blood spot from the anesthesia machine surface.

Lastly, bacterial debris on the machine's surface was measured and all 6 of the wipes tested removed more than 98% of the initial bacterial inoculums. Therefore, no specific disinfectant cleaning wipe was superior to another.

CONCLUSION

Device-associated HAIs have become an increasingly more common occurrence. Several factors such as noncompliance with manufacturer's instructions for cleaning and disinfection, improper personnel training, increased medical design complexity, and/or new device materials, required further research to delineate how cleaning and disinfection practices of medical devices can be improved.

Under the experimental test conditions, the wipe that performed the best, ie, leaving behind the least amount of residual protein debris and requiring the least mechanical effort was Clorox Germicidal Wipes. In

descending order, the remaining wipes ranked from best to worst (in efficacy) were as follows: Oxivir Tb Disinfectant Wipes, CaviWipe, CleanCide Ready-To-Use, ProSpray Wipe, and lastly, HypeWipe Bleach Towelette.

Although two wipes such as Clorox Germicidal Wipe and HypeWipe Bleach Towelette contain Sodium Hypochlorite as their active ingredient, variation in performance was interpreted to be based on factors such as packaging and wetness of wipes. HypeWipe Bleach Towelette was saturated with more than 2 times the amount of liquid per square centimeter than Clorox Germicidal Wipe. It is believed that this wipe was too wet to effectively remove all the debris from the surface as it appeared to push its own liquid across the surface. More importantly, when a wipe is too wet, other problems may arise such as corrosion of electronic circuitry.

It is imperative for health care providers to always read the instructions for use provided by the manufacturers of reusable devices and medical equipment to choose the most appropriate cleaning agent. It is hoped that the results from this study will contribute to more knowledgeable and informed decisions regarding the selection of disinfectant cleaning wipes

The active ingredient, wipe design, and wipe wetness are important factors to consider when selecting a disinfectant cleaning wipe. Additionally, achieving conditions that effectively clean, disinfect, and/or inactivate surface bacterial contamination is critical to preventing the spread of health care-associated infections.