



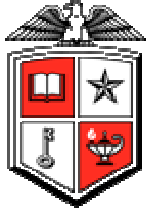
***Through Automated Technology,
Device is Effective in Eradicating
Bioburden on Hospital Equipment:***

***A Pre-test / Post-test
Single Group Design Study***

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Through Automated Technology Device is Effective in Eradicating Bioburden on Hospital Equipment: A Pre-test Post-test Single Group Design Study

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Background

The prevalence and cost of Health-care Associated Infections (HAI) has rapidly increased over the previous 2 decades to epidemic levels. The estimated number of HAI's in 2002 was approximately 1.7 million.¹ The Centers for Disease Control, after a thorough investigation by economist R. Douglas Scott, released a report estimating the direct annual cost of HAI's to Hospitals alone to be between \$35.7 and \$45 billion dollars. Of this cost to hospitals it is estimated that between \$5.7 and 31.5 billion are the cost of preventable infections.²

One of the larger opportunities for prevention of HAI lies in regular sterilization of hospital equipment. Currently available methods for cleaning the surface of medical equipment, such as wheelchairs and gurneys, are inadequate in their ability to eliminate potentially infectious bioburden from surfaces which regularly come into contact with patients and healthcare professionals. Therefore, efforts are being made to develop effective methods to remove bioburden from medical equipment. The elimination of bioburden has been emphasized as it has been commonly known for decades that the reduction and elimination of bioburden is necessary to achieve sterilization.³

The BRS/100 Bioburden Reduction System® (STAT Medical Systems Inc., Palmetto, Florida), is a cleaning instrument specifically designed to eliminate all infectious biological material from larger (i.e. hospital gurneys) and smaller (commode, IV pole) hospital equipment with many surfaces that traditional methods of disinfection are not able to provide. The BRS/100 equipment uses a combination of 140°F

(60°C) water, multiple-angle high-pressure jets and chemical disinfectant to neutralize and eliminate infectious bioburden from medical equipment. The objective of this study was to provide direct evidence for the effectiveness of the BRS/100 system to eliminate bioburden from medical equipment.

Methods

ATP Rapid Hygiene Testing

Bioburden presence and prevalence was determined via Hygiena® (Camarillo, California, USA) ATP Rapid Hygiene Testing (ATP/RHT) system. The, industry-standard, ATP/RHT system is a method of determining the amount of potentially infectious organic matter present on a surface. The ATP/RHT system is specifically suited to detect amount of viable organic matter through its detection of Adenosine Triphosphate. The ATP/RHT system was specifically chosen as it not only detects biological material present, but also provides data regarding the amount of virulent bacteria and other living organic matter that has the potential to reproduce and colonize if it came into contact with a patient. The ATP/RHT system procedure consists of swabbing the *Ultrasnap*® ATP Test Device data collection end across the surface of interest, then breaking open the *Ultrasnap*® liquid stable reagent holder which exposes the swab to ATP enzymatic reagent, and then placing the swab end into the *SystemSURE*® ATP Bioburden detection instrument. All ATP/RHT bioburden testing of hospital gurneys and manual wheelchairs was performed under the direct supervision of an independent scientific laboratory (Precision Analysis Inc., Florissant, Missouri, USA) to ensure proper data collection and absence of testing bias.

Hospital Gurney Testing

Twelve standard hospital gurneys and three standard manual wheelchairs were randomly selected for bioburden testing pre- and post-cleaning from the pool of regularly circulating hospital gurneys at St. Luke's Hospital (Chesterfield, Missouri, USA). At both the pre- and post-cleaning times 4 areas were swabbed on each individual gurney. A swab for bioburden presence via the ATP/RHT system was performed at each of the following high contact areas: 1) Gurney rail Lever Release, 2) Right Gurney Rail, 3) Left Gurney Rail, 4) Mattress.

Manual Wheelchair Testing

Three wheelchairs were randomly selected from the same institutions pool of regularly circulating manual wheelchairs. At both the pre- and post-cleaning times 3 areas were swabbed on each individual chair. A swab for bioburden presence via the ATP/RHT system was performed at each of the following high contact areas: 1) Attendant Handgrip, 2) Right Arm Rest, 3) Seat.

Bioburden Elimination

All hospital gurneys and manual wheelchairs underwent cleaning via the BRS/100 Bioburden Reduction System® following the first bioburden data collection. Each piece of hospital equipment was individually cleaned. No additional application of cleaning solvent or cleaning procedure was performed to any of the hospital equipment pieces before the second bioburden data collection.

Statistical Analysis

Paired samples t-tests and descriptive statistical analyses were performed utilizing PASW® 18 statistical package and Microsoft Excel®. Significance was set at $p \leq 0.05$. A separate t-test was performed for each swabbed area to avoid inflation of statistical error.

Results

Hospital Gurney Testing

All Bioburden levels were significantly reduced at each of the individual swab areas following cleaning by the BRS/100 Bioburden Reduction system®.

For gurney rail lever releases, the mean bioburden on pre-test was 243.4 (sd=225.7) and the mean on the post-test was 11.1 (sd=10.9). A significant decrease in bioburden level from pre-test to final was found ($t(11), p=0.00$).

For right gurney rails, the mean bioburden on pre-test was 432.7 (sd=411.0) and the mean on the post-test was 7.2 (sd=8.0). A significant decrease in bioburden level from pre-test to final was found (t(11), p=0.00).

For left gurney rails, the mean bioburden on pre-test was 148.8 (sd=76.7) and the mean on the post-test was 5.5 (sd=5.1). A significant decrease in bioburden level from pre-test to final was found (t(11), p=0.00).

For gurney mattresses, the mean bioburden on pre-test was 212.3 (sd=257.6) and the mean on the post-test was 3.2 (sd=2.4). A significant decrease in bioburden level from pre-test to final was found (t(11), p=0.02).

Wheelchair Testing

For wheelchairs, the mean bioburden on pre-test was 1220.8 (sd=1257.1) and the mean at post-test was 4.0 (sd=3.8). A significant decrease in bioburden level from pre-test to final was found (t(8), p=0.02).

Discussion and Conclusion

Statistical analysis and review of mean data indicate that the BRS/100 Bioburden Reduction System® significantly reduced the presence of infectious bioburden on all hospital equipment. Additional categorization of raw data according to Hygiena's standardized scale for cleanliness of equipment revealed that all equipment reached a cleanliness level considered appropriate and necessary for use in a medical setting (i.e. "Good Clean", "Very Clean", or "Ultra-Clean").

What was particularly interesting to note was that 95% of hospital gurney areas tested, and 100% of wheelchair surfaces tested were considered to be between "Ultra-Clean" (areas considered for sterile purposes) and "Very Clean" (Areas for critical touch point use i.e. wound care). In other words, nearly all surfaces cleaned on hospital gurneys, and all surfaces on wheelchairs, would be appropriate to use as a surface to perform highly sensitive procedures (i.e. wound care) without risk of infection.

In conclusion, results indicate that the BRS/100 Bioburden Reduction System® is an effective means for eliminating bioburden on previously soiled hospital equipment. Our investigation revealed that hospital equipment in general circulation, even when it did not appear soiled, had significant amounts of potentially infectious bioburden. Use of the BRS/100 system resulted in hospital gurneys and wheelchairs with surfaces appropriate to perform wound care upon without fear of infection.

References

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