Comparison of Surface Marker, Colony Count and ATP as a Measure of Environmental Cleaning Compliance for Intensive Care Discharge Rooms

Michelle J Alfa¹, Curtis J Donskey², Icaro Boszczowski³, Joost Hopman⁴

¹ St. Boniface Research Centre, Winnipeg, MB, Canada, ²Louis Stokes Veterans Affairs Medical Center, Cleveland, OH, USA, ³Hospital Alemão Oswaldo Cruz, Sao Paulo, Brazil, ⁴Radboud University Nijmegen Medical Centre, Nijmegen, Netherlands

INTRODUCTION

The use of monitoring as an important quality process to ensure adequacy of environmental cleaning in healthcare has been advocated.¹,² However, there is little data comparing the optimal "cut-off for adequate cleaning" when monitoring using surface marker, colony count or ATP. The study objective was to determine the relationship of these three monitoring methods in ICU discharge rooms in two different countries.

MATERIALS & METHODS

This was a prospective study in Canada and the Netherlands that assessed five high-touch sites (HTS) in 50 ICU rooms (HTS included: procedure table, bedside table, computer keyboard, bedrail, pump and cardiac screen) at each site. The Netherlands site uses a bed washer-disinfector post-discharge where the cleaned beds go to any ICU room.³ As such it was not possible to do testing on bedrails pre and post cleaning.

A novel reflective surface marker (RSM) was used to mark each HTS after patient discharge but before cleaning (clean cutoff; total marker removal). Viable surface count on each HTS was done using Rodac plates containing DEN agar (clean cutoff as per Dancer et al; < 2.5 cfu/cm²) and ATP surface residuals (clean cutoff as per Boyce et al; < 250 RLU’s) were tested before and after cleaning. The ATP was measured as relative light units (RLUs) The surface area sampled for ATP and Rodac plates was 4 cm².

RESULTS

Pre-cleaning 92.8% and 25.2% of HTS were “dirty” by RLU in Canada and Netherlands, respectively. Post-clean 75.3% and 66.3% were “clean” by RLU in Canada and the Netherlands, respectively (Figure 1). The pre-clean cfu levels were low but there was still a 22.8% and 8.9% improvement in % “clean” cfu achieved post-cleaning in Canada and the Netherlands, respectively (Figure 4). The bedrails pre-clean had the highest bacterial level of the Canadian HTS whereas in the Netherlands (bedrails not available for testing) it was the computer keyboard.

Post-cleaning the RSM was removed from 84.6% and 60% of HTS, in Canada and the Netherlands (Figure 1).

DISCUSSION

The level of viable microorganisms in both The Netherlands and Canada ICUs were below the “clean threshold” of 2.5 cfu/cm² even before cleaning. This suggests that the “clean threshold” could be reduced. A more representative cut-off might be Log₁₀0.7 cfu as the majority of pre-clean counts from NL and CA were above this level and the majority of the post-clean were below this level. The disinfectant-cleaner used in Canada was effective at reducing the number of viable bacteria (22.8% reduction) on HTS in the ICU . The Netherlands levels of viable bacteria were lower than the levels in Canadian ICUs both pre and post cleaning. This may be due to different surface materials, disinfectants/cleaner and absence of hand-wash sinks in the ICUs in The Netherlands.

Residual ATP was harder to eliminate from the environment compared to RSM at the Canada site whereas the reverse occurred in the Dutch ICUs.

There was little relationship between viable counts and ATP supporting previous reports that ATP in the healthcare environment is derived primarily from non-microbial sources. Keyboards and bedrails represented the “dirtiest” sites in the ICUs by both ATP and RSM testing.

CONCLUSIONS:

1. Visual assessment of cleaning was inferior to RSM or ATP testing.
2. The “clean threshold” of 2.5 cfu/cm² could be lowered to 0.20 cfu/cm².
3. There were differences in RSM, ATP and viable counts pre and post-cleaning in ICUs in different countries.

ACKNOWLEDGEMENTS

The funding for this study was provided by 3M Company, Infection Prevention Division (St. Paul, MN). The medical and ethical approval for this study was obtained from the institutional review board. Research and Ethics approval was obtained prior to the study commencement in both the Netherlands and Canada.

REFERENCES