Multi modal cleaning strategy for beds – what is required?

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Background

- Hospital-associated infections (HAI) are more frequently encountered in low than in high resource settings [Allegranz B et al., 2011].
- Environmental contamination of the patient zone is important for the occurrence of HAI.
Objective

• To evaluate the contamination levels of beds using a manual bed cleaning regimen in both high and low resource settings.
Methods

• Comparison of manual bed cleaning in a surgical short stay unit in University hospital in a high income country with manual bed cleaning in University hospital in a middle income country.

• ATP levels were evaluated from 3 locations on 150 beds after cleaning in a high resource setting.
Methods (Cont’d)

• In the low resource setting 96 beds evaluated before and after cleaning in January 2014.
• The cleaning staff was blinded for the ATP sampling.
• The local investigator collaborated with the unit managers to identify patients that were going to be discharged.
Methods (Cont’d)

• After identifying beds to be sampled, the investigator sampled the beds immediately after the patient had left the room.

• After sampling, the mattress was cleaned and the investigator observed the cleaning procedure.

• After finishing all measurements feedback was given to the domestic staff, unit managers and nurses.
Wards included were:

- Emergency,
- ICU,
- High care,
- Medical,
- Surgery,
- Ear-nose-Throat,
- Urology,
- Orthopedics,
- Obstetrics,
- Pediatrics.
Methods (Cont’d)

- The 3 samples were obtained from standardized locations at the mattresses.
- Two samples (A and B) were obtained at the head-end of the mattress and one (C) in the pelvic region.
- Sample size was 10 by 10 cm on each of the three areas.
Methods (Cont’d)

• Beds sampled using Clean-Trace Surface ATP swabs (3M Health Care Ltd).
• A clean trace NG Luminometer (3M Health Care Ltd) was used and ATP present was quantified as relative light units (RLU).
• A clean surface was defined as one with a measured RLU < 250, consistent with prior studies [Lewis T et al., 2008; Moore G et al., 2010].
ATP Bioluminescence Method

Step 1
Use special swab to sample surface

Step 2
Place swab in reaction tube

Step 3
Place tube in luminometer
Results: Relative Light Units
Methods (Cont’d)

• Qualitative analysis of the cleaning process performed to identify predictors of cleaning outcome in low resource settings.
• Evaluation of compliance to local cleaning policy.
• The observations registered included:
  - Type of cleaning
  - Product used for cleaning
  - Professional background of cleaner
  - Cleaning qualifications
  - Quality of the mattresses.
Methods (Cont’d)

• Fluorescent cut-off $\leq 250$ RLU: Clean
• Fluorescent cut-off $>10000$ RLU: Highly contamination
• Training of cleaning personnel was performed in a 3-year training program.
Place of the study:
Tygerberg Academic Hospital
Tygerberg Hospital:

• Academic tertiary referral hospital
• Located in Cape Town, South Africa
• 1310 beds are in use
Results
Results

• Prior to cleaning, beds were highly contaminated as measured by ATP levels in low resource settings.

• Routinely performed manual cleaning reduces significantly contamination of beds in low resource setting ($p<0.0001$). *(Figure 1)*
Results (Cont’d)

Figure 1

South-Africa Beds Before & After cleaning

p<0.0001
Results (Cont’d)

• The comparison of ATP levels after cleaning between Radboud UMC and Tygerberg Academic hospital showed:

• No significant difference could be observed between manual cleaning in high and low resource settings (Figure 2).
Results (Cont’d)

Figure 2

The Netherlands & South-Africa
ATP (RLU) after cleaning

ns
Results (Cont’d)

• When defining beds as dirty (one or more dirty location) using the fluorescent cut-off of either 100 or 250 RLU there was no significant difference between ATP levels in high and low resource settings (p<0.0004, p< 0.0001). (Figure 3)
Results (Cont’d)

Figure 3

Bed cleaning

<table>
<thead>
<tr>
<th>Type of cleaning</th>
<th>Percentage of beds &lt; 250 (RLU)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manual.Netherlands (n=150)</td>
<td>80</td>
</tr>
<tr>
<td>Manual.South-Africa</td>
<td>80</td>
</tr>
</tbody>
</table>

- Manual.Netherlands (n=150)
- Manual.South-Africa (n=96)
Results (Cont’d)

• Cleaning according to local protocols reduces the contamination of beds adequately in contrast to inappropriate cleaning regimens.

• Multivariate regression analysis indicated several independent predictors for beds being dirty (defined as more than 250 RLU) after cleaning.
Results (cont’d)

Predictors identified are:

- Type of product used ($p < 0.001$)
- Type of ward ($p < 0.001$)
- Training ($p < 0.024$)
- Level of contamination prior to cleaning (high contamination defined as ATP levels of RLU$>10000$) ($p < 0.001$).
Results (cont’d)

% of beds < 250 (RLU)

<table>
<thead>
<tr>
<th>Type of detergent</th>
<th>Combination (n=4)</th>
<th>Fresh soap (n=26)</th>
<th>D-germ (n=2)</th>
<th>Sparkle (n=34)</th>
<th>Bioscrub (n=6)</th>
<th>Handysan (=24)</th>
</tr>
</thead>
<tbody>
<tr>
<td>freshsoap combination</td>
<td>100</td>
<td>90</td>
<td>70</td>
<td>50</td>
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<tr>
<td>Sparkle</td>
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</tbody>
</table>
Conclusion

• At the end of admission, prior to cleaning, beds were highly contaminated as measured by ATP levels in low resource settings.
Conclusion (cont’d)

- Routinely performed manual cleaning can be as effective and sustainable in a low resource setting.

- After training no differences were observed between manual cleaning of beds in high and low resource setting.
Recommendations

A recommended multimodal cleaning strategy:

• Training of domestic services staff
• Adequate time to clean beds between patients
• Adequate cleaning products.
References


Acknowledgements

• Domestic Services at the Radboudumc
• Domestic Services at TBH
• Unit Managers at TBH
• Nurses at TBH