Identity tags: A vector for cross-infection?

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Background. Nosocomial infections represent one of the challenging problems of modern medicine. Healthcare providers play an important role in the transmission of these infections on their hands, clothing and equipment. Modern security systems require personnel to wear clearly displayed identity (ID) tags, and to have an easily accessible access disc. These access and ID tags are often worn around the neck on a lanyard, and could possibly harbour bacteria and be a vector for cross-infection.

Method. Saline-moistened swabs of the front and back of ID tags of 50 healthcare workers were taken for bacterial culture. Swabs were inoculated onto standard microbiological media. Potential pathogens were subjected to sensitivity testing while organisms resembling normal skin commensals were reported as such.

Results. Twenty-eight of the 50 (56%) ID tags cultured exhibited no bacterial growth. Eighteen (36%) swabs grew primarily skin flora. Neutrophils were observed under microscopy on two (4%) swabs. Seven (14%) swabs grew potentially pathogenic bacteria. Doctors were found to have almost three times the risk of carrying pathogenic bacteria on their ID tags compared with nurses. Recent patient contact also showed a higher incidence of colonisation. There were no statistically significant differences between variables such as ward or area of work, nature of patient contact, time since qualification, level of qualification or length of employment at Red Cross War Memorial Children’s Hospital, Cape Town, South Africa.

Conclusions. Prevention of hospital-acquired infections is important in any setting. The ID tag has been identified as a possible source of infection spread in this and previous studies. The ID tag has to date been neglected as a potential source of pathogen spread, and efforts to make staff aware of this potential danger should be considered in every institution.

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Cultures from 10 unused ID tags exhibited no bacterial growth.

Methods

Permission was obtained from local and university ethics review boards and hospital management to perform the study prior to commencement (University of Cape Town Human Research Ethics Committee Ref. 492/2012). Participation of staff members was voluntary and anonymous. Informed consent was obtained from all participants. Swabs for bacterial culture were taken from the ID tags of 50 healthcare workers at RCWMCH, the largest tertiary hospital dedicated entirely to children’s healthcare in SA. To achieve a cross-sectional representation of the different specialities, staff members in different units were approached. These areas included the intensive care unit (ICU), surgical wards, general medical wards and gastroenteritis ward. All staff present on the ward at the time of sampling, wearing an ID tag on a lanyard, were asked to participate (maximum of 50 participants).

Swabs were moistened with sterile saline, and the surface (front and back) of the ID tag, as well as the corners of the tag holder, was swabbed in a criss-cross manner.

Swabs were inoculated onto standard microbiological media at the National Health Laboratory Services (NHLS microbiology) located at Groote Schuur Hospital. Only potential pathogens (Staphylococcus aureus and Gram-negative bacilli) were followed up; organisms resembling normal skin commensals were reported as such.

Data were summarised as total numbers (column percentages) for categorical variables. Baseline comparisons where appropriate were made using a χ² test. Statistical significance was determined as p<0.05. All statistical analyses were performed using SPSS Statistics, version 21 (IBM, USA).

Results

Control group

Cultures from 10 unused ID tags exhibited no bacterial growth.
Participant demographics
The ID tags of 21 doctors and 29 nurses were swabbed. Table 1 reflects the results relating to participant demographics, as well as patient contact, ID-tag cleaning practices and time worked at the institution.

Bacteria
Twenty-eight of the 50 (56%) ID-tag swabs cultured exhibited no bacterial growth. Eighteen (36%) swabs grew primarily skin flora. Neutrophils were observed under microscopy on two (4%) swabs. Seven (14%) swabs grew potentially pathogenic bacteria comprising coagulase-negative Staphylococcus (n = 1), Enterobacter cloacae with an inducible beta-lactamase and Klebsiella (n = 1), Micrococcus spp. (n = 1), Gram-positive cocci (n = 2), Gram-positive bacilli (n = 2) and Gram-negative bacilli (n = 2). One culture grew a few mixed aerobic organisms as well as Gram-negative bacilli. None of the cultures exhibited anaerobic organism growth. While doctors and nurses had elicited different proportions of contaminations, a comparison using a z-score revealed no significant difference (z-score –1.70; p = 0.09).

Decontamination practices
Decontamination practices were observed among 26 of the participants (52%). A total of 24 of the staff members had never cleaned their ID tag, 18 cleaned it < 1 day a week, and 8 cleaned it more often.

Of the participants whose swabs cultured pathogenic bacteria, four had never cleaned their ID tag, all had had contact with a patient in the previous hour, and notably, two of the four worked on the gastroenteritis ward. There was no significant correlation identified between participants with pathogenic microbial growth on culture and measured variables such as ID-tag cleaning frequency. However, there was a positive correlation of positive pathogenic growth with participants sampled within 30 minutes of patient contact (p = 0.006). No further correlations were identified between these participants and other variables previously mentioned.

Risk of carrying pathogens
Doctors were found to have almost three times the risk of carrying pathogenic bacteria on their ID tags compared with nurses, although this was not significant (relative risk (RR) 2.98; 95% confidence interval (CI), 0.63 - 14.1; p = 0.17).

There were no statistically significant differences between other variables, such as ward or area of work, nature of patient contact, time since qualification, level of qualification or length of employment at RCWMCH (estimated time of ID-tag use).

Discussion
The paediatric patient population at RCWMCH makes it very probable that ID tags hanging around the necks of physicians to the waist level inadvertently come into contact with patients and the clinical environment. On occasion, they are used as a distraction to facilitate consultation. It may be reasonably assumed that these processes and the regular need to apply the tag to the security panel may result in the tags ultimately becoming colonised with potential nosocomial pathogens.

Previous studies have documented that many articles of clothing worn by healthcare staff can harbour potential pathogens such as methicillin-resistant S. aureus (MSSA) and MRSA on doctors' neckties[8,9] and MRSA on stethoscopes.[10] Contaminated equipment and clothing provide a reservoir from which healthcare workers may reinoculate their hands after hand hygiene practices have been carried out. The British Medical Association has suggested that doctors refrain from wearing non-essential items of clothing such as ties and implement a bare-below-the-elbow policy.[11]

The relatively low prevalence of both methicillin-susceptible S. aureus (MSSA) and MRSA in this study compared with other international studies[1,5] can be explained by a previous article from this institution,[12] documenting both the low annual incidence of bacteraemia at 3.28 cases per 1 000 hospital admissions and the fact that MRSA was responsible for only 26% of S. aureus bacteraemia. In this article, only six possible cases of community-acquired MRSA infections were described.[12]

It has previously been shown that lanyards were particularly contaminated, with a median bacterial load per unit surface area up to ten times greater than ID tags.[10] Studies have also shown that bacteria are able to survive on plastic surfaces for long periods of time, with Gram-negative bacteria surviving for >60 days and

<table>
<thead>
<tr>
<th>Tag-cleaning frequency</th>
<th>Doctors, n (%)</th>
<th>Nurses, n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never</td>
<td>13 (61.9)</td>
<td>11 (37.9)</td>
</tr>
<tr>
<td>&lt;25% of time</td>
<td>6 (28.6)</td>
<td>12 (41.4)</td>
</tr>
<tr>
<td>25 - 75% of time</td>
<td>2 (9.5)</td>
<td>3 (10.3)</td>
</tr>
<tr>
<td>Always</td>
<td>0</td>
<td>3 (10.3)</td>
</tr>
<tr>
<td>Nature of last patient contact</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intact skin only</td>
<td>15 (71.4)</td>
<td>18 (62.1)</td>
</tr>
<tr>
<td>Invasive procedure</td>
<td>3 (14.3)</td>
<td>3 (10.3)</td>
</tr>
<tr>
<td>Mucous membranes, secretions</td>
<td>3 (14.3)</td>
<td>2 (6.9)</td>
</tr>
<tr>
<td>Nappy change, stool contact</td>
<td>0</td>
<td>6 (20.7)</td>
</tr>
<tr>
<td>Time since last patient contact (minutes)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;30</td>
<td>17 (80.9)</td>
<td>17 (58.6)</td>
</tr>
<tr>
<td>30 - 60</td>
<td>4 (18.2)</td>
<td>10 (34.5)</td>
</tr>
<tr>
<td>&gt;60</td>
<td>0</td>
<td>2 (6.9)</td>
</tr>
<tr>
<td>Time since qualification (years)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;2</td>
<td>5 (23.8)</td>
<td>3 (10.3)</td>
</tr>
<tr>
<td>2 - 4</td>
<td>5 (23.8)</td>
<td>5 (17.2)</td>
</tr>
<tr>
<td>5 - 9</td>
<td>9 (42.9)</td>
<td>8 (27.6)</td>
</tr>
<tr>
<td>&gt;9</td>
<td>2 (9.5)</td>
<td>13 (44.8)</td>
</tr>
<tr>
<td>Work period at RCWMCH (years)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;2</td>
<td>17 (80.9)</td>
<td>5 (17.2)</td>
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<td>2 - 4</td>
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<td>5 - 9</td>
<td>0</td>
<td>8 (27.5)</td>
</tr>
<tr>
<td>&gt;9</td>
<td>0</td>
<td>11 (37.9)</td>
</tr>
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</table>
enterococci for >90 days.\textsuperscript{[14]} Hence, our study focused on ID tags as a separate entity.

We observed that decontamination practices by 52% of staff were more prevalent than in previous reports (16% and 27%).\textsuperscript{[15,16]} The tags that had never been cleaned were more likely to carry pathogenic growth. Also, there was a significant positive likelihood of pathogenic growth within the first 30 minutes of patient contact, irrespective of the nature of the patient contact. Hence, we recommend that an effective decontamination regimen (e.g. 30 seconds criss-cross scrubbing with a cleaning swab) be implemented where ID tags may have been in contact with patients.

While there was a higher risk that doctors’ tags were colonised with potential pathogens, there was not a significant difference between doctors and nurses, contrary to what has previously been reported.\textsuperscript{[13]} The equal compliance with hand-hygiene protocols observed by both doctors and nurses at RCWMCH may help to explain the lack of difference in contamination rates observed in our study. However, larger studies are required to compare the relative carriage rate of potential pathogens between doctors and nurses.

Study limitations
One limitation of our study is that we did not assess the participants for carriage of S. aureus in the nares or on their hands. Also, we did not do a baseline evaluation of the current pathogenic bacterial occurrence on the ward at the time of data collection. Hence, we were unable to correlate between inoculated bacteria from the swabs and the clinical occurrence on the wards. Another limitation is that although staff members estimated the length of time for which they had been using the ID tags, we were unable to establish the exact point of contamination.

Conclusion
Prevention of hospital-acquired infections is important in any setting. Efforts to reduce these infections include the use of protective clothing, a no-sleeve policy, and, most importantly, hand washing. The ID tag has been identified as a possible source of infection spread in previous studies. This study shows that most staff either seldom or never clean their ID tags, and this results in a higher incidence of tag colonisation. It shows a higher probability of the tag being infected if the tag owner is a doctor (although not significant), or has had recent patient contact. Most hospitals have education drives, strict hand-washing practices and sanitising equipment available. The ID tag has to date been neglected as a potential source of pathogen spread and efforts to make staff aware of this potential danger should be considered in every institution.

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References

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