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Short report

Identification badge lanyards as infection control risk: a cross-sectional observation study with epidemiological analysis

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SUMMARY

Staphylococcus aureus cultures from name badge lanyards were phenotypically and genotypically indistinguishable from the wearer's nasal carrier strains by pulsed-field gel electrophoresis and antibiogram. Lanyards had a mean age of 22 months and hygiene was poor with only 9% ever having been laundered. Molecular analysis showed that 26% of *S. aureus* nasal carriers shared an indistinguishable strain on their lanyard. Lanyards should not be recommended for staff in frontline clinical care.

Introduction

UK Department of Health guidance recommends healthcare workers wear clear identifiers (uniform and/or name badge), as patients wish to know who is caring for them, and expect to use appearance to do this.[1] A joint working party of the Hospital Infection Society and the British Society of Antimicrobial Chemotherapy advocates an assessment of the effectiveness of current and emerging approaches to environmental decontamination and their impact on MRSA colonization and infection rates.[2] *Staphylococcus aureus*, including both meticillin-sensitive (MSSA) and meticillin-resistant (MRSA) strains, have been reported from cultures of neck-suspended lanyards used to attach identification badges in healthcare workers, raising the question of this reservoir of bacteria being a risk of infection to patients.[3]

The aim of this study was to use molecular fingerprinting to show whether *S. aureus* found on the lanyards represented transient contamination (i.e. environmental-sourced and therefore removable by cleaning), or more permanently resident (i.e. also found in the wearer's nose, in which case laundry would be of temporary value only).

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Methods

This was a cross-sectional study of hospital staff recruited by e-mail invitation to all staff and by a direct personal approach to staff who were randomly passing through the main atrium of the hospital. The study hospital was a tertiary referral 554-bed university teaching hospital with a median score in the 2012 European Centre for Disease Prevention and Control (ECDC) point prevalence survey (PPS) of Hospital Acquired Infections and Antimicrobial Use.[4] Data were also collected on job description, the age of the lanyard and the time, if ever, since it was last laundered. *Staphylococcus aureus* was chosen as a representative marker of potential bacterial transmission.

The Chairman of the Saint James's Hospital and the Adelaide and Meath Hospitals Dublin incorporating the National Children's Hospital Research Ethics committee considered that ethical approval was not required. All data were anonymized. If the healthcare worker expressed a wish for results of the nose swab, they were asked to submit a separate nose swab with full patient demographic data in the normal manner. Healthcare workers were invited to exchange their lanyards for a new one and the used lanyards were cultured in nutrient broth overnight. Nasal swabs were also taken from the lanyard wearer. The following data were noted: job description; age of lanyard use; lanyard laundry frequency. All lanyards were constructed from fabric with plastic attachments and derived from a variety of sources including hospital supplies and industry sponsors. Frontline staff were defined as those whose job descriptions included either direct physical contact with patients or their immediate physical environment, and participants were also asked to confirm if they had direct patient contact. Frontline staff were compared to non-frontline staff using GraphPad Prism version 6.0h for significant differences with *P*-values and chi-squared Fisher's exact test (two tailed) with relative risk (RR) and odds ratio (OR) with 95% confidence interval (CI). No patients were involved in this study.

One hundred and two staff volunteered with informed verbal consent to exchange lanyards and the used ones were collected into sterile containers. A nasal swab (Ames transport medium) was collected from each volunteer staff member. Sixty-five of these staff were classified as frontline staff, i.e. they had direct patient physical contact.

Lanyard and nasal swabs were separately enriched in nutrient broth overnight at 37°C. After 24 h the broth was inoculated on to *S. aureus* identification agar SAID (bioMérieux, Marcy l'Etoile, France), and incubated at 37°C for 48 h. A single colony was subcultured for purity and tested with a pastorex and/or coagulase test. Positive pastorex/coagulase samples were analysed by Vitek (bioMérieux) for identification using the GP card and antimicrobial sensitivity testing with the AST-P620 card using EUCAST breakpoints. All specimens and data were collected within three days in August 2012. Phenotypic analysis and DNA extraction was performed within seven days of bacterial isolation on overnight cultures and frozen at −80°C, and PFGE was performed on extracts within one month.

Molecular fingerprinting

Isolates were tested from seven study participants that cultured MSSA from both lanyard and nasal samples. Two isolates (one lanyard and one nasal) per participant were compared to verify strain relationship. Pulsed-field gel electrophoresis (PFGE) was performed on a single gel and occasion from the frozen DNA extracts according to Mulvey modified by washing the plugs in 5 mL of Tris—EDTA buffer.[5] Three epidemiologically unrelated MSSA strains from the routine hospital laboratory service were included in the collection. Cluster analysis was performed using Bionumerics 5.0 based on UPGMA (unweighted pair group method with arithmetic mean) using the Dice coefficient and a band tolerance of 1.5%, and a cut-off value of 95% was selected for the demarcation of PFGE groups.[6] The operator was blinded to the epidemiological background of isolates.

Results

The mean age of lanyards was 22 months and 91% had never been laundered. Nine staff (8.8%) had laundered their lanyard ranging from one week to one year previously, and two of these staff were nasal carriers but none had positive lanyard cultures. Nine out of 122 (8.8%) lanyards were culture positive for *S. aureus*, and in seven (6.8%) the same organism was also cultured from the heathcare worker's nose swab. Two lanyards were positive from staff who had negative nasal cultures. One MRSA was cultured from a nasal carrier whose lanyard was culture negative.

Table I shows lanyard and nose *S. aureus* positivity data for frontline and non-frontline staff. The differences between frontline and non-frontline staff were not statistically significant for lanyard [RR: 1.99 (CI: 0.44—9.1); OR: 2.11 (CI: 0.41—10.75); $P = 0.48$] and nose positivity [RR: 1.36 (CI: 0.73—2.53); OR: 1.58 (CI: 0.65—3.82); $P = 0.38$].

Figure 1 shows all seven pairs of isolates derived from within each subject, lanyard and nasal, to be indistinguishable by PFGE. The dendrogram shows all seven pairs (groups A, B, C, D, F, G, K), of *S. aureus* each clustering at 100% within each pair from nose and lanyard cultures. Strains H, I, and J were epidemiologically unrelated control strains of *S. aureus*.

Similarly, phenotypic analysis showed indistinguishable antibiograms for each pair of isolates using the 20 antimicrobial agents in the Vitek P620 card. Three epidemiologically unrelated MSSA controls were included to verify the ability of the method to distinguish unrelated strains. PFGE analysis classified these controls as unique and unrelated at a strain level within the species. Each participant clone (either nose or lanyard isolate) was unrelated to any other participant clone at a wide genetic distance, reflecting lack of relatedness and good discriminating power of the typing system.

Discussion

This is the first study to use molecular analysis to compare pathogens on lanyards with those present in the wearer's nose,

Table I
Staphylococcus aureus culture positivity among frontline and non-frontline staff

	No.	Nose swab positive	Lanyard culture positive
Frontline staff	65 (64%)	24 (37%)	7 (11%)
Non-frontline staff	37 (36%)	10 (27%)	2 (5%)
Total staff	102	34 (33.3%)	9 (8.8%)