

<sup>c</sup>Department of Infectious Diseases,  
National Institute of Health,  
Rome, Italy  
E-mail address: giovanni.orsi@uniroma1.it

Available online 6 February 2009

\* Corresponding author. Address: Dipartimento di Scienze di Sanità Pubblica, Università 'La Sapienza' Roma, P.le Aldo Moro 5, 00185 Roma, Italy. Tel.: +39 6 49914553; fax: +39 6 4454845.

© 2009 The Hospital Infection Society. Published by Elsevier Ltd. All rights reserved.

doi:10.1016/j.jhin.2008.11.027

### Contamination of stethoscopes with MRSA and current disinfection practices

Madam,

Meticillin-resistant *Staphylococcus aureus* (MRSA) is a major challenge in healthcare institutions worldwide. For very severe infections, the risk of death is about two times higher with MRSA than with meticillin-susceptible *Staphylococcus aureus*.<sup>1</sup> Stethoscopes have been shown to have a high rate of bacterial contamination, with 0–20% of those tested being colonised with MRSA.<sup>2–6</sup> Healthcare professionals (HCPs) frequently use stethoscopes when performing assessments on patients, and anecdotes suggest that there is wide variation in the stethoscope disinfection practices used.

A study was conducted to ascertain if the diaphragm of a sample of HCPs' stethoscopes was colonised with MRSA, and to gain an insight into the stethoscope disinfection practices currently in use among this sample.

The study was carried out in the physiotherapy departments of four acute Irish hospitals. An average of 11 HCPs in each hospital were approached and agreed to participate in the study ( $N=44$ ). On the morning of the assessment the HCPs who had volunteered were provided with an information leaflet outlining the details of the study, and given the option to consent or decline to participate.

The diaphragm of each of the participants' stethoscopes was swabbed for MRSA. The procedure involved rubbing a sterile cotton swab, moistened with sterile normal saline, over the entire diaphragm of the stethoscope in a circular motion. The swabs were immediately placed in

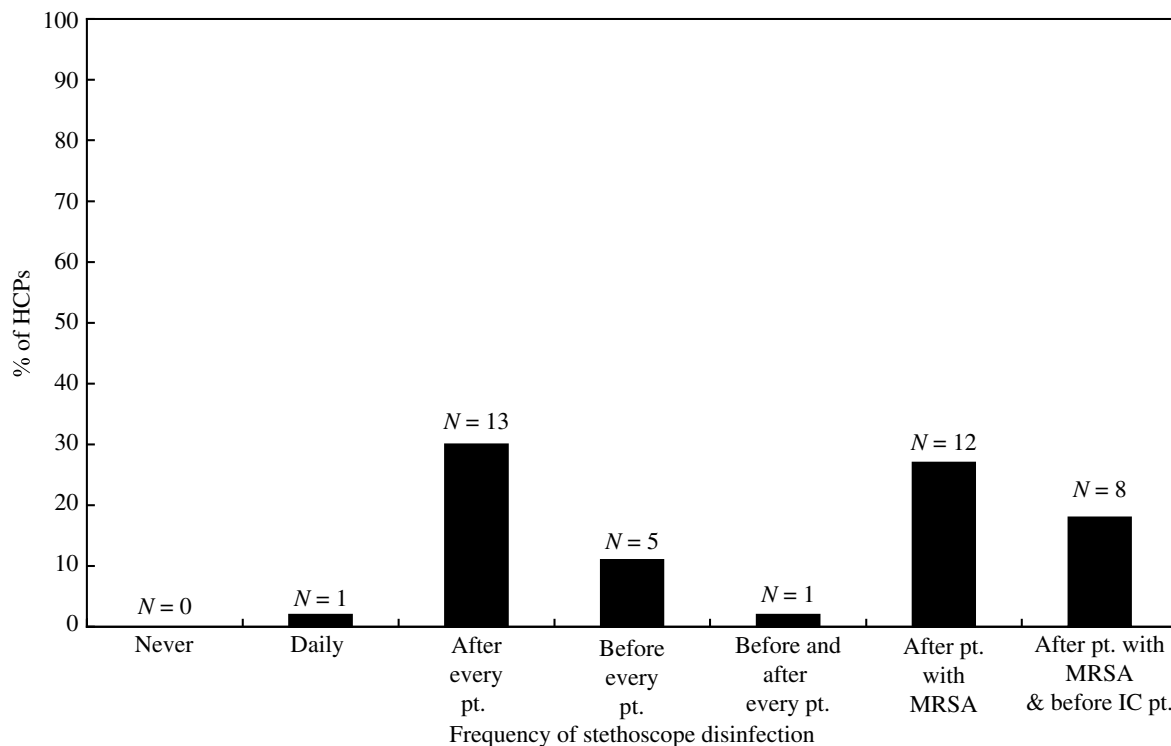
Amies transport medium. While the researcher was swabbing the stethoscopes the participants completed a questionnaire about stethoscope disinfection practices. Each swab was rubbed over the surface of an MRSA ID chromogenic agar plate. These were incubated at 36 °C and examined for the presence of green colonies after 24 h and again after 48 h. The presence of at least one green colony indicates a positive result, i.e. the presence of MRSA.

MRSA was not isolated from the diaphragm of any of the 44 stethoscopes that were tested. Bacterial growth was identified on a number of the agar plates, but identification and quantification of these colonies lay outside the scope of this study. When asked how often they disinfect their stethoscopes, 2% ( $N=1$ ) of the participants reported disinfecting their stethoscope once daily. Thirty percent ( $N=13$ ) said that they did so after every patient contact, while 11% did so before every patient contact. Two percent ( $N=1$ ) reported disinfecting their stethoscopes before and after every patient contact. Twenty-seven percent ( $N=12$ ) only disinfecting their stethoscopes after treating a patient with MRSA. None of the respondents reported never disinfecting their stethoscopes (Figure 1).

The most frequently used method of stethoscope disinfection was swabbing with alcohol wipes. Seventy five percent ( $N=33$ ) of the HCPs surveyed reported using alcohol wipes to disinfect their stethoscopes.

When asked what they thought would encourage them to disinfect their stethoscopes more frequently, 64% ( $N=28$ ) of the participants said increased availability of alcohol/disinfectant wipes. Seven percent ( $N=3$ ) listed other methods that they felt would be effective in encouraging them to disinfect their stethoscopes, with a number of the participants selecting more than one option.

The results of this study indicate that the diaphragm of the stethoscopes used by a sample of HCPs working in acute hospitals in Ireland did not carry MRSA. This suggests that the current stethoscope disinfection practices in use among this sample of HCPs are effective in preventing the colonisation of their stethoscopes with MRSA. Nevertheless the identification of some bacteria on the diaphragm of the stethoscope suggests that current stethoscope disinfection practices are not sufficient to eliminate all bacteria. HCPs' stethoscopes may still act as vectors for the transmission of other nosocomial bacteria such as *Clostridium difficile* and vancomycin-resistant enterococci.



**Figure 1** Bar chart illustrating the reported frequency of stethoscope disinfection expressed as a percentage of the total sample of healthcare professionals (HCPs). IC, immunocompromised; pt., patient.

It is of concern that 27% of the respondents only disinfected their stethoscopes after treating a patient with MRSA. This practice could lead to the spread of the organism as there may be a delay in determining whether a patient is MRSA positive; it also creates a window for the transmission of other nosocomial bacteria. In their respective studies both Nunez *et al.* and Parmar *et al.* acknowledged that to be effective, decontamination would have to be performed after each use of the stethoscope.<sup>7,8</sup>

The method of stethoscope disinfection used by the majority of HCPs in this study was swabbing with alcohol wipes. Convenience and availability appeared to determine the method of stethoscope disinfection used by HCPs.

In light of the results of this study it is recommended that clear guidelines, outlining the need to disinfect stethoscopes before and after every patient contact, using alcohol wipes, are established in order to limit the bacterial load to which patients are exposed. In addition, alcohol wipes should be made widely available at a specific location on all hospital wards.

#### Conflict of interest statement

None declared.

#### Funding sources

This study was funded by the research fund in the microbiology department of St. Vincent's University Hospital Microbiology Research Fund.

#### References

1. Cosgrove SE, Qi Y, Kaye KS, Harbarth S, Karchmer AW, Carmeli Y. The impact of methicillin resistance in *Staphylococcus aureus* bacteremia on patient outcomes: mortality, length of stay and hospital charges. *Infect Control Hosp Epidemiol* 2005;**26**:166–174.
2. Zuliani Maluf ME, Maldonado AF, Bercial ME, Pedroso SA. Stethoscope: a friend or an enemy? *Sao Paulo Med J* 2002; **120**:13–15.
3. Jones JS, Hoerle D, Riekse R. Stethoscopes: a potential vector of infection? *Ann Emerg Med* 1995;**26**:296–299.
4. Marinella MA, Pierson C, Chenoweth C. The stethoscope a potential source of nosocomial infection? *Arch Intern Med* 1997; **157**:786–790.
5. Smith MA, Mathewson JJ, Ulert IA, Scerpella EG, Ericsson CD. Contaminated stethoscopes revisited. *Arch Intern Med* 1996; **156**:82–84.
6. Sanders S. The stethoscope and cross-infection revisited. *Br J Gen Pract* 2005;**55**:971–972.
7. Nunez S, Moreno A, Green K, Villar J. The stethoscope in the emergency department: a vector of infection? *Epidemiol Infect* 2002;**124**:233–237.
8. Parmer RC, Valvi CC, Sira P, Kamat JR. A prospective randomised double blind study of comparative efficacy of immediate versus daily cleaning of stethoscope using 66% ethyl alcohol. *Indian J Med Sci* 2004;**58**:423–430.

L. Fenelon<sup>a</sup>  
 L. Holcroft<sup>b,\*</sup>, N. Waters<sup>b</sup>  
<sup>a</sup>St. Vincent's University Hospital,  
 Dublin, Ireland  
<sup>b</sup>School of Physiotherapy and Performance  
 Science, UCD, Dublin, Ireland E-mail address:  
[lorna.holcroft@gmail.com](mailto:lorna.holcroft@gmail.com)

Available online 6 February 2009

\* Corresponding author. Address: University College Dublin, School of Physiotherapy and Performance Science, Belfield, Dublin, Ireland. Tel.: +353 861757902; fax: +353 17166501.

© 2008 The Hospital Infection Society. Published by Elsevier Ltd. All rights reserved.

doi:10.1016/j.jhin.2008.11.009

### Serum albumin in risk assessment for *Clostridium difficile*

Madam,

We have examined serum albumin as a risk factor for *Clostridium difficile*-associated diarrhoea (CDAD).

CDAD and serum albumin are related. In a series of studies of patients with *C. difficile*, it has been found that serum albumin is lower in patients with CDAD and that it is associated with refractoriness.<sup>1–5</sup> A fall in serum albumin is associated with the onset of CDAD.<sup>6</sup> There is a rationale since *C. difficile* toxin A in rats induces a leucocyte-dependent leakage of albumin from postcapillary venules.<sup>7</sup> Toxin A increases vascular and mucosal permeability resulting in intraluminal accumulation of serum albumin-rich fluid.<sup>8</sup>

We considered anonymised records of a sample of 9409 patients, aged >13 years, admitted non-electively from 1 April 2006 to 30 November 2007 who had no pressure ulcer recorded on admission because pressure ulcers can reduce albumin. CDAD was diagnosed in 138 patients, of whom 37 were not tested until more than two days after admission. We excluded all patients tested in the first two days since they may have had CDAD on admission. Only four patients with a diagnosis of CDAD were aged <65 years, and we excluded patients aged <65 years from our analysis. Prior to data analysis, Caldicott Guardian and ethics opinions were sought and the study was deemed to be a service evaluation, not in need of a formal ethics approval.

Binary logistic regression with CDAD as dependent variable, of serum albumin, haemoglobin, sodium, gender and age with the forward conditional method gave the inverse of serum albumin, hypoalbuminaemia and age as significant.

Using receiver operating characteristic, serum albumin (inverted, as low values are associated with cases) showed a greater area under the curve as a classifier of CDAD than age, but hypoalbuminaemia alone was similar (Figure 1).

While serum albumin is slightly superior to a binary split into normal and abnormally low albumin, the latter has the advantage of simplicity. It is easy to interpret and is objective. About 90% of cases are in 10% of the sample who are elderly and hypoalbuminaemic.

Since serum albumin is increasingly used routinely on admission, this may be a useful screening tool. Serum albumin with age (both objective and easy to interpret) is sensitive and specific and, in our sample, suggested that 10% were at risk. Concentrating infection control measures on this subgroup could be more efficient than using the current risk tool that focuses on age and antibiotic use. This would be especially useful in planned admission cases where albumin could be measured in assessment clinics. We have previously shown the Waterlow score to be useful in assessment of risk for CDAD. This is non-invasive and can be

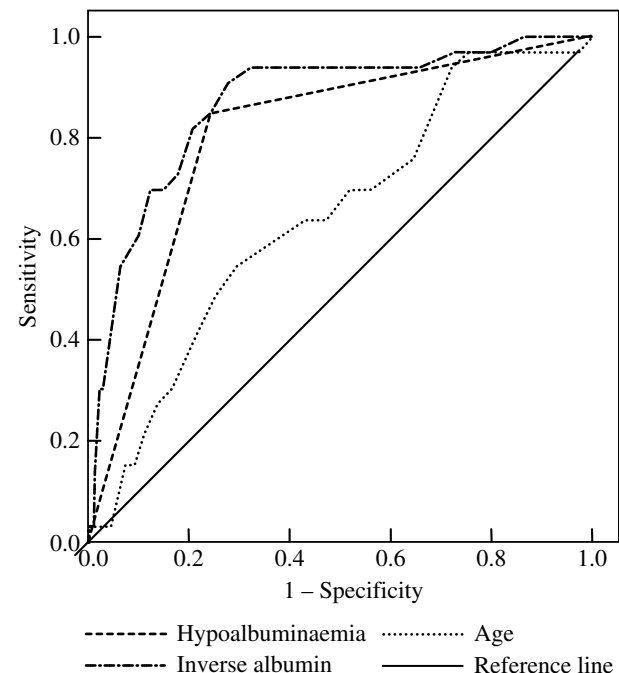


Figure 1 Receiver operating characteristic curves for patients aged >64 years. Diagonal segments are produced by ties.