

Could stethoscope be a source of infection?

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ABSTRACT

Objectives: We aimed to determine the prevalence of bacterial colonisation of stethoscopes in various departments in a district hospital and audited the effect of staff education at reducing this contamination.

Methodology: Bacteriological culture swabs were taken from the stethoscopes of consultants, trainees, medical students, physiotherapists and nursing staff in various departments. A campaign was launched and all the staff was asked to regularly clean the stethoscopes with alcohol wipes after each use. After an interval of one week, culture swabs were repeated and antibiotic sensitivity testing was carried out. The staff habit of cleaning their stethoscopes was compared before and after the campaign.

Results: Ninety two stethoscopes were swabbed, 47 in the first week and 45 in the second week. In the first week almost all (n=44) stethoscopes were positive for staphylococcus aureus. In the second week, 38 stethoscopes had positive cultures, all of which grew Staphylococcus epidermidis. None of the cultures were positive for methicillin resistant Staphylococcus aureus (MRSA) in either week. The number of colony forming units dropped significantly from a median of 20 (range 0-50) in the first week to a median of 8 (range 0-30) in the second week. Staff awareness led to increased frequency of stethoscopes cleaning.

Conclusion: Stethoscopes carry potential pathogens, but staff education and change in stethoscope cleaning habits reduce the risk imposed by the use of this standard piece of medical equipment.

KEY WORDS: Infection control, Hygiene, Stethoscope, MRSA.

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INTRODUCTION

Nosocomial infections (NI) are a common cause of morbidity and mortality in hospitalized patients. Approximately 5-10% of patients may acquire infections while in hospital.¹ In addition to the increased morbidity and mortality, this inevitably results in increased financial burdens on the healthcare system.^{1,2}

Stethoscopes have long been considered as major vector in transmission of NI.^{1,2} Staphylococcus epidermidis is the most common bacteria isolated from the diaphragm of the stethoscopes.³ Madar et al found Staphylococcus species in 85% of the stethoscopes sampled. Marinella et al sampled 40 stethoscopes and showed colonization with Staphylococcus aureus in almost all the samples taken. Growth of other organisms, such as E.Coli,

C.Diff, and MRSA from stethoscopes has been controversial.^{1,4}

In 1860 Ignaz Semmelweis claimed that hand hygiene had significantly reduced mortality from puerperal sepsis in obstetric patients.⁵ His work was subsequently confirmed by the Louis Pasteur's germ theory. Recently, outbreaks of NI have been linked to other sources such as electronic thermometers, latex gloves, blood pressure cuffs, computer terminals⁶ and Doppler probes.¹

Stethoscopes are widely used by the health care professionals and are rarely cleaned or disinfected.^{3,7} Various agents have been used to stratify their potency to eliminate the germs from the diaphragms of the stethoscopes.^{1,2,4} Among all, Isopropylene alcohol has been found to have a significant impact on the reduction of the bacterial load from diaphragm of the stethoscopes.⁸ However, the role of stethoscopes in spreading viral infections, particularly respiratory syncytial virus has not been confirmed.² Moreover, efficacy of the Alco wipes against viruses has yet to be established. So far, none of the studies in the literature has metaphorically claimed the isolation of *Clostridium difficile* from the stethoscopes.⁸ This study aimed to determine the prevalence of colonization of stethoscopes and assess the efficacy of routinely used cleansing agents, and role of healthcare professionals in reducing the prevalence of stethoscope colonization.

METHODOLOGY

This was a prospective audit. Ninety two stethoscopes used by consultants, trainees, medical students, physiotherapists, and nursing staff were sampled. Cultures were obtained by direct impression of the diaphragm of stethoscopes onto blood agar plates. Anaerobic blood agar plates were taken straight to the laboratory, and samples were incubated at 37°C for 48 hours. Micro-organisms cultured from the plates were identified and measured by colony forming units (CFU). Antibiotic sensitivity was carried out on some samples.

Diaphragms of the stethoscopes were cultured twice in a two week period (47 in the first week, and 45 stethoscopes in second week). Each of the partici-

pants was asked to fill a questionnaire regarding their habit of cleaning stethoscopes and the agent they used for cleaning. Participants were chosen randomly in the first week and were asked to clean their stethoscopes with alcohol wipes after being used. The same stethoscopes were swabbed after a week and the same questionnaire was filled again to assess the habits of stethoscope cleaning and the influence of staff education. A p-value of less than 0.05 was deemed significant.

RESULTS

A total of 92 stethoscopes were sampled, 47 in the first week and 45 in the second week. The participants' included were consultants (n=4), trainees (n=40) medical students (n=1), nurses and physiotherapists (n=47). The samples were collected from various departments, surgical (n=33), medical (n=34), paediatric (n=7), anaesthetic (n=12) and Obstetric and Gynaecology (n=7).

In the first week, almost all stethoscopes had a positive culture (46 out of 47 stethoscopes). The organisms isolated in the positive cultures were *Staphylococcus aureus* (n=44) and *staphylococcus epidermidis* (n=2). In the second week, only 38 out of 45 stethoscopes had a positive culture. However, the organism isolated was *S-epidermidis* in all the positive cultures and none of the stethoscopes tested positive for *Staphylococcus aureus* (Table-I).

Bacterial load, measured by CFU, has dropped after staff education in the second week. A median of 20 CFU (Range 0-50) were isolated in the first week; whereas, a median of 8 CFU (Range 0-30) were isolated in the second week from the cultured stethoscopes (P = 0.001).

The stethoscope cleaning habits of the participants have changed in the second week as reflected on the questionnaire. In the second week, participants who cleaned their stethoscopes frequently (after each patient or daily) increased from 12 out of 47 participants to 25 out of 45 participants (p=0.03) (Table-II).

Table-I: Type of the organisms isolated before and after the campaign.

Organism	Week 1	Week 2
<i>Staphylococcus epidermidis</i>	2	38
<i>Staphylococcus aureus</i>	44	0
No Growth	1	7

Table-II: Frequency of cleaning before and after staff education.

	Week 1	Week 2
Frequently (after every patient, daily)	12	25
Less frequently (weekly, monthly)	35	20

DISCUSSION

NI is occurring more frequently and tends to affect debilitated patients, which render their management more challenging and expensive. Up to 10% of patients acquire an infection during their stay in the hospital. This poses a significant financial burden on an already stretched healthcare system. The stethoscope has always been recognized as a potential vector of bacteria and they could be a source of NI. Awareness among the health care professionals is of utmost importance. The aim of this study was to measure bacterial colonization of stethoscopes used by healthcare professionals and audit the effect of staff education at reducing this contamination.

The results of this study suggest that up to 94% of stethoscopes are contaminated by potentially pathogenic bacteria (*Staphylococcus aureus*). Although this is relatively high, staff education and change in stethoscopes cleaning habits has significantly reduced the degree of contamination and therefore could potentially reduce the risk of NI.

We recognize certain limitations to our study. First, the number of stethoscopes cultured was relatively small. Secondly, we didn't collect data about the episodes of NIs that occurred during the two stages of our study to allow comparison and to show the real effect on patients. However, even if this was collected, it is unlikely to show significant differences due to the relatively low incidence of NI in our hospital.

Methicillin resistant *S-aureus* (MRSA), *Clostridium difficile* and other virulent organisms were previously isolated from stethoscopes and various other hospital equipments.^{1,4,6} However, in our study; we failed to isolate these pathogenic bacteria, though we were specifically targeting them. This could be due to the strict procedures in place, which includes vigorous patients screening and isolation of carriers, or simply due to the relatively small sample size. These organisms still poses a threat to patients and

stethoscopes could act as a reservoir for all these organisms.

Healthcare professionals play a key role in preventing NIs. In our study staff education led to more frequent cleaning of stethoscopes as shown from the questionnaires filled at both stages of the study. Also in the second week, both the number of CFUs and the number of positive cultures were significantly reduced. We also noticed that *S-aureus* was replaced with coagulase negative staphylococci (*Staphylococcus epidermidis*), which is considered as non-harmful skin flora.

There was no standard policy in our hospital regarding stethoscope cleaning at the time of the study. Our study suggested that, if such policy exists, we could reduce stethoscope contamination and may reduce the incidence of NI. In summary, stethoscopes carry clinically significant pathogenic organisms. Physicians, nurses and all health care professionals need to be more vigilant with their role in disease transmission.

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