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Case Study

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Staphylococcus on your Stethoscope?

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A B S T R A C T

Stethoscope harbours pathogenic microbes which can transmit to patients and health care workers. Disinfection of stethoscope can prevent this transmission and will reduce hospital acquired infections. Aim: To compare the bacterial contamination in personal stethoscope of doctors and ward stethoscopes which are disinfected routinely. Design: Single blinded study Methods and Material: A baseline culture was done on ward and personal stethoscopes. Ward stethoscopes were disinfected daily for four weeks and bacterial culture was done after each week. After four weeks, the bacterial contamination of ward and doctor's stethoscope was compared. Results: In baseline culture, 22 stethoscopes (61%) had potential pathogenic microorganisms. After four weeks without any intervention, no considerable change was observed in the bacterial load and the pathogenic organisms cultured from personal stethoscopes. However, the bacterial load and the pathogenic organisms were markedly reduced in ward stethoscope after four weeks of disinfection. Conclusions: Stethoscopes harbours potentially pathogenic microorganisms and acts as a vector for transmission of HAIs among patients. This study proves that regular disinfection of stethoscope will reduce its bacterial contamination. Key-words: Stethoscope, Disinfection, Bacterial contamination, Hospital acquired infection, Non critical medical instruments. Key Messages: Hospital acquired infections can be greatly reduced if doctors follow disinfection of non-critical medical equipment when it is visibly soiled and on a regular basis.

Introduction

The Centres for Disease control and prevention (CDC) acknowledge that infections are associated with devices used in medical procedures. Stethoscopes are indicated as possible vehicles of pathogens. (Carducci *et al.*, 2016) Mayo Clinic's study concluded that their results provide strong evidence of the potential for stethoscope-mediated transmission of pathogenic bacteria and the need to disinfect stethoscopes after each use. (Longtin *et al.*, 2014; Lokkur and Nagaraj, 2014) The Healthcare

Infection Control Practices Advisory Committee (HICPAC) and CDC suggest that non-critical medical equipment should be disinfected and cleaned when it is visibly soiled and on a regular basis. (O'Flaherty and Fenelon, 2015) Disinfection of stethoscopes will reduce bacterial colonization and thereby decrease the transmission of nosocomial infections. (Uneke *et al.*, 2010)

The main objectives of this study includes to check the presence of pathogenic bacteria in the personal stethoscope of Doctors and ward stethoscopes. And also to assess the effect of regular disinfection practice on bacterial colonization in the ward stethoscopes.

Materials and Methods

Study design

Single-blinded study

Study period

Two months

Study population

The personal stethoscopes of Doctors posted in General medicine and ward stethoscopes of General Medicine, General Surgery, Paediatrics, Obstetrics and Gynaecology.

The sample size is 30 including ward and doctor's stethoscopes.

A baseline culture of the stethoscope's diaphragm is done to ward stethoscopes and to the personal stethoscopes of the participants. The participants are the control group and the ward stethoscopes will undergo intervention.

The ward stethoscopes will be disinfected three times a day with isopropyl alcohol for four weeks. After each week, a bacterial culture of the diaphragm of ward stethoscopes is done to assess bacterial colonization. At the end of four weeks, a bacterial culture is done on the diaphragm of stethoscopes of participants and the ward stethoscopes and the growth status will be analyzed.

Results and Discussion

In this study, 36 stethoscopes were included (20 ward stethoscopes and 16 doctor's stethoscopes). A baseline culture was done on the doctor's stethoscope and ward stethoscope. Out of 36 stethoscopes cultured, 33 stethoscopes were contaminated. Microorganisms isolated were *Methicillin-resistant Staphylococcus aureus* (*MRSA), Staphylococcus aureus, Coagulase-negative Staphylococci (CoNS), Diphtheroids, Pseudomonas aeruginosa, Escherichia coli, and Candida spp.* which are considered as potential pathogens. Out of 36 stethoscopes that were cultured, potential pathogenic microorganisms were isolated from 22 stethoscopes (61%). The ward stethoscopes were disinfected two times daily for four weeks and swabs were taken from the diaphragm of the stethoscopes were cultured at the end of each week. At the end of four weeks, the final culture was done and the results are recorded.

Doctor's stethoscope

Many pathogenic organisms have been isolated from doctor's stethoscopes such as MRSA, *S.aureus, Methicillin resistant coagulase negative Staphylococci (MR-CoNS), Diphtheroids, P. aeruginosa* (Table 1). After four weeks without any intervention, no considerable change was observed in the bacterial load and the pathogenic organisms cultured from the diaphragm of the stethoscope.

Ward Stethoscope

The ward stethoscopes included in the study were taken from the wards of Gen. Medicine, Gen. Surgery, OG and Paediatrics. In total, 20 stethoscopes were included in the study. Many pathogenic organisms were isolated in the baseline culture such as *S.aureus*, CONS and *Diphtheroids*.

After four weeks of regular disinfection with isopropyl alcohol, the bacterial load and the pathogenic organisms were markedly reduced. The culture done at the end of each week shows a progressive decrease in the bacterial load and the pathogenic organisms in the ward stethoscopes (Figure 2). However, owing to the small sample size statistical correlation could not be obtained.

Table.1 Bacterial culture report of doctor's stethoscope.

Stethoscope No	Baseline culture	Final culture
1	*S.aureus*	*S.aureus*
2	*S.aureus*	*S.aureus*
3	*S.aureus*	*Micrococci*
4	*S.aureus*	*Candida spp.*
5	*Diphtheroids*	*S.aureus*
6	*Diphtheroids*	No growth
7	*CONS, Diphtheroids , P. aeruginosa*	*Micrococci*
8	*Diphtheroids*	*Micrococci*
9	*CONS*	*Micrococci*
10	*Diphtheroids*	*MR-CONS*
11	*CONS*	*S.aureus*
12	*MRSA*	*Micrococci*
13	*CONS*	*MR-CONS*
14	*Micrococci*	*S.aureus*
15	*P. aeruginosa*	*S.aureus*
16	*CONS, , P. aeruginosa*	*Micrococci*

Fig.1 Frequency of isolation of microorganisms from Doctor's stethoscope.

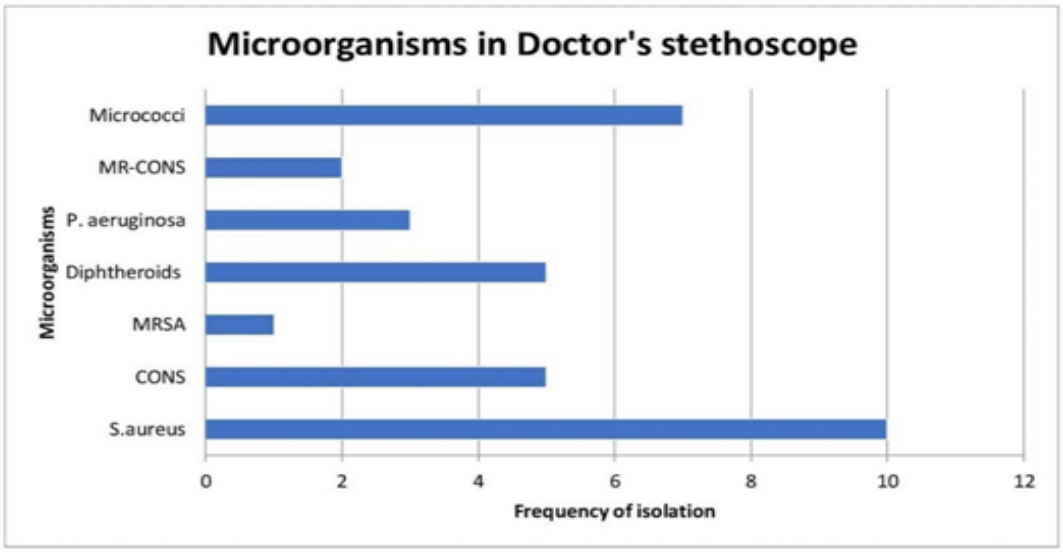
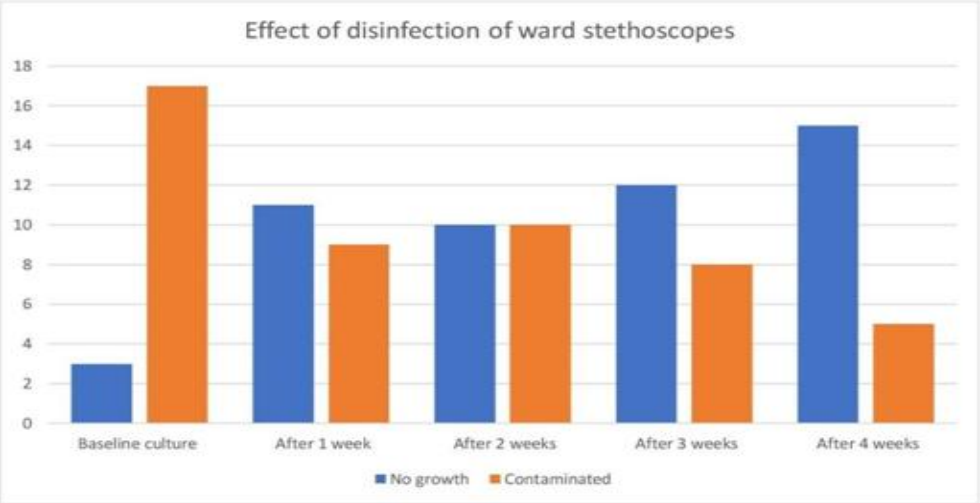


Fig.2 Proportion of stethoscope contaminated with potential pathogenic organisms before and after disinfection of ward stethoscopes.



Medical practitioners' stethoscopes are contaminated by pathogenic microorganisms. In this study, 61% of the stethoscopes resulted in the growth of potential pathogenic organisms. A similar study conducted by Raghubanshi *et al.,* shows that 30%of the stethoscope were contaminated by pathogenic bacteria. *S. aureus* is the most common potential pathogenic organism isolated from stethoscopes. (Raghubanshi *et al.,* 2017) Similarly, in this study, MSSA and MRSA were the most common potential pathogenic organisms isolated. Organisms like *Acinetobacter* and *Klebsiella* were isolated in their study.

Organisms like pseudomonas and Diptheriods and *E.coli* were isolated in this study. A similar study done by Lecat *et al.,* showed that after disinfection 28.28% of stethoscopes were growth free. (Lecat *et al.,* 2009) In this study, 75% of stethoscopes were growth free after 4 weeks of regular disinfection.

A similar study done by Jones *et al.,* showed that 89% of stethoscopes were contaminated and 19% of stethoscopes grew *S.aureus*. Disinfection of the stethoscope diaphragm resulted in an immediate reduction in the bacterial load by 94% with alcohol swabs. (Jones *et al.,* 1995)

In this study, regular disinfection of the stethoscope with alcohol-based disinfectants for four weeks has decreased bacterial contamination to 75%. A similar study done by Merlin *et al.,* (2009) showed that out of 50 stethoscopes, 16 stethoscopes (32%) had MRSA colonization. In this study, one doctor's stethoscope had MRSA colonization. In another similar study done by Cohen *et al.,* (1997) 54.4% *S.aureus* and 7.3% MRSA were isolated. In this study, 31% of *S. aureus* was isolated from Doctor's stethoscope. In their study, cleaning with alcohol reduced the colony count by an average of 93.6%. In this study, 75% of stethoscopes had no growth after 4 weeks of regular disinfection. In a similar study by Parmar *et al.,* compared the efficacy of immediate versus daily cleaning of a stethoscope using 66% ethyl alcohol. Immediate cleaning and daily cleaning were associated with a significant reduction in the rate of contamination to 28% and 25% respectively.

The study concluded that no statistically significant difference between immediate disinfection and daily cleaning of the stethoscope in terms of the efficacy of disinfection. In this study, regular disinfection showed a progressive reduction in bacterial contamination of the stethoscope over the course of four weeks. Stethoscopes harbor potentially

pathogenic microorganisms and it acts as a vector for the transmission of HAIs among patients. This study proves that regular disinfection of stethoscopes will reduce the bacterial contamination of stethoscopes thereby decreasing the rate of hospital-acquired infections.

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