

# Stethoscopes: A Potential Source of Nosocomial Infections\*

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## ABSTRACT

Nosocomial infections remain a significant hazard for hospitalized patients. Stethoscopes because of their universal use by medical professionals, can be a potential source of nosocomial infections. This study was undertaken to determine the stethoscope-cleaning practices among medical health providers at the Infectious Ward of the Santo Tomas University Hospital; to show whether the stethoscope is a potential source of nosocomial infection; and to compare the effectiveness of common antiseptics (i.e. soap and water, 70% isopropyl alcohol and hypochlorous acid in solution) in disinfecting stethoscopes.

Health care providers were asked how often they clean their stethoscopes and what is their cleansing agent of choice. Cultures were then obtained from the diaphragm of 30 randomly chosen stethoscopes, after disinfecting with soap and water, 70% isopropyl alcohol or hypochlorous acid in solution. The transmissibility of human skin flora to the diaphragm of disinfected stethoscopes was also determined.

Results show that 63.3% of health care providers (19 of 30) cleaned their stethoscope a week to a year prior to the survey with 16.7% (5 of 30) doing it monthly and 47% (14 of 30) doing it once yearly while 36.7% (11 of 30) had never cleaned their stethoscopes. There is a trend showing that residents seem to practice disinfection of their stethoscopes more frequently than the other groups surveyed. Alcohol was the preferred agent for cleaning. Fifty seven of the disinfected stethoscopes' diaphragms (17 of 30) that were placed on patient's chest grew *Staphylococcus aureus*. Cleaning of the stethoscope with soap and water, 70% isopropyl alcohol or hypochlorous acid in solution resulted in the disinfection of the stethoscope sampled.

Our results confirm that stethoscopes can be a potential source of infection. This contamination can be greatly reduced by cleansing with soap and water, 70% isopropyl alcohol or hypochlorous acid in solution. We recommend the disinfection of stethoscopes regularly. (*Phil J Microbiol Infect Dis* 2000; 29(2):9-13)

*Key words:* stethoscopes, nosocomial infections

## INTRODUCTION

Nosocomial infections remain a significant hazard for hospitalized patients and health care workers are potential sources of these infections, with many of the pathogens transmitted by hand carriage. This is the rationale behind the time-honored advice for all to wash their hands before and after seeing each patient. However, transmission of infection through contaminated medical devices is also a possibility. Outbreaks of nosocomial infections have already been linked to electronic thermometers,<sup>1</sup> blood pressure cuffs<sup>2</sup> and latex gloves.<sup>3</sup>

Stethoscopes have always been part of the physician's basic paraphernalia when examining patients. It has recently been shown to harbor various organisms on their diaphragm surfaces with coagulase negative staphylococci as the predominant isolate.<sup>4,5</sup> Other organisms isolated were *Staphylococcus aureus*, *Corynebacterium spp.*, *Bacillus spp.*, *Neisseria spp.*, alpha-hemolytic streptococci, *Micrococcus luteus*, *Enterococcus spp.*, *Candida spp.*, Gram negative organisms and *Aspergillus spp.*<sup>6-9</sup> Despite these findings, at present, disinfection of stethoscopes after each use is still not an established and accepted practice.

The authors pursued this study with the following objectives: 1) To determine the stethoscope cleaning practices among medical health care providers at the Infectious Tropical Ward of the clinical division of the Santo Tomas University Hospital; 2) To compare the effectiveness of common antiseptics (i.e. soap and water, 70% isopropyl alcohol or hypochlorous acid in solution) in disinfecting the stethoscopes by culturing swabs of stethoscope diaphragms with or without disinfection; and 3) To show whether the stethoscope is a potential source of nosocomial infection.

## MATERIALS AND METHODS

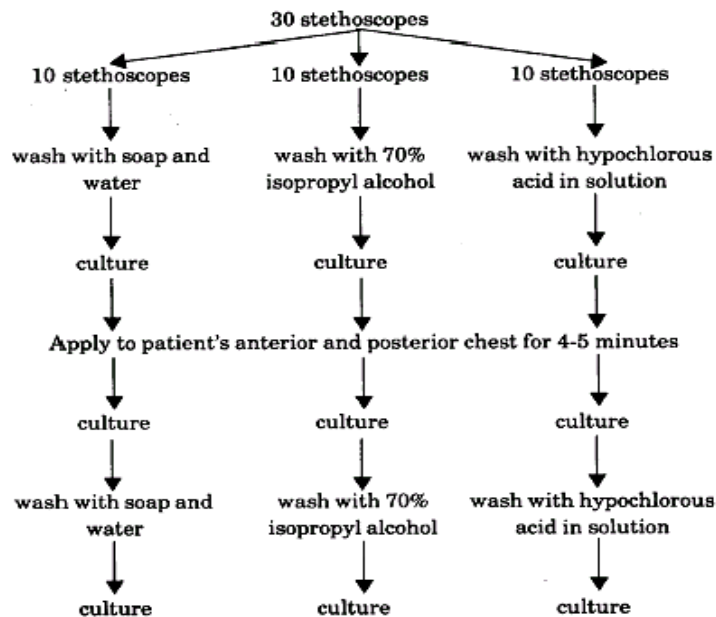
1. A total of thirty clerks, infectious Diseases Ward, Clinical Division of the Santo Tomas University Hospital were randomly chosen and asked to answer a questionnaire to gauge their practice regarding the cleaning of their stethoscopes. 2. Stethoscopes among the surveyed health care providers were likewise randomly chosen and cleaned using soap (Perla) and water, 70% isopropyl alcohol or hypochlorous acid in solution (PRESEPT Disinfectant tablets, one tablet dissolved in 10 liters of water).

2. After drying at room air, the diaphragm of the stethoscopes were swabbed with sterile normal saline solution and immediately sent for culture using 3 ml of Trypticase Soy Broth (TSB).

3. Thereafter, the diaphragms of the stethoscopes were applied to the anterior and posterior chest of patients simulating a physical examination for approximately four to five minutes. The diaphragms were again swabbed with sterile normal saline solution and sent for culture.

4. The stethoscope diaphragms were cleaned using the same agent previously used on them. After air-drying, another swab from the diaphragm was sent for culture. 5. All swabs inoculated in the Trypticase Soy Broth (TSB), were immediately placed on blood agar and MacConkey Agar plates and incubated for 24-48 hours. All growth was identified using standard biochemical techniques (Figure 1).

Figure 1. Flow chart of study



## RESULTS

The reply of the four surveyed groups to the questionnaire on their stethoscope-disinfection practices were tabulated accordingly (Table 1). Of the 30 individuals surveyed, four were nurses, ten were clerks and there were 8 each for interns and residents. Of the four nurses surveyed, two claimed to have cleaned their stethoscope one week to a month prior and said they do so monthly to yearly. The other half never did. Among the clerks, sixty percent (6 out of 10) disinfected their stethoscopes within 8 weeks of the survey, with 5 out of 6 claiming to do so

yearly, while forty percent did not clean them at all. More than half (5 out of 8) of the interns cleaned their stethoscopes two weeks to a year prior and all claimed they do so monthly to yearly while the rest never did. Of the eight residents included in the study, only twenty-five percent did not clean their stethoscopes while the rest claimed to have disinfected it from a week to a year ago. Five out of the six residents who claim they disinfect their stethoscope say they do so yearly. It appears then that the residents practice disinfection of their stethoscopes more frequently than the other groups surveyed. This table also shows that alcohol was the preferred agent for disinfecting.

Table 1. Cleaning practices of stethoscope by physicians and nurses

Question					
When did you last clean your stethoscope?	Nurses N=4	Clerks N=10	Interns N=8	Residents N=8	Total N=30
1 week ago	1 (25%)	1 (10%)	0	2 (25%)	4 (13.3%)
2-4 weeks ago	1 (25%)	4 (40%)	4 (50%)	0	9 (30%)
5-8 weeks ago	0	1 (10%)	0	0	2 (6.67%)
More than 8 weeks ago	0	0	1 (12.5%)	4 (50%)	4 (13.3%)
Never	2 (50%)	4 (40%)	3 (37.5%)	2 (25%)	11 (36.7%)
What agent did you use to clean your stethoscope?	Nurses N=2	Clerks N=6	Interns N=5	Residents N=6	Total N=19
Soap and water	0	0	0	0	0
Alcohol	2	6	5	6	19
Others: Please specify					
Do you clean your stethoscopes after seeing each patient?	Nurses N=4	Clerks N=10	Interns N=8	Residents N=8	Total N=30
YES	0	0	0	0	0
NO	4	10	8	8	30
How often do you clean your stethoscope?	Nurses N=4	Clerks N=10	Interns N=8	Residents N=8	Total N=30
Once daily	0	0	0	0	0
Once weekly	0	0	0	0	0
Once monthly	1 (25%)	1 (10%)	2 (25%)	1 (12.5%)	5 (16.7%)
Once yearly	1 (25%)	5 (50%)	3 (37.5%)	5 (62.5%)	14 (47%)
Never	2 (50%)	4 (40%)	3 (37.5%)	2 (25%)	11 (36.7%)

Seventeen of the thirty stethoscopes (57%) that were applied to the patients' chest grew *Staphylococcus aureus*. This proves the occurrence of organism transfer from the patient's skin to the stethoscope and makes stethoscopes as possible sources of nosocomial infection. On the other hand, all disinfected stethoscopes, regardless of the agent used, failed to grow any organism after incubation (Tables 2 and 3).

## DISCUSSION

The study of Marinella et al<sup>4</sup> has shown that 100% of stethoscopes sampled from the health care workers at the University of Michigan Medical Center were contaminated with coagulase negative staphylococci and other bacteria. After cleaning with isopropyl alcohol, sodium hypochlorite or benzalkonium chloride, bacterial colony counts were shown to be significantly reduced. Our study used a different methodology to show that stethoscopes can be a possible source of infection by showing that a clean stethoscope after coming in contact with patient's skin can harbor common normal skin flora like *Staphylococcus aureus*. The organism grew in 57% of the stethoscopes sampled.

Although most patients might not be especially prone to infection after contact with contaminated stethoscopes, those with open wounds like patients with burns or with tracheostomies may be colonized leading to infection at a later time. The other risk likewise,

would be the possible dissemination of multiresistant organisms that may be manifest in a later outbreak as has been seen in hospital endemics traced to the use of contaminated thermometers, blood pressure cuffs or latest gloves. Handwashing and barrier protection remain the simplest and most important infection control measure. Despite the apparent simplicity, hospital personnel remain poorly compliant.

In contrast to other studies, our study showed that all the three agents used to clean the stethoscopes were equally effective in disinfecting the stethoscope, while other authors showed that though it is not statistically significant, there is a trend that 70% alcohol was more effective in reducing the bacterial count. Its disadvantage would be the possibility that alcohol may dry out the rubber seals. Cleaning with soap and water would be the simplest and most convenient method of disinfecting the stethoscope, while the use of hospital disinfectants in the form of hypochlorous acid is less convenient because the solution is more tedious to prepare.

Stethoscopes are a reservoir of infectious agents that might cause nosocomial infections. Although, we were not able to prove in our study that stethoscopes directly result in infection to patients, the fact that even 4-5 minutes contact with patients skin have been shown to transfer organisms to the stethoscopes indicate that strategies to decrease contamination of stethoscopes should be developed.

Table 2. Incidence of culture positive swabs and their sources of stethoscopes

	A	%	B	%	C	%
Nurses n=4	0	0	1	25	0	0
Clerks n=10	0	0	7	70	0	0
Interns n=8	0	0	3	37.5	0	0
Residents n=8	0	0	6	75	0	0

Legend: A-Swab after cleaning with either soap and water, 70% isopropyl alcohol or hypochlorous acid in solution

B. Swab after applying to a patient's anterior and posterior chest for 4-5 minutes

C. Swab after cleaning with the same solution that was used in A

Table 3. Incidence of culture positive swab and agent used for cleaning

	Soap and water N=10 (%)	70% isopropyl alcohol N=10 (%)	Hypochlorous acid N=10 (%)
Culture positive Organism	5 (50) S. aureus	6 (60) S. aureus	6 (60) S. aureus

## CONCLUSION

The limitation of our study involves the relatively small number of stethoscopes cultured, making us unable to use statistical means to conclude if there is a significant difference in the stethoscope-disinfecting practices of the different medical personnel in our institution. None of the medical personnel surveyed clean their stethoscopes after seeing a patient or even daily. The residents seem to practice disinfection of their stethoscopes more frequently than the other groups surveyed. Alcohol was the preferred agent used by medical personnel for cleansing their stethoscopes.

Soap and water, 70% alcohol and hypochlorous acid in solution are equally effective in disinfecting stethoscopes.

Stethoscopes can be a potential source of nosocomial infection due to the transfer of organisms from the patient's skin flora.

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