INTRODUCTION

The stethoscope is a popular instrument used by health care providers to evaluate the lung, heart, and abdominal sounds of their patients. Although clinicians are instructed about microbiology and the importance of maintaining clean medical instruments, the stethoscope may not be thought of as a potential source of nosocomial infection.

Numerous studies in the past decade have reported the level of bacterial contamination on stethoscopes belonging to physicians and nurses (Table 1). The large majority of the stethoscopes examined in these studies were contaminated; most with Gram-positive organisms, primarily Staphylococcus species. In addition, in some studies the stethoscopes used by physicians were found to be more contaminated than those of nurses and others. Some of the studies examined the effectiveness of different cleaning agents and the self-reported frequency of clinicians cleaning their own stethoscope. The most effective cleaning agent identified was 70% isopropyl alcohol. The reported frequency of stethoscope cleaning varied significantly in each study but many participants reported cleaning their scopes infrequently.

To the best of our knowledge, no studies have been published comparing the prevalence of stethoscope contamination between physicians and physician assistants (PAs). The objectives of this study were to: (1) identify the degree of bacterial contamination present on stethoscopes used by PAs and physicians in the outpatient setting; (2) identify the reported frequency of stethoscope cleaning by physicians and PAs; and (3) determine whether profession, gender, or years of experience predict the degree of bacterial stethoscope contamination.

Contamination Level of Stethoscopes Used By Physicians and Physician Assistants
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To identify the presence and degree of bacterial contamination on stethoscopes used by physicians and physician assistants (PAs) in an outpatient setting, we swabbed and cultured 61 stethoscopes. We defined the degree of contamination as follows: minimal contamination, 1-2 isolates; moderate contamination, 3 isolates; and severe contamination, 4 or more isolates. All stethoscopes were found to be contaminated. Coagulase-negative Staphylococcus was detected on 93.4% of the stethoscopes. Stethoscopes used by physicians were found to have more "moderate to severe" contamination than those used by PAs (p = .03). No difference was found in the reported frequency of stethoscope cleaning between physicians and PAs. Nearly 25% of the participants reported that they never cleaned their stethoscopes. It is recommended that all health care providers clean their stethoscopes on a daily basis.
METHODS

This is a descriptive study that involved swabbing and culturing the stethoscopes of physicians and PAs working in outpatient clinics. Subsequent to approval by the Institutional Review Board, samples were collected from outpatient settings, such as clinics and private practice offices. A survey was used that included questions regarding the number of years in practice, gender of respondent, frequency of cleaning the stethoscope, and profession. An identification number was assigned to each clinical site, and anonymity was maintained for all participants by substituting random numbers in place of names on each survey distributed.

Sterile swabs moistened with a saline solution were used to swab the circumference of the stethoscope diaphragms of participating MDs and PAs. After swabbing each stethoscope, blood agar plates (tryptic soy agar with 5% sheep blood) were streaked, sealed, labeled, and transported to the clinical laboratory. Following the incubation period, the plates were examined for colony forming units (CFUs) and Gram staining was performed to identify the cultured microorganisms (isolates). The level of contamination was determined by counting the number of different isolates on each stethoscope as follows: minimal contamination was defined as 1-2 isolates; moderate contamination as 3 isolates; and severe contamination as 4 or more isolates.

Frequencies and relative frequencies were used to summarize the data. Data were analyzed using SPSS, version 10.0 for Windows. Chi-square tests were used to test for associations between the level of contamination and profession.

RESULTS

A total of 61 stethoscopes that belonged to physicians and PAs were cultured. Twenty-nine (48%) of the participants were PAs and thirty-two (52%) were MDs. Twenty-nine (48%) of the participants were females and thirty-two (52%) were males.

All of the stethoscopes were found to be contaminated. The most commonly identified microorganisms were coagulase-negative Staphylococcus (CoNS), Micrococcus spp, Bacillus spp, Corynebacterium spp, and Streptococcus spp. CoNS was identified on 93.4% of the stethoscopes sampled, and Micrococcus species on 63.9% of them (Figure 1).

Stethoscopes used by physicians showed greater levels of contaminations...
tion than those used by PAs ($X^2 = 6.825; p = .03$). Eight (25%) of the physicians and six (21%) of the PAs reported never having cleaned their stethoscopes. Six (19%) physicians and nine (31%) PAs reported cleaning their stethoscopes daily. We did not find a significant difference between physicians and PAs in the reported frequency of stethoscope cleaning ($X^2 = 1.323; p = .72$).

**DISCUSSION**

Our results suggest that PAs and physicians in the outpatient setting use contaminated stethoscopes, which are potential vectors for the transmission of bacteria from one patient to the next. The heavier contamination of stethoscopes used by physicians compared to PAs is consistent with the results of others.\(^1\)\(^-\)\(^3\)\(^-\)\(^7\) This suggests that physicians clean their stethoscopes less often or they are exposed more frequently to bacteria. Although our study was conducted in an outpatient setting, there is a risk of spreading infections to patients by physicians and PAs who also take care of patients in the hospital.

We know from past and current research that the stethoscopes of physicians, nurses, and PAs are frequently contaminated with microorganisms and that they infrequently clean these devices. While the simple use of isopropyl alcohol to clean the stethoscope has been found to dramatically reduce the number of isolates and CFUs,\(^1\)\(^,\)\(^2\)\(^,\)\(^4\)\(^,\)\(^6\) \(23\%\) of our surveyed participants and \(7\%\) to \(45\%\) of health care providers in other studies reported never having cleaned their stethoscope.\(^1\)\(^,\)\(^7\) This shows that education in this area is needed.

Melanson and collaborators recently evaluated the short- and long-term effect of an educational intervention on the contamination rate of physicians' stethoscopes. They found that a 30-minute lecture addressing the importance of stethoscope cleaning significantly decreased the contamination rate of physicians' stethoscopes at three weeks and the effect was maintained after a 6-month period.\(^9\)

We could not find any previous report comparing stethoscope contamination between physicians and PAs. PAs often are involved in patient care in the outpatient and hospital setting and frequently use the stethoscope. Although their stethoscopes were not contaminated as much as the physicians in this study, our results indicate that they also need more education on stethoscope cleaning.

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**REFERENCES**