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Contaminated physician's stethoscope - a potential source of transmission of infection in the hospital. *Need of frequent disinfection after use*

**Bodh R. Panhotra, PhD, MNAMS,
Anil K. Saxena, MD, FRCP,
Abdulrahman S.Al-Mulhim, FICS, FACS.**

Hospital acquired infections (HAI) are one of the most common cause of higher mortality, morbidity, tremendous human suffering and enhanced cost of patient care both in developing and developed countries. All endeavors towards reducing the patients' suffering and cost of patient management play an important role in the control of such infections. The transmission of HAI occurs by direct patient to patient contact, indirect contact through the contaminated hands of health care workers or through contaminated inanimate objects and medical instruments. The stethoscope is a universal tool constantly used in patient care by medical professionals. Since the same tool is repeatedly used for examining both infected and non infected patients, the diaphragm of the stethoscope gets contaminated with pathogenic bacteria when it comes in direct contact with the patients' skin. Although there is no direct evidence so far, but this might be a potential source of transmission of HAI in wards. With the increasing number of admissions of elderly patients with comorbid conditions, patients undertaking chemotherapy and those being administered with immunosuppressive drugs, it is essential that all possible sources of transmission of HAI should be taken care of. Stethoscopes frequently get contaminated with *Staphylococcus aureus* and several studies have reported the isolation of MRSA from 7-17% of stethoscopes

being used by the medical professionals in the hospitals.¹ Pathogenic bacteria deposited on the diaphragm of stethoscope can survive as long as 6-18 hours, which suggests that if the diaphragm is not disinfected there is a likelihood of transmission of these pathogens to patients.² The present study was undertaken to determine the extent of contamination and effect of decontamination of stethoscopes used by physicians working in medical wards.

The study was conducted by the Infection Control Department of King Fahad Hospital and Tertiary Care Center, Al-Hofuf, Kingdom of Saudi Arabia (KSA) during the period of January to April 2004. The stethoscopes being used by physicians in the department of medicine were selected for the study. The culture samples from the stethoscope were collected while physicians were working in the ward. The stethoscope samples (n=48) were collected with sterile swabs moistened with sterile normal saline. The entire surface of the stethoscope diaphragm was rubbed with the moistened swab and these swabs were cultured on blood agar and MacConkey's agar within 1 hour of collection. Swab samples for culture were also taken from the ear pieces of the stethoscopes. *Staphylococcus* species were identified by Gram's stain, catalase test and tube coagulase test. *Streptococcus (Strep)* species were identified by Gram's stain, catalase test and API 20 *Strep*. The gram negative *Bacilli* were identified by Gram's stain, catalase, oxidase test, API 20E and API 20NE (BioMerieux Sa, Marcy l'Etoile, France). Antibiotic susceptibility of the isolated bacteria was determined by disk diffusion method in accordance with the guideline of National Committee for Clinical Laboratory Standards.

Diaphragm surface swabs were also collected from 10 stethoscopes after disinfecting the diaphragm with 70% isopropyl alcohol swab. The diaphragm surface was rubbed with 70% isopropyl alcohol swab (Saudi Sachet service, Riyadh, KSA), allowed to dry and then the swab samples were taken for culture. The diaphragms of majority (43/48, 89.5%) of the stethoscopes had bacterial contamination with pathogenic and potentially pathogenic bacteria. *Staphylococcus aureus* was the most common (23, 47.9%) isolated bacteria and MRSA could be isolated from 2(4.1%) of the diaphragms of stethoscopes. Gram positive bacteria were more frequently isolated from the stethoscopes than the gram negative bacteria. Multiresistant *Pseudomonas aeruginosa* were isolated from 8.2% of the stethoscope diaphragms and *Acinetobacter baumannii* from 6.2%. The pathogenic and potentially pathogenic bacteria could also be isolated from 16 (33.3%) of the ear tips of stethoscope. *Staphylococcus* was the most common

Table 1 - Microorganisms isolated from the physicians' stethoscopes (n = 48).

Organisms	Diaphragm		Ear piece	
	n	(%)	n	(%)
<i>Staphylococcus epidermidis</i>	8	(16.6)	5	(10.4)
<i>Staphylococcus aureus</i>	23	(47.9)	6	(12.5)
Methicillin-resistant <i>Staphylococcus aureus</i>	2	(4.1)	-	-
<i>Enterococcus faecalis</i>	1	(2)	-	-
<i>Streptococcus salivarius</i>	1	(2)	-	-
<i>B-hemolytic Streptococcus</i>	1	(2)	-	-
<i>Pseudomonas aeruginosa</i>	4	(8.2)	1	(2)
<i>Acinetobacter baumannii</i>	3	(6.2)	2	(4.1)
<i>Aspergillus flavus</i>	-	-	2	(4.1)
Total	43	(89.5)	16	(33.3)

bacteria isolated from ear tips of stethoscopes. Multiresistant *Pseudomonas aeruginosa* were isolated from 2% and *Acinetobacter baumannii* from 4.1% of the ear tips and *Aspergillus flavus* was isolated from 4.1% (Table 1). Contaminating bacteria isolated from the stethoscopes had similar antibiotic susceptibility pattern as those isolated from the patients admitted to the medical wards during the study period. The contaminating bacteria could not be isolated from the 10 stethoscope diaphragm samples collected after disinfection with 70% isopropyl alcohol swabs.

Prevention of HAI transmission in a hospital setting requires a multi pronged approach. It is essential that all possible sources of infection transmission should be blocked by taking effective preventive measures. The basic practice of hand washing, which is the simplest, easiest and most inexpensive can effectively control the transmission of pathogenic bacteria but despite of the simplicity of the procedure a suboptimal compliance has been documented.³

The stethoscope is a universal tool used by the physician for examination of patients. Except for the critical care areas where dedicated stethoscopes are used, physicians use the same stethoscope for examining patients having infection/colonization of the multiresistant pathogenic bacteria. The contaminated diaphragm of these stethoscopes can be a potential vector for the transmission of the pathogenic and potentially pathogenic bacteria from one patient to the other. Elderly patients with underlying comorbid conditions generally under the

care of physicians are more prone to contract HAI. All stethoscopes being used by pediatric physicians working in the community clinic in Israel were observed contaminated and 85.4% of them had staphylococcal contamination, 54.5% were *Staphylococcus aureus* and 7.3% MRSA.⁴ Physicians' stethoscopes being used in the outpatient clinics in the United States of America (USA) had bacterial contamination among 80% and 45% of them were contaminated with *Staphylococcus aureus* including 17% with MRSA.² Bacterial contamination of 85% of the stethoscopes used by the medical staff in Brazil was observed and *Staphylococcus aureus* was the most common contaminating bacteria, although *Klebsiella*, *Pseudomonas* and *Acinetobacter* species were also isolated from some of the stethoscopes.¹ Bernard et al² reported contamination of 65.6% of the stethoscopes with potentially pathogenic bacteria, which could survive on stethoscopes' diaphragm for 6-18 hours and cleaning the diaphragm with 70% alcohol could effectively remove these bacteria.² A study of the culture from the ear tips of the dedicated stethoscopes used on patients under contact precautions reported contamination of 17% of the ear tips with pathogenic bacteria including 1.3% with MRSA and 11% with multiresistant *Acinetobacter baumannii*.⁵

In the present study diaphragms of 89.5% of the stethoscopes used by the physicians were contaminated with pathogenic and potentially pathogenic bacteria, which is comparable to the rate of contamination of stethoscopes already reported from Brazil and USA.^{1,2} However, it is lower than the 100% contamination rate reported from Israel.⁵ *Staphylococcus aureus* was the most common (47.9%) contaminating bacteria and 4.1% had MRSA contamination. Multiresistant *Pseudomonas aeruginosa* were isolated from the diaphragm of 8.2% and *Acinetobacter baumannii* of 6.2% stethoscopes. These bacteria had similar antibiotic susceptibility pattern as of isolated bacteria from the clinical samples of patients admitted in the medical wards, suggesting that the bacterial contamination of stethoscopes occurred during examining the patients. Bacterial contamination of the ear tips was observed in 33.3% of stethoscopes. Cleaning with 70% isopropyl alcohol could effectively disinfect the stethoscope diaphragm. This suggests a high rate of contamination of the physician's stethoscope diaphragms due to its universal use on patients could form a potential source of transmission of infection in the hospital. Therefore, strategies to reduce the contamination of stethoscopes should be developed. The stethoscope diaphragm should be disinfected regularly with a 70% isopropyl alcohol swab, in particular after the examination of a patient having known multiresistant pathogenic bacterial infection or MRSA infection/colonization to minimize transmission of these bacteria.

Received 11th September 2004. Accepted for publication in final form 23rd October 2004.

From the Department of Microbiology (Panhotra), Department of Nephrology (Saxena) and the Department of Surgery (Al-Mulhim), King Fahad Hospital, Al-Hofuf, Al-Hasa, Kingdom of Saudi Arabia. Address correspondence and reprint requests to Prof. B.R. Panhotra, Department of Infection Control, King Fahad Hospital, Al-Hofuf, Al-Hasa 31982, Kingdom of Saudi Arabia. Tel. +966 (3) 5750000/1768. E-mail: drpanhotra2000@yahoo.co.in

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A sero-epidemiologic study on cystic echinococcosis in midwestern region of Turkey

Zafer Cetinkaya, MD, PhD, Ihsan H. Ciftci, MD, PhD,
Reha Demirel, MD, PhD, Mustafa Altindis, MD, PhD,
Erol Ayaz, Med Vet.

Cystic echinococcosis (CE) has been recognized as the most important helminth zoonoses. The parasite is distributed extensively in sheep and cattle raising areas of the world. It has great economic and public health significance in developing countries. It threatens both human and animal health and causes significant economic losses. The following are the risk factors of acquiring CE infection: agricultural or stock-raising lifestyle, low socioeconomic status, climate, bad hygiene and illegal or uncontrolled slaughter.^{1,2} The estimated prevalence of CE in our country depends on the data gathered from the Health Ministry records and retrospective evaluation of surgical interventions. In retrospective studies, the prevalence was found to be 0.8 - 2/100,000; however, the prevalence was reported to be higher (example, 291/100,000 - 585/100,000) in limited

number of seroepidemiologic studies. According to other local studies, the prevalence of *Echinococcus granulosus* infection in dogs varies widely between 0.32 - 40% in different areas of Turkey and varies widely with geographical location. The reported prevalence of CE in domestic animals in Turkey ranged from 11.2 - 68.7%. Having shepherd dogs and watchdogs, especially in rural areas leads to a higher prevalence of infection in these areas. These high prevalence in dogs have a great risk for human health.^{1,2} In this study, we aimed to investigate the prevalence of CE in people working in agricultural and stock-raising rural areas of Afyon, Turkey.

A total of 333 (54.5%) females and 278 (45.5%) males, aged 10-85 years (mean 38.8 ± 16.7), who are living in the villages of Bolvadin, Cay, Cobanlar, Hocalar and Kiziloren districts of Afyon, Turkey were enrolled randomly between January - March 2003. The main livelihood of the enrolled patients was agriculture and stock raising. The nature of the study was explained and informed consent was obtained from all patients. Some socio-demographic status (age, gender, education level, job, and others) and having shepherd dog or watchdog, as well as stock-raising participants were noted. Occupation was classified into 3 groups, where other includes officers, laborers, tradesmen, retired employees and students and compared it with the housewife group and farmer group to determine the seropositivity ratio. Stray dogs were also recorded (Table 1). Serum was harvested from blood collected from the peripheral venous vessels. The serums were stored at -40°C. In the collected serum samples, anti-*Echinococcus* antibodies were investigated by Indirect Hemagglutination kit (Fumouze Laboratoires, Fumouze Levallois-Perret, France). The statistical analysis of the collected data was performed by means of Statistical Package for Social Sciences version 10. Statistical significance was tested with the Chi-square test and Fisher's exact test.

Seronegativity was detected in 552 (85.4%) of 611 cases while 89 (14.6%) cases were detected with seropositivity (Table 1). The seropositivity in women (17.7%) was higher than men (10.8%) and this difference was statistically significant (OR: 1.8, CI 95%: 1.1-2.8, $p=0.016$). When education level was examined, it was determined that 118 (19.3%) of participants were illiterate, 9 of them were bachelors and no statistically significant difference was found between seropositivity and education level ($p=0.542$) (Table 1). Among the participants the rate of having a shepherd dog or watchdog was 72% and the rate of dogs living in certain places was 30.6%. It was also determined that the