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Hand washing and to the stethoscopes contamination in two hospitals in Huanuco, Peru

Lavado de manos y contaminación de estetoscopios en dos hospitales de Huánuco, Perú

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Abstract

Introduction: The stethoscope is the universal tool of the doctor and the health personnel; it is in direct contact with numerous patients and is a possible vector of infections associated with health care. The present research sought to determine the association of hand washing and the stethoscope cleaning with contamination.
Methods: This study was observational, descriptive and transversal. The samples to 70 stethoscope´s diaphragm were cultured and a questionnaire was applied to the health personnel who used them.
Results: The contamination of the stethoscopes was to the 90% and the most frequent microorganism was to the Staphylococcus coagulase negative. In the bivariate analysis, a significant association was found between the contamination of the stethoscopes, the absence of hand washing, and the cleaning frequency less than ten times at the month.
Conclusion: To washing your hands and cleaning the stethoscope more than 10 times a month are protective factors to prevent contamination of stethoscopes.

Keywords: stethoscopes, contamination, health personnel. (Source: MeSH/NLM).

Resumen

Introducción: El estetoscopio es la herramienta universal del médico y personal de salud, está en contacto directo con numerosos pacientes y es un posible vector de infecciones asociadas a la atención de salud. El presente estudio buscó determinar la asociación del lavado de manos y la limpieza de estetoscopios con su contaminación.
Métodos: Estudio de tipo observacional, descriptivo y transversal. Se cultivó muestras del diafragma de 70 estetoscopios y se aplicó un cuestionario al personal de salud que los utilizaba.
Resultados: La contaminación de estetoscopios fue del 90% y el microorganismo más frecuente fue Staphylococcus coagulasa negativo. En el análisis bivariado, se encontró asociación significativa entre la contaminación de estetoscopios, la ausencia de lavado de manos, y la frecuencia de limpieza menor a diez veces al mes.
Conclusión: El lavarse las manos y limpiar el estetoscopio más de 10 veces al mes, son factores protectores para evitar la contaminación de los estetoscopios.

Palabras clave: estetoscopios, contaminación, personal de salud. (Fuente: DeCS/BIREME).

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Introduction

The stethoscope is probably the universal tool of the doctor and health personnel; it is in direct contact with many patients at the day and is considered a possible vector of infections associated with health care (IAHC) (1). The IAHC represent an important public health problem worldwide since it affects the patient, their family environment, the community and the nations, causing expenses related to hospital stay, antibiotics, surgical reinterventions in addition to social costs given by lost wages, of production, etc. (2,3).

According to O'Flaherty (4), the parts of the stethoscope such as the diaphragm, the bell and the olives are contaminated by pathogenic microorganisms with a frequency of up to 85%. According to the microbiological profile, the most frequently isolated microorganisms are Staphylococcus coagulase negative, Methicillin-resistant Staphylococcus aureus (MRSA), Vancomycin-resistant Enterococci and pan-resistant Acinetobacter baumannii that survive on inanimate surfaces such as the stethoscope (5-7).

The hand washing is the most effective and cheap measure for the control of the IAHC and to reduce the morbidity and mortality of the patient. The World Health Organization recommends 05 moments for the hand washing: before touching the patient, before performing a clean / antiseptic task, after the risk of exposure to body fluids, after touching the patient and after contact with the environment of the patient (8.9).

Alcohol-based solutions, either isopropyl alcohol or ethyl alcohol, have proven effective for disinfecting the diaphragms and bells of the stethoscopes because of their fast bactericidal ability, as well as to eliminate the tubercle bacilli, fungi and viruses. Its activity depends on its concentration, so a range between 60 and 90% solution in water (volume / volume) is indicated (10). In 2008, the Center for Disease Control (CDC) published a guide that suggests to the health centers to develop and implement policies and procedures to ensure that the

patient care equipment, including the stethoscope, is properly cleaned before its use in another patient to reduce the number of pathogens present in the stethoscope's diaphragms and therefore decrease the risk of infections associated with health care (11); But despite these recommendations, what has been observed in the daily practice is that not only of the stethoscope cleaning practices are underestimated, but the health workers are stubborn to implementing these practices (12).

The present research seeks to determine the association of hand washing, the method and frequency of the cleaning with the contamination of stethoscopes at the Hermilio Valdizan Regional Hospital and the Huánuco EsSalud II Hospital, in 2016.

Methods

An observational, descriptive and cross-sectional study was carried out from August to October 2016 in the Hermilio Valdizán Regional Hospital and in the EsSalud II Hospital, both second levels of attention hospitals localized in the city of Huánuco. In this research 70 stethoscopes of the health personnel in the areas of medicine, surgery, neonatology, pediatrics, ICU, emergencies and gynecology / obstetrics were studied.

During the cited period, a total of 85 stethoscopes were collected by non-probabilistic sampling for convenience, from this 60 of them belonged to the Hermilio Valdizan Medrano Regional Hospital and 25 from the level II EsSalud hospital of Huanuco; besides to 15 stethoscopes to were excluded to the total because they were not being used or in poor condition, finally we analyzed 70 stethoscopes.

The stethoscope´s diaphragm samples were taken by sterile dry swabs the same ones that to were placed into a tube that contained the Thioglycolate liquid culture media, they were incubated for 24 hours at 37 ° C. Posteriorly, the samples were reseeded in the culture media into a Petri dish: containing blood agar, MacConkey agar, Mannitol salt agar and they were incubated for 48 hours at 37 ° C, after which the colonies were counted, considering a contaminated stethoscope if the count was greater than 20 CFU /diaphragm, subsequently the identification of pathogenic bacteria species was performed by biochemical tests.

To obtain the sociodemographic data and the associated factors, a self-administered questionnaire was applied to doctors, nurses and medical interns who used the stethoscopes that were used in the research, assigning it a unique code.

This questionnaire consisted of 20 multiple-choice questions, which was validated by expert judgement, this was contained 3 sections: sociodemographic data, questions about the frequency and method of cleaning to the stethoscopes and questions about the hand washing.

This research was conducted according to the ethical principles based on the Declaration of Helsinki. The research protocol was evaluated and approved by the Ethics Committee of the Hermilio Valdizán National University, as well as the Hermilio Valdizan Regional Hospital and Huanuco EsSalud II Hospital. The purpose of the research was explained to each participant and an informed consent was obtained from each one, ensuring the confidentiality of the information collected.

The collected data was stored and processed in the Microsoft Excel version 2010 program and for its respective analysis the statistical program SPSS version 15 was used. The univariate analysis was performed calculating proportions, percentages, rates, mean, medium, mode and standard deviation (about the contamination of the stethoscopes prevalence) depending on the type of variable. To establish the relationship between variables (bivariate analysis), the Chi-square test was used, with a statistical significance level of 0.05.

Results

Of the 70 stethoscopes studied, 63 (90%) were contaminated with an average number of 79x103 colony forming units/ diaphragm. In the research, the 70 participating health professionals had an average age of 39.1 ± 10.3 years. In the Table 1 shows the rest of the demographic and occupational characteristics of the health personnel of the HVMRH and Huanuco EsSalud II Hospital.

Table 1. Demographic and occupational characteristics of the health personnel of the HVMRH and Huanuco EsSalud II (n = 70)

Characteristics	Frequency	Percentage
Gender		
Male	32	54,3
Female	38	45,7
Ege (Years)		
X ± DS	39,1 ± 10,3	
Hospital		
EsSalud II	27	38,6
Hermilio Valdizan	43	61,4
Working time in the Hospital (months)		
X±DS	53 ± 38,1	
Hospital Department		
Surgery	7	10,0
Medicine	25	35,7
ICU	10	14,3
Pediatrcs	11	15,7
Neonatology	7	10,0
Gynecology and Obstetrics	6	8,6
Emergency	4	5,7
Working time in the Hospital Department (months)		
X±DS	38,8 ± 33,2	
Health Personnel Profession		
Nurse	27	38,6
Doctor	29	41,4
Intern	14	20,0

Table 2. Microbiological characteristics of the stethoscopes of the HVMRH and Huanuco EsSalud II (n = 70)

Characteristics	Frequency	Percentage
Microorganisms		
Staphylococcus coagulase (-)	41	65,1
Staphylococcus aureus	2	3,2
Klebsiella spp	2	3,2
E. Coli	7	11,1
Pseudomonas spp	2	3,2
Pseudomonas stutzeri	1	1,6
Pasteurella pneumotropica	2	3,2
Sphingomonas paucimobilis	6	9,5
Colony Forming Units /diaphragm		
X ± DS	79841,3 ± 24062,6	
Contamination of the stethoscope		
Yes	63	90,0
No	7	10,0
Stethoscope cleaning method		
Cotton and alcohol	51	72,9
Soap and water	0	0,0
Common water	0	0,0
Dry cloth	8	11,4
Stethoscope disinfectant	11	15,7
Stethoscope cleaning frequency		
Always / after examining each patient	13	18,6
= > 10 times at month	15	21,4
= 6 - 10 times at month	15	21,4
= ? 5 times at month	20	28,6
Never	7	10,0
Hand washing		
Yes	25	35,7
No	45	64,3

Table 3. Bivariate analysis of the stethoscopes of the HVMRH and Huanuco EsSalud II (n = 70)

Characteristics	Contamination of the stethoscopes				X^2	p	RP	IC 95%	
	Si	%	No	%				Low ;	Upp
Gender									
Female	30	93,8	2	6,3	0,9	0,3	1,1	0,9	1,3
Male	33	86,8	5	13,2					
Age									
x ± DS	38,9 ± 10,1		41,3 ± 12,3		192*	0,6			
Hospital									
Hermilio Valdizan	38	88,4	5	11,6	0,3	0,6	1,0	0,8	1,1
EsSalud II	25	92,6	2	7,4					
Health Personnel Profession									
Medical staff	40	93,0	3	7,0	1,1	0,3	1,1	0,9	1,3
Nursing staff	23	85,2	4	14,8					
Hospital Department									
Pediatrics and neonatology	14	77,8	4	22,2	4,0	0,05	0,8	0,6	1,1
Medical specialties in adults	49	94,2	3	5,8					
Frequency of stethoscope use (days / week)									
x ± DS	5,4 ± 3,9		4,0 ± 5,0		144,5*	0,1			
Hand washing									
No	44	97,8	1	2,2	8,5	0,01	1,3	1,1	1,6
Yes	19	76,0	6	24,0					
Stethoscope cleaning method									
Alcohol	48	94,1	3	5,9	3,5	0,06	0,8	0,7	1,1
Without alcohol	15	78,9	4	21,1					
Stethoscope cleaning frequency									
> a 10 times at month	21	75,0	7	25,0	11,7	0,00	1,3	1,1	1,7
< o = a 10 times at month	42	100,0	0	0,0					

*: Mann–Whitney U test

From the microbiological profile, the most frequently isolated bacterium was Staphylococcus coagulase negative (65.1%). The isolation frequencies of the rest of microorganisms are found in Table 2.

The bivariate analysis that was carried out between the contamination of stethoscopes, the hand washing, the frequency and the cleaning method is presented in Table 3. It is observed that the contamination of stethoscopes and the absence of hand washing (RP = 1, 3 [95% CI: 1.10-1.60]), in addition to the cleaning frequency ≤ 10 times at month (RP = 1.3 [95% CI: 1.10-1.70]), presented a statistically significant association.

Discussion

The Huanuco EsSalud II Hospital and the Hermilio Valdizán Medrano Regional Hospital are located in the central east region of Peru, the first one serves patients of medium to high socioeconomic status; the second serves patients of low socioeconomic status and extreme poverty. Both are second attention level hospitals where doctors, nurses, residents, technicians and administrative staff work and receive medical interns.

Of all the tools to are used in the medical practice, the stethoscope is one of the most important and the most frequently used, therefore, it can act as a reservoir for various microorganisms, allowing the spread of these pathogens to patients and even health personnel (13).

The contamination of the stethoscopes is determined by the presence of > 20 colony forming units (CFU) of microorganisms on the surface of the diaphragm. In a research conducted in the Arzobispo Loayza Hospital of Peru by Oliva-Menacho (13), was found 91.0% of contamination, a finding very similar to what was found in our research; However, Méndez et al. (14), found that the percentage to contamination of the stethoscope in a Colombian Hospital was only 20.2%.

The microbiological profile of the stethoscopes subjected to culture showed that the most prevalent bacterium is the Staphylococcus coagulase negative, as well as what was found in the Carducci´s research (15), where the percentage for this microorganism was 88.7%. However, Zuliani et al. (16) founding that the more frequently isolated bacteria was the Staphylococcus aureus, which was less importance in our study.

The hand washing is the simplest, most effective and cheapest measure to prevent the IAHC. However, this practice is poorly performed among health professionals, as shown by Uneke (1) in a research where he found that 90% of the doctors and 55.7% of the nurses never wash their hands after using the stethoscope. This same author, in other research(17), demonstrates that washing your hands after seeing each patient reduces significantly the contamination of the stethoscopes to 9%, compared to the personnel who don´t wash the hand, this group had a contamination value of 86%. This last observation is similar to that found in our research where we observe that 64.3% of staff do not wash their hands after using the stethoscope and when we made the bivariate analysis we see that this measure is statistically significant for the contamination of the stethoscopes in the hospitals.

In the majority of the researches, the frequency of stethoscope´s cleaning is very poor among health workers. In our research found that less than 19% always clean the stethoscopes after using them. Magdaleno (18) found that 18.8% do it daily and that 91.4% do not know how and when to do it. However, this situation is not repeated in researches such those of the Saloojee and Steenhoff (19), where 48% clean their stethoscope daily, which, although not exceeding 50%, it is not as low as the results cited above. An important fact is the finding that 10% of personnel studied never clean the stethoscopes after using them.

Although there is still no consensus regarding the best stethoscope´s cleaning method, Messina et al. (20) showed that the ethanol-based antimicrobials can to reduce the CFU of contaminated stethoscopes by almost 100%. Our findings show that the 72.9% of respondents use alcohol for cleaning, but when we do the bivariate analysis there is no statistically significant difference between contamination and alcohol cleaning; However, other researches considers alternative products to the alcohol, such as Wood (21), which shows that the silver based antimicrobials applied in the stethoscope´s diaphragms can eliminate effectively the pathogens.

Is very common, among the health professionals, to the nurse makes the cleaning or disinfects the stethoscope, this is corroborated by the Whittington research (22), he showed that the 91% of nurses clean the stethoscope after each use. However, others researches as well as the Duroy research (23), he affirm the opposite and he find that the professionals who clean more the stethoscopes are the doctors and the medical students. Our research find that the stethoscope´s contamination is equally high in both professional groups; however, the frequency with which the stethoscope is cleaned if it is statistically significant with the presence of contamination, so cleaning more than 10 times at month is a protective factor to prevent the contamination of stethoscope´s.

The bacteria are able to colonize any hospital environment. Youngster (24), found that 85.7% of pediatric stethoscopes are contaminated; Shiferaw (25), showed to the 68.8% of stethoscopes were contaminated in the ICU, these results are very similar to that found by us in this research where don't find differences among pediatric and adult areas.

The main limitation of this research was that some stethoscopes are not exclusive to each staff, which could limit the positivity of the findings described; however, since more use would mean more contamination, hand washing and disinfection findings are valid. Another limitation is the small number of people that conform the evaluated sample, so we suggest that the subsequent researches on this topic have a extensive population for conform an adequate sample to will be evaluate.

In conclusion, our research finds that the washing hands and cleaning the stethoscope more than 10 times at month are protective factors to prevent the stethoscope´s contamination and thereby decrease the association of IAHC in patients treated in our hospitals, not finding an association with the type of disinfectant used.

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Bibliographic references

1. Uneke CJ, Ndukwe CD, Nwakpu KO, Nnabu RC, Ugwuoru CD, Prasopa-Plaizier N. Stethoscope disinfection campaign in a Nigerian teaching hospital: results of a before-and-after study. J Infect Dev Ctries. 2014; 8(1): 086-093.
2. Zúñiga A, Mañalich J, Cortés R. ¿Estetoscopio o estafiloscopio? Potencial vector en las infecciones asociadas a la atención de la salud. Rev Chilena Infectol. 2016; 33 (1): 19-25.
3. World Health Organization (WHO). Reto mundial en pro de la seguridad del paciente 2005-2006. Geneva-Switzerland, WHO Document Production Services. 2005: 1-25.
4. O'Flaherty N, Fenelon L. The stethoscope and healthcare-associated infection: a snake in the grass or innocent bystander? J Hosp Infect. 2015 Sep; 91(1):1-7.
5. Núñez DS, Moreno DA, Rodríguez PI, García MP, Hernández YJ, Izquierdo M. El estetoscopio como vector de la infección nosocomial en urgencias. Emergencias. 1999; 11: 281-285.
6. Castañeda DM, Requelme PF, Poma OJ. Infecciones intrahospitalarias: Un círculo vicioso. Rev Med Hered. 2011; 22 (4): 201-203.
7. Nodarse HR. Visión actualizada de las infecciones intrahospitalarias. Rev Cubana Med Milit. 2002; 31(3): 201-208
8. WHO. Guía de aplicación de la estrategia multimodal de la OMS para la mejora de la higiene de las manos. Geneva: World Health Organization; 2009.
9. Alba LA, Fajardo OG, Papaqui HJ, Vignoli R. La importancia del lavado de manos por parte del personal a cargo del cuidado de los pacientes hospitalizados. Enf Neurol (Mex). 2014. 13(1): 19-24.
10. Guerra D. Uso de antisépticos y desinfectantes. Funlarguía. Citado el 11 de noviembre del 2016. Disponible en: http://www.funlarguia.org.ar/Herramientas/Guia-de-Prevencion-de-Infecciones-Intra-Hospitalarias/Uso-de-Antisepticos-y-Desinfectantes
11. Rutala WA, Weber DJ. Guideline for Disinfection and Sterilization in Healthcare Facilities CDC. 2008: 21-39.
12. Kramer A, Schwebke I, Kampf G. How long do nosocomial pathogens persist on inanimate surfaces? A systematic review. BMC Infectious Diseases. 2006; 6:130.
13. Oliva-Menacho JE, García-Hjarles MA,

Oliva-Candela JA, De la Cruz-Roca HS. Contaminación con bacterias patógenas de estetoscopios del personal médico en un hospital de nivel III en Lima, Perú. Rev Med Hered. 2016; 27: 83-88.
14. Méndez I, Calisto O, Becerra W, Vásquez J, Bravo J, Pachón D. Microorganismos presentes en fonendoscopios, manos, cavidad oral y nasal de estudiantes de una facultad de medicina. Rev Fac Med. 2012; 20 (1): 90-100.
15. Carducci A, Cargnelutti M, Tassinari F, Bizzarro A, Cordio G, Carletti S, et al. What's growing on general practitioner's stethoscope? Ann Ig. 2016; 28(5): 367-372.
16. Zuliani Maluf ME, Maldonado AF, Bercial ME, Pedroso SA. Stethoscope: a friend or an enemy? Rev Paul Med. 2002; 120(1): 13-15.
17. Uneke CJ, Ogbonna A, Oyibo PG, Onu CM. Bacterial contamination of stethoscopes used by health workers: public health implications. J Infect Dev Ctries. 2010 Aug 4; 4(7): 436-41.
18. Magdaleno-Vázquez C, Loría-Castellanos J, Hernández-Méndez N. Frecuencia de contaminación de teléfonos celulares y estetoscopios del personal que labora en el Servicio de Urgencias. El Residente. 2011; 6 (3): 142-147.
19. Saloojee H, Steenhoff A. The health professional's role in preventing nosocomial infections. Postgrad Med J. 2001; 77: 16-19.
20. Messina G, Ceriale E, Burgassi S, Russo C, Nante N, Mariani L, et al. Hosting the unwanted: Stethoscope contamination Threat. Br J Med Med Res. 2014; 4(30): 4868-4878.
21. Wood MW, Lund RC, Stevenson KB. Bacterial contamination of stethoscopes with antimicrobial diaphragm covers. J Infect Control. 2007; 35: 263–266.
22. Whittington AM, Whitlow G, Hewson D, Thomas C, Brett SJ. Bacterial contamination of stethoscopes on the intensive care unit. Anaesthesia. 2009; 64: 620–624.
23. Duroy E, Le Coutour X. L'hygiène hospitalière et les étudiants en médecine. Médecine et maladies infectieuses. 2010; 40: 530–536.
24. Youngster I, Berkovitch M, Heyman E, Lazarovitc Z, Goldman M. The stethoscope as a vector of infectious diseases in the paediatric division. Acta Paediatrica. 2008; 97: 1253–1255.
25. Shiferaw T, Beyene G, Kassa T, Sewunet T. Bacterial contamination, bacterial profile and antimicrobial susceptibility pattern of isolates from stethoscopes at Jimma University Specialized Hospital. Ann Clin Microbiol Antimicrob. 2013; 12: 39-47.