



Stethoscope Care Practices of Nurses in Sulu Provincial Hospital, Sulu, Philippines

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ABSTRACT

Background: Regular disinfection practices of the stethoscope, although regarded as a non-critical medical device, is emphasized as a practical and straightforward way of reducing healthcare-associated infections (HCAIs). However, in a resource-poor setting, strict compliance may be hindered by the nurses' lack of knowledge of its care and sense of ownership.

Purpose: This study explored the compliance of stethoscope disinfection by nurses as well as assessed associated factors affecting practice in a resource-constrained setting in Bangsamoro Autonomous Region in Muslim Mindanao (BARMM), Philippines.

Methods: A cross-sectional descriptive study involving thirty-six nurses in various units of the Sulu Provincial Hospital using a Nurses' Stethoscope Usage Questionnaire was done.

Results: The majority of the nurses were found compliant with their stethoscopes' regular disinfection, with more than 50% being conscious in swabbing the instrument with alcohol. Compared to the younger nurses (age < 30 years), there appeared to be a greater tendency for older respondents (age > 30 years) to clean their stethoscope diaphragm before (p=0.010) and after use (p=0.030) than the other parts, i.e., earpiece, bell, and ear tube. The same trend was evident for nurses who have more extended professional practice (> 3 years) than those who had been working in the hospital for less than three years (p=0.030). None of the nurses surveyed owned the stethoscopes they use in the clinic, and such had an influenced on how thorough the instrument was being disinfected or cleaned. Better stethoscope disinfection compliance was also attributable to adequate knowledge of stethoscope parts and use.

Conclusions and Implications for Practice: While the results of this study were broadly consistent with the role of knowledge and education program on stethoscope disinfection behavior, a key finding to further improve compliance is by addressing the ownership issues of stethoscopes. This intervention can provide nurses with a stronger sense of personal responsibility towards stethoscope care and hygiene.

Keywords: *Stethoscope Care, Practices, Disinfection, Compliance*

INTRODUCTION

Health-care-associated infection (HCAI) (or nosocomial infections) is an infection occurring in a patient in a hospital or other healthcare facility setting whereby the contamination is not present or incubating at the time of admission (WHO, 2002). While HCAI is regarded as a significant global public health concern common to both developed and developing countries (Allegranzi et.al, 2011; Ilyas et.al, 2019), the infection burden in developing countries is worrisome as poorer nations carry an estimate of 2- to 20-fold higher risk of HCAI as compared to more developed economies. According to WHO, 2010, the impact of HCAI implies long-term disability, prolonged hospital stays, increased resistance of microorganisms to antimicrobials, increased mortality, and massive additional financial burden for the already strained national health systems and patients' families.

Bacteria, fungi, or viruses cause HCAs through various sources, including person-to-person contact via the hands of healthcare providers and visitors, personal equipment, airborne transmission, environmental contamination, and colonized hospital staff (Ahmedkhan, 2017; Sahiledengle, 2019; Ilyas et.al, 2019). A medical device commonly used by almost all healthcare workers, the stethoscope, has long been considered a potential vector for nosocomial infections. Numerous studies conducted across the globe have reported the very high contamination rates in stethoscopes ranging from 66% to 100% (Bansal et.al, 2018; Datta et.al, 2018; Horiuchi, 2018). Several researchers have also reported that stethoscopes may harbor bacteria, including methicillin-resistant *Staphylococcus aureus*, vancomycin-resistant *Enterococci*, and *Clostridium difficile* (Fenelon F, O'Flaherty, 2015; Fenelon F, Holcroft L. 2015). Additionally, **Huang, 2017** explains MRSA detected on this instrument and other fomites, such as table tops and cloth curtains, can persist up to 12 days.

Effective disinfection of stethoscopes with ethanol-based cleaner or isopropyl alcohol led to a significant reduction in bacterial growth. As an extension of the hand, a healthcare professional should clean the stethoscope with the same frequency as the hands¹⁴. However, despite the recommendations, often in a resource-constrained setting, like in many healthcare facilities in Ethiopia (Sahiledengle, 2019) and

India (Jain et.al, 2013), routine disinfection of stethoscopes was hardly ever undertaken. Accordingly, health professionals' failure to adhere to guidelines has been attributed to time constraints, absence of disinfecting material, and insufficient visual reminders (Shaw and Cooper, 2014).

Suarez et.al 2019 construed that the development of rational control methods for HCAs requires identifying the management of medical devices, such as stethoscopes, in health care practice, and assessing the education of staff on necessary infection control measures. This present study evaluates the method of stethoscope disinfection among nurses working for healthcare facilities in a rural community setting and identifies some factors that may be related to its hygienic use. To improve healthcare providers' appropriate disinfection practice and develop successful infection prevention programs through education, an in-depth understanding of the issues is essential.

METHODOLOGY

Study Design and Respondents

This study follows a descriptive research design. Using purposive sampling, we selected the respondents to capture a cross-section of the nursing professionals in the municipality of Jolo, Sulu. As the capital of the island of Sulu (Philippines) in the Bangsamoro Autonomous Region in Muslim Mindanao (BARMM), Jolo is a 1st class municipality with a population of 125,564 people, according to the 2015 census of the Philippine Statistics Office.

This study's ethical soundness was cleared as per the research ethics review of Sulu State College following the national guidelines of ethical conduct in research ensuring that the study adhered to the principles of the Declaration of Helsinki (World Medical Association declaration of Helsinki, 1997 and amended during the 64th WMA General Assembly, Fortaleza, Brazil, October 2013). Voluntary participation was followed by an introduction to the study, an explanation of informed consent, and the freedom to withdraw participation. The right of participants to anonymity and confidentiality was maintained.

Demographic Questionnaire. The demographic questionnaire was used to gather data on the respondents' profile, namely, gender, age,

position, length of nursing practice, and assigned clinical area in the hospital.

Nurses' Stethoscope Usage Questionnaire. A validated questionnaire on the study was utilized to the practices of the nurses regarding stethoscope care. The instrument was initially evaluated by a panel of nurses and nursing professors of Sulu State College and who were graduates of Masters of Arts in Nursing. The readability and understandability of each statement and the appropriateness of the questions were checked. Specifically, the questionnaire contained the following items: (1) stethoscope characteristics: type of stethoscope, age and source of the instrument, and frequency of use; (2) stethoscope care and use: clinical procedures, patient body parts in contact, and stethoscope care before and after use; and (3) general knowledge on stethoscopes.

Data Analysis

Data were analyzed using Student's t-test and chi-square test to compare results between groups. A statistical significance level of 0.05 was used for all statistical tests.

RESULTS

The stethoscope, considered to be an important medical devices and a trademark of healthcare, seemingly contaminated by microorganisms and performs a major role in the transmission of hospital-acquired infection (Sahiledengle , 2019)

The increasing awareness of infection control measures in regional hospitals has prompted the examination of nurses' safety practices in this study. Considering that patients are susceptible to nosocomial infections, an important subject relevant to all health care professionals is stethoscope disinfection (Venkatesan , et.al, 2019; Zehra et.al, 2019;). However, the

relationship between the handling and use of medical devices, such as the stethoscope, that are in direct contact with patients and other extrinsic factors (i.e., education, position, and training) remains unnoticed in the Philippines.

Socio-demographic characteristics

From the 148 total number of nurses stationed in the provincial hospital, we recruited thirty-six (36) nurses, aged 21 to 58 years old, with an average age of 28 years (SD =10.4). Most of the respondents belong to the age group of 20-24 years old (n=21, 58%) as they are either fresh graduates or newly hired healthcare providers in the hospital. The majority of the respondents were female (n=30) and Muslim (n=34), comprising 83% and 94% of the sample size. The institutional position of the majority of the respondents were Registered Nurses for Health Enhancement and Local Service (RN HEALS) (n=32, 88.9%), followed by Nurse-I (n= 2, 5.6%), Nurse-II and then Nurse-III (n=2 respondents, 5.6%). RN HEALS refers to the Philippine government program that deploys registered nurses to underserved and rural communities where conditional cash transfer strategy is being implemented to address the surplus in inexperienced nurses in those areas. The majority of the respondents had only 0-2 years of nursing practice, which reveals that the health personnel was mainly a fresh graduate. There were 11 respondents with 3-10 years and only 5 with more than ten years of experience as registered nurses. The respondents were distributed almost equally among the different clinical areas of practice: emergency room, pediatrics, surgical, out-patient department, communicable ward, medical, and obstetrics-gynecology wards.

Profile of use of the stethoscopes

TABLE 1: Profile of stethoscope use from the respondents

	Frequency	Percentage (%)
Type of stethoscopes		
Acoustic	35	97.2
Fetal	1	2.8
Length of time stethoscope is being used after acquisition		
6 months	4	11.1
1-3 years	9	25.0

	4-6 years	8	22.2
	> 6 years	15	41.7
Use of stethoscope			
	Blood pressure measurement	36/36	100
	Chest auscultation	35/36	97.2
	Abdominal auscultation	34/36	94.4
Body parts that get in contact with stethoscope			
	Upper arm	24	66.7
	Chest	10	27.8
	Abdomen	1	2.8
	Back	1	2.8

Table I shows the general profile of stethoscope usage among the respondents. The majority of the nurses in this study utilized an acoustic stethoscope (n=35, 97%), while only one (3%) used a fetal stethoscope. Our survey further reveals that 15 respondents (42%) had been using the same stethoscope for more than six years, with the majority (n=17, 47%) for around 1-4 years. Only four respondents (11%) had the 'privilege' of using a relatively newer stethoscope, i.e., six months before the survey.

All the respondents were using stethoscopes for taking blood pressure measurements. Chest and abdominal auscultation were performed by 35 (97%) and 34 (95%) of those surveyed. As such, the patient's upper arm became the frequently touched body part that gets in contact with the instrument, followed by the chest, abdomen, and back.

It is noteworthy that ownership of the stethoscope was an issue. We found that none of the nurses in this study owned the instrument that they were using as these were either supplied by the hospital or just borrowed from fellow healthcare providers. Among the respondents, 18 (50%) borrowed their stethoscope from the hospital supply, 9 (25%) from midwives, 8 (22.2%) from doctors, and 1 (2.8%) from a student nurse.

Stethoscope disinfection practice

The survey results of stethoscope disinfection before and after use together with other factors that may affect the practice are shown in Table II. In general, the respondents always practiced disinfection after (n=15, 41.7%) (t (35)= 19.48, p < 0.05) compared to prior to using the stethoscope (n=9, 25%) (t (35)= 16.072, p <

0.05). Conversely, more nurses neglect to clean their stethoscope before (n=10, 27.8%) (t (35) = 16.072, p < 0.05).

Next, we probed the subtle differences in stethoscope disinfection practice before and after use. Before use, 27.8% of the respondents also infrequently disinfected their stethoscope. Infrequent disinfection was operationally defined in the survey as on and off cleaning of stethoscope before and after use. The earpiece (n= , 36.1%) (t (35) = 11.936, p < 0.05) was the most common part of the stethoscope subject for cleaning. Usually, cotton swabs with a copious amount of ethyl or isopropyl alcohol were applied by 22 respondents (61.1%). Nine nurses (25%) reported only swabbing the stethoscope with cotton as their primary means of disinfection, and one nurse (2.8%) did not clean at all (t (35)= 15.337, p < 0.05). Thus, although there was only one who was careless at disinfecting the stethoscope before use, many did not use the recommended disinfectants.

The after-use disinfection practice of the nurses was also assessed. While 15 (41.7%) respondents reported to always disinfect their stethoscope, there were 16 who infrequently practiced disinfection (44.4%) (t (35) = 19.483, p < 0.05). Also, it was found that five respondents (13.9%) never disinfected their stethoscopes after using them. The diaphragm was the most common part of the stethoscope being disinfected by the respondents (33.4%), followed by the bell (27.8%), earpiece (25%), and all parts (13.9%) (t (35) = 12.822, p < 0.05). Majority of the respondents (n=24, 66.7%) (t (35) = 22.913, p < 0.05) used alcohol to disinfect their stethoscope while 9 (25%) used only cotton. Three respondents (8.3%) reported skipping

disinfection altogether after using the *Factors associated with stethoscope disinfection before and after every use*

TABLE 2: Frequencies and chi-square values of variables of stethoscope care among nurses

		Age of the respondent			Length of nursing practice			Source of stethoscope used			General knowledge		
		≤ 30 yrs	>30 yrs	χ ² (p-value)	≤ 3 yrs	> 3 yrs	χ ² (p-value)	hospital	borrowed	χ ² (p-value)	little/none	enough	χ ² (p-value)
A) PRIOR TO USE													
Frequency of cleaning	never	6 (16.7%)	4 (11.1%)	0.10 (p=0.950)	5 (13.9%)	5 (13.9%)	0.20 (p=0.910)	4 (11.1%)	6 (16.7%)	1.50 (p=0.470)	10 (27.8%)	0 (0%)	7.29* (p=0.026)
	infrequent	11 (30.6%)	6 (16.7%)		10 (27.8%)	7 (19.4%)		10 (27.8%)	7 (19.4%)		15 (41.7%)	2 (5.6%)	
	always	6 (16.7%)	3 (8.3%)		5 (13.9%)	4 (11.1%)		6 (16.7%)	3 (8.3%)		5 (13.9%)	4 (11.1%)	
Method of cleaning	swabbing with alcohol	12 (33.3%)	10 (27.8%)	1.40 (p=0.50)	10 (27.8%)	12 (33.3%)	2.69 (p=0.260)	12 (33.3%)	10 (27.8%)	0.82 (p=0.660)	19 (52.8%)	3 (8.3%)	0.73 (p=0.694)
	cleaning with cotton	9 (25.0%)	4 (11.1%)		9 (25.0%)	4 (11.1%)		7 (19.4%)	6 (16.7%)		10 (27.8%)	3 (8.3%)	
	no cleaning step	1 (2.8%)	0 (0.0%)		1 (2.8%)	0 (0.0%)		1 (2.8%)	0 (0.0%)		1 (2.8%)	0 (0.0%)	
Part of the stethoscope disinfected	diaphragm	0 (0.0%)	6 (16.7%)	15.07* (p=0.010)	0 (0.0%)	6 (16.7%)	10.45* (p=0.030)	1 (2.8%)	5 (13.9%)	12.52* (p=0.010)	6 (16.7%)	0 (0.0%)	4.58 (p=0.172)
	earpiece	10 (27.8%)	3 (8.3%)		10 (27.8%)	3 (8.3%)		12 (33.3%)	1 (2.8%)		10 (27.8%)	3 (8.3%)	
	bell	6 (16.7%)	0 (0.0%)		4 (11.1%)	2 (5.6%)		3 (8.3%)	3 (8.3%)		3 (8.3%)	3 (8.3%)	
	ear tube	2 (5.6%)	1 (2.8%)		2 (5.6%)	1 (2.8%)		1 (2.8%)	2 (5.6%)		3 (8.3%)	0 (0.0%)	
	all parts	4 (11.1%)	4 (11.1%)		4 (11.1%)	4 (11.1%)		3 (8.3%)	5 (13.9%)				
B) AFTER USE													
Frequency of	never	2 (5.6%)	3 (8.3%)	1.14 (p=0.560)	2 (5.6%)	3 (8.3%)	0.61 (p=0.740)	2 (5.6%)	3 (8.3%)	2.1 (p=0.350)	5 (13.9%)	0 (0.0%)	1.92 (p=0.383)

cleaning	infrequent	10 (27.8%)	6 (16.7%)	3.16 (p=0.370)	9 (25.0%)	7 (19.4%)	0.73 (p=0.870)	11 (30.6%)	5 (13.9%)	1.86 (p=0.602)	12 (33.3%)	4 (11.1%)	3.77 (p=0.287)
	always	10 (27.8%)	5 (13.9%)		9 (25.0%)	6 (16.7%)		7 (19.4%)	8 (22.2%)		13 (36.1%)	2 (5.6%)	
Method of cleaning	washing with soap and water	4 (11.1%)	0 (0.0%)	3.16 (p=0.370)	3 (8.3%)	1 (2.8%)	0.73 (p=0.870)	1 (2.8%)	3 (8.3%)	1.86 (p=0.602)	4 (11.1%)	0 (0.0%)	3.77 (p=0.287)
	pre-and - post wash phase	6 (16.7%)	5 (13.9%)		6 (16.7%)	5 (13.9%)		6 (16.7%)	5 (13.9%)		10 (27.8%)	1 (2.8%)	
	hand washing	4 (11.1%)	4 (11.1%)		4 (11.1%)	4 (11.1%)		5 (13.9%)	3 (8.3%)		5 (13.9%)	3 (8.3%)	
	clean with alcohol	8 (22.2%)	5 (13.9%)		7 (19.4%)	6 (16.7%)		8 (22.2%)	5 (13.9%)		11 (30.6%)	2 (5.6%)	
Part of the stethoscope disinfected	diaphragm	3 (8.3%)	6 (16.7%)	9.01 * (p=0.03)	3 (8.3%)	6 (16.7%)	10.57 * (p=0.01)	5 (13.9%)	4 (11.1%)	4.81 (p=0.186)	8 (22.2%)	1 (2.8%)	5.78 (p=0.123)
	earpiece	9 (25.0%)	1 (2.8%)		9 (25.0%)	1 (2.8%)		7 (19.4%)	3 (8.3%)		6 (16.7%)	4 (11.1%)	
	bell	2 (5.6%)	4 (11.1%)		1 (2.8%)	5 (13.9%)		1 (2.8%)	5 (13.9%)		6 (16.7%)	0 (0.0%)	
	all parts	8 (22.2%)	3 (8.3%)		7 (19.4%)	4 (11.1%)		7 (19.4%)	4 (11.1%)		10 (27.8%)	1 (2.8%)	

We further describe the chi-square values of some factors in **Table II**, which show conditions that may impact stethoscope disinfection behavior. In our analyses, the age of the respondent, length of professional practice as nurse, ownership, general knowledge on stethoscope parts, and use were significantly associated with stethoscope disinfection before and after every use.

Compared to the younger nurses (age < 30 years), there appeared to be a tendency for older respondents (age > 30 years) to clean their stethoscope diaphragm before (p=0.010) and after use (p=0.030) than the other parts, i.e., earpiece, bell, and ear tube. The same trend was evident for nurses who have more extended professional practice (> 3 years) than those who had been working in the hospital for less than three years (p=0.030) as with the RNHEALS. As

all the nurses surveyed did not personally own stethoscopes that they use in the clinic, this factor also influenced how the instrument was disinfected or cleaned. Stethoscopes borrowed from fellow healthcare professionals, i.e., doctors and midwives, appeared to be cleaned more thoroughly before use with particular attention to the diaphragm (p=0.010). According to Leontsini et.al, 2013, the earpiece of hospital-supplied stethoscopes, on the other hand, received more attention in disinfection. The earpieces frequently carry pathogenic organisms, potentially posing a risk to the stethoscope user.

Additionally, we note a significant relationship between the length of nursing practice and the parts of the stethoscope cleaned before use (p=0.03). The priority of the novice nurses or nurses with work experience below two years is the earpiece, while more those with work

experiences > 3 years prioritize the diaphragm. A similar pattern of relationship between the length of nursing practice and stethoscope disinfection after use was obtained ($p=0.01$). We speculate that this might also be related to the observed significant relationship between knowledge of stethoscope parts and use and the frequency of disinfection before use ($p= 0.026$). These findings support the notion that general knowledge on stethoscope use, awareness on infection prevention guidelines, favorable attitude towards infection prevention, and safe infection prevention practice are predictors of stethoscopes disinfection consistent with previous studies (Jain et.al, 2013; Ahmed et.al, 2020; Holleck et.al, 2017; Naghdi et.al, 2019; Omiye et.al, 2019). Hence, the implementation of practical training on stethoscope disinfection and increasing awareness of infection prevention may improve stethoscope disinfection practice.

CONFLICT OF INTEREST

None

DISCUSSIONS

In light of the recent findings that SARS-CoV-2 can survive on plastic surfaces (Kampf et.al , 2020), it is essential for healthcare workers to practice cleaning their stethoscopes while sanitizing their hands thoroughly. Stethoscopes that are borrowed by and from multiple individuals, as practiced by our respondents, should be avoided, if possible, to prevent any nosocomial spread, especially that the communities being served in Mindanao, Philippines are economically-disadvantage. Although the stethoscope is but a small and straightforward medical device, nurses who are considered as the most vulnerable frontliners in the health care community should inculcate this practice to protect themselves and their patients.

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