



JoAnn Grif Alspach

Editorial

About That Health Care Icon Dangling Around Your Neck: Do We Have Some Cleaning Up to Do?

I know your stethoscope is an essential, near and dear part of your daily clinical life as a critical care nurse, often the first really expensive badge that we purchased on our very own. I know you devoted hours to selecting the stethoscope that was right for you and your patient assessment needs and that you treasure it as an integral and personal expression that you belong in the position you occupy. I fully understand and share many of those sentiments—truly. With that said, I also need to remind you of some rather discomfiting realities regarding that treasured device, realities that may have escaped your attention with all of the other issues you are expected to deal with every day. In addition to all of the clinical information about your patients that your stethoscope enables you to access, your stethoscope also affords you with a highly effective and efficient means of infecting every one of your patients by picking up microorganisms from their body surfaces, serving as a culture medium to sustain and foster microbial growth, and transmitting those organisms to every subsequent patient that device touches, in addition to possibly contaminating yourself.

That unpleasant wake-up call was recently issued from a study¹ reported by the World Health Organization (WHO) Collaborating Centre on Patient Safety. This report is not the first to identify stethoscopes as potential sources of hospital-associated infection, but what makes this research

noteworthy is its rather unique frame of reference, methodology, and data collected to address this issue. Before reiterating the need for us to clean our stethoscopes after every patient contact, let me add some background context from this study and then add some foreground to suggest how we might most readily advance on this initiative using evidence-based yet practical approaches.

Stethoscopes as Pathogen Reservoirs

The diaphragm and bell at the “business end” of a stethoscope that make contact with the patient’s skin have long been recognized as possible sources of infection due to their frequent contamination with pathologic organisms commonly found in hospitalized adults,²⁻¹¹ as well as children, infants, and neonates.^{12,13} Applying a contaminated stethoscope headpiece to every patient a nurse encounters exposes every one of those patients to all of the pathogens of that nurse’s past patient assignments. For nurses who work in areas such as the emergency department, where a myriad of body fluids and external contaminants may await the nurse’s contact, the load of pathogens can multiply exponentially.

None of this would be especially problematic, of course, if health care professionals had an unblemished record of cleansing their stethoscopes with each use. However, although we may have made some progress about the necessity of handwashing, there has been little to no transfer of that fomite-fighting tenacity directed at cleansing our stethoscopes. Virtually every survey

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of nurses and/or physicians confirms that most of us have not yet developed the habit of disinfecting our stethoscopes with each use, or daily, or weekly, or monthly, or annually, or—for some—ever.^{5-6,12,14-19} Given these circumstances, the WHO study¹ offered an alternative approach to the contaminated stethoscope problem. The research team set out to determine how stethoscopes compared to a health professional's hands in acquiring and transmitting pathogens.

A Unique Frame of Reference

In the WHO study,¹ the reference point for whether stethoscopes contributed to hospital-associated infection was not merely measured by absolute counts of various pathogens on the stethoscope, but also by how pathogen counts on stethoscopes compared to those on a health care provider's hands. If the pathogen counts on stethoscopes are significantly lower than those on a provider's hands, then the contribution that stethoscopes make to spreading infection may be viewed as commensurately less problematic. Conversely, if the stethoscope pathogen counts are higher than those on a provider's hands, then the role that stethoscopes could play in transmission of infection should be viewed with a comparable degree of concern and effort that we currently focus on hands.

A Tighter Control Over Potentially Confounding Influences

A second unique aspect of the WHO study was its substantial effort to establish greater control over some of the sources of variation in reports of pathogen contamination of stethoscopes. In studies that employ this type of point prevalence methodology, potentially confounding variables that may lead to wide variance in contamination measurements can be numerous and include patients' existing health problems, types of sounds auscultated (heart sounds, breath sounds, bowel sounds, etc), work environment, number of staff using that device, differences in the model and type of stethoscope used, and how staff use and handle the stethoscope. The WHO study methodology attempted to control for some of these variables via the following procedures:

- Using patient inclusion criteria that excluded those with active skin infection
- Employing a standardized 9-step physical examination procedure that specified the body areas to be auscultated and palpated

- Drawing all patients to be evaluated from 2 specific patient units: medical and orthopedics
- Restricting use of the stethoscope to a single use
- Having all physicians use the same brand and model stethoscope (Littman Cardiology II, 3M)
- Limiting the number of health care providers to 1 of 3 physicians randomly selected for each patient
- Using sterile stethoscopes
- Comparing contamination of the stethoscope with that on the same examiner's dominant hand

A Longer Look at the Stethoscope

A third insight incorporated into the study methodology was extending the measurement of stethoscope contamination beyond just the headpiece to include the flexible stethoscope tubing that runs from the headpiece to the metal binaural tubing to which the earpieces attach. If we are intending to clean all contaminated surfaces of the stethoscope, it only makes sense to check more than the most obvious locus of patient contact. At least one other study¹⁸ reported finding contamination on stethoscope earpieces before and after cleansing, so even more inclusive measurements of stethoscope components may be warranted, but checking for contamination at more than a single location on the stethoscope makes sense for capturing other possible areas of transmission. In the WHO study, the section of tubing checked for microbial growth was located 10 cm proximal to the stethoscope head.

Study Findings

The WHO study supplied yet another layer of objective evidence that stethoscopes acquire a considerable amount of contamination even following a single patient examination. Using a structured prospective study design involving 1 of 3 physicians performing an assessment on 83 hospitalized patients in a university teaching hospital, the study team sampled 4 regions of the physician's dominant hand (finger tips, thenar eminence, hypothenar eminence, dorsum) and 2 regions of the stethoscope (diaphragm, tubing) for possible contamination. On the physician's dominant hand, the greatest median total aerobic colony counts (ACCs) were found in the fingertips (467), followed by the thenar eminence (37), hypothenar eminence (34), and least on the dorsal surface (8). On the stethoscope, the diaphragm contained a far greater amount of contamination (89) than the tubing (18).

Although neither of those sets of results is remarkable taken separately, the amount of contamination on the diaphragm of the stethoscope (89) is especially noteworthy as it is substantially higher than on any other location on the hands, except for the fingertips. Comparable findings were described relative to methicillin-resistant *Staphylococcus aureus* (MRSA) colony-forming unit counts. These were greatest at the fingertips, followed by the stethoscope diaphragm, thenar eminence, hypothenar eminence, and stethoscope tube and dorsum of the hand. Contamination of the stethoscope tube was found to be comparable to that of the examiner's hypothenar eminence and greater than the dorsum of their hand.

These important findings suggest that using a stethoscope to complete a routine patient examination is associated with greater contamination to the stethoscope diaphragm than to 3 of the 4 areas of the examiner's hands, that is, everywhere except the fingertips. In addition, evidence of stethoscope tubing contamination to a degree similar to 1 hand area and higher than another suggests that more than just the diaphragm of a stethoscope could serve as a vector of infection and that both the diaphragm and tubing need to be disinfected with each use. Two related findings from correlational analysis underscore that point. For both the total ACC and MRSA counts, there was a strong, direct, positive relationship found between contamination of the fingertips and contamination of the stethoscope diaphragm, so that higher amounts of fingertip contamination were associated with higher levels of stethoscope diaphragm contamination. These findings indicate that contamination of the stethoscope diaphragm is significant even after a single patient examination, that it rises or falls in the same direction as contamination of the fingertips for both ACC and MRSA, and that the amount of contamination it reveals surpasses every one of the 6 other sites monitored, and is surpassed only by the examiner's fingertips. The only remaining issue to be addressed is how we can most effectively mitigate this problem.

Evidence-Based Recommendations on How to Disinfect a Stethoscope

The ideal cleanser for our stethoscope would probably be whatever works best for cleaning our hands because both locations are highly important and, as the WHO study demonstrated, closely aligned to the presence of

contamination. If we need to clean our hands and stethoscope with comparable frequency and timing after each patient contact, then the ideal cleaner would perform equally well at both sites. Unfortunately, however, although "plain soap and water" are often advocated to achieve the best results for handwashing, those cleansers are not appropriate for a stethoscope. Littmann, the vendor perhaps most associated with stethoscopes, admonishes against that quite directly: "Do not immerse your stethoscope in any liquid or subject it to any sterilization process."²⁰ Alternative means suggested in the literature include the following 3 options:

1. *Isopropyl alcohol wipes.* Numerous studies have reported that a thorough wipe-down of the stethoscope with an alcohol wipe is an effective disinfecting procedure.^{3-5,7,8,17,21-26} This is also the stethoscope disinfection method recommended at the Littmann website²⁰: cleaning the stethoscope with a 70% isopropyl alcohol solution or wipe. One study²³ found alcohol wipes to be more effective as a stethoscope disinfectant than alcohol-based hand rub and another²² found them to be equally as effective as an ethanol-based cleanser.

2. *Alcohol-based gel or foams.* Seventy percent isopropyl alcohol wipes are not always immediately available to health care staff as they come into contact with patients, so the now nearly ubiquitous alcohol-based gel or foam hand sanitizers have been used as a more practical alternative to no disinfection of the practitioner's hands or any other equipment. A number of studies attest to the effectiveness of these gels or foams for cleansing stethoscopes.^{3-5,10,11} Even when these gels or foams do not match the efficacy of alcohol wipes, they provide adequate cleansing and are far superior to not disinfecting.²¹

3. *Ethanol-based cleansers.* Another category of cleansers mentioned less frequently in this literature are ethanol-based.^{22,27} One study²² found these to be as effective as isopropyl alcohol wipes for disinfecting stethoscopes.

If we use the WHO study¹ results as a guide, and clean in a direction from less to more contaminated areas, that would suggest a wipe-down order from the less contaminated tubing at the examiner's earpieces, down the tube distally to the bell and diaphragm. Additional studies are needed to determine where the earpieces rank in order of contamination relative to other parts of the stethoscope so we have an evidence base for locating them appropriately in this wipe-down procedure.

What Else Could Help?

Two other suggestions surfaced as I perused some of the literature on this topic: one relates to removing identified barriers to implementing these disinfection procedures and the other relates to supporting and facilitating their implementation.

In an attempt to identify predictors of stethoscope disinfection among pediatric health care staff, researchers used an anonymous online survey to solicit the views of 1401 pediatric nurses, nurse practitioners, and physicians. The findings¹⁹ revealed that the odds of stethoscope disinfection after each use were significantly decreased in respondents who perceived barriers including lack of time, lack of access to the materials needed to complete the disinfection, or lack of visual reminders to disinfect. With these implications in mind, do everything possible to minimize the time required to complete the disinfection, maximize immediate access to the disinfection materials, and add visually prominent signs that remind health care staff to perform the disinfection.

Follow-through on those implications was reported in a subsequent study,²⁶ which describes a program that installed baskets containing a generous supply of alcohol prep pads outside patient rooms and added stickers reminding nursing and medical staff to disinfect their stethoscopes with each patient contact. This time-saving program resulted in significant improvements in stethoscope disinfection rates among physicians and nurses.

Closing

Doing our part to help stem the tide of hospital-associated infections by regularly and effectively disinfecting our stethoscopes can only result in good outcomes. Failing to recognize and appropriately respond to this problem could constitute a serious patient safety issue comparable to neglecting hand hygiene. From both an infection control and patient safety perspective, critical care nurses need to regard their stethoscope as an extension of their hands and take responsibility for disinfecting both after every patient contact.^{19,22} **CCN**



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