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Stethoscopes and Health Care–Associated Infection

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Over the past 30 years we have come to fully appreciate the enormous potential for person-to-person spread of virulent nosocomial pathogens (eg, methicillin-resistant *Staphylococcus aureus* [MRSA], vancomycin-resistant enterococcus [VRE], multidrug-resistant [MDR] gram-negative bacilli and *Clostridium difficile*, viruses such as influenza A, respiratory syncytial virus, and norovirus, and even *Candida* species) in the health care setting, with devastating infection being the most feared iatrogenic consequence and one of the greatest threats to hospital safety.[1,2] It has long been accepted that the major reservoir of nosocomial infection is infected or colonized patients and the major mode of transmission is the transient carriage of nosocomial pathogens on the hands of noncolonized health care workers having direct physical contact with patients.[3] Hand hygiene before and after direct patient contact—now most often with a waterless alcohol gel or hand rub—has become an uncompromising expectation for modern-day health care workers.[4]

Although it had long been held that microorganisms in the inanimate hospital environment do not play a significant role in the acquisition of nosocomial infection,[5] it has become evident in recent years that surfaces in hospitals touched by patients or health care workers readily become contaminated by "environmental pathogens," such as MRSA, VRE, *Acinetobacter baumanii, C difficile*, respiratory syncytial virus, and norovirus, which collectively have a unique capacity to survive dessiccation in a viable, transmissible form for days to months. Compelling epidemiologic data indicate that contamination of inanimate surfaces in hospitals is an important reservoir of these pathogens and has driven a move toward more comprehensive surface decontamination with bleach solutions, ultraviolet light, or aerosolization of hydrogen peroxide or peroxacetic acid.[6]

Auscultation of the heart, lungs, abdomen, and major arteries with a stethoscope has long been considered an integral part of the physical examination, and most health care providers prefer to use their own stethoscope. It has long been known that the diaphragms and bells of stethoscopes randomly sampled in a health care setting, such as a hospital, are almost universally contaminated by potential nosocomial pathogens,[7-18] most often staphylococci—MRSA up to 32% of the time[18]—but also *C difficile*,[17] resistant gram-negative bacilli, and even viruses,[19] and studies have shown that stethoscope contamination by these microorganisms is commonly acquired from colonized or infected patients.[9,10]

In this issue of *Mayo Clinic Proceedings*, Longtin et al[20] report an innovative study of ungloved physicians who auscultated MRSA-colonized patients with presterilized stethoscopes, showing that the fingertips of the examiners or the diaphragms of their stethoscopes acquired MRSA contamination during 76% of the examinations. They found a powerful correlation between counts on examiners' hands and the quantitative level of contamination of the stethoscope with each examination, both for total bacterial counts and for MRSA. The efficiency of transmission of MRSA from the trunk of colonized or infected patients to the hands of health care workers and their stethoscopes rigorously documented in this unique real-life study is almost staggering. One can ask, why are we all not MRSA carriers?

Given that microorganisms on contaminated stethoscopes are readily transmitted

back to the surfaces they touch[7,9,10,12,14] and must be considered a preventable source of nosocomial colonization (and subsequent nosocomial infection) of patients, this mode of transmission would seem no less important than the uncleansed hands of health care workers. Although a number of studies have microbiologically and epidemiologically implicated electronic thermometers in the genesis of nosocomial outbreaks,[21-23] only a single report has linked the contamination of stethoscopes to infections in patients in an outbreak in a neonatal intensive care unit (ICU) epidemiologically as well as microbiologically[24] and no published study has made an unequivocal association with endemic health care–associated infections. However, if hand hygiene is considered an essential infection control measure to help prevent the spread of pathogens both in the health care setting and in the community,[4] it seems only logical that measures to minimize the accumulation of potential nosocomial pathogens on stethoscopes are needed to prevent transmission to vulnerable patients.

Studies have shown that wiping the head of a stethoscope with a 70% alcohol pledget[7-13,17] or wiping it with the antiseptic used for hand hygiene[7-9,16] or a hospital surface disinfectant [7-9] greatly reduces—usually eliminates—the bioburden of aerobic bacterial contamination. Moreover, the personal stethoscopes of health care workers who practice regular decontamination have been found to be less likely to be contaminated by MRSA and other MDR pathogens.[11-14,16] As such, health care workers should be expected to routinely decontaminate the head of their personal stethoscope between patients, logically when they do postexamination hand hygiene.

Unfortunately, the efficacy of these simple approaches to on-site decontamination of stethoscopes for removing *C difficile* spores or viruses that can also be present is unknown. It has long been accepted that dedicated stethoscopes—used only on the isolated patient and sent to Central Supply for decontamination with ethylene oxide gas when the patient is transferred or discharged—are an integral feature of barrier isolation to prevent the spread of microorganisms known to be spread by direct physical contact, such as MRSA, VRE, MDR gram-negative bacilli, and *C difficile* but also all the respiratory and enteric viruses, and enteric parasites such as *Giardia lamblia* and *Cryptosporidium* species.[25] However, it has also become clear that for every patient known to be colonized or infected by an MDR nosocomial pathogen because of a positive clinical culture or *C difficile* polymerase chain reaction test, there are many more patients on that same patient care unit with undetected colonization—patients who pose a greater risk of spreading these microorganisms than patients known to be colonized or infected and in isolation.[26] This fact has formed the basis for "search and destroy" strategies for preventing MRSA and VRE infection, screening newly admitted patients for carriage to determine the need for barrier isolation and decolonization,[27,28] and most recently, putatively more cost-effective and broadly effective preventive strategies in the ICU, bypassing screening and subjecting *all* patients in the ICU to daily chlorhexidine bathing,[29,30] with or without the use of nasal mupirocin.[31]

Studies showing that neckties and clothing readily become contaminated by nosocomial pathogens such as MRSA or *C difficile* have driven a new policy in UK National Health Service hospitals forbidding neckties and jackets and mandating hospital-provided reprocessable overgarments for health care workers involved in direct patient care.[32] Notwithstanding a recent multicenter trial that showed only moderate benefit,[33] preemptive barrier isolation of all high-risk patients, with dedicated stethoscopes, to prevent the spread of nosocomial pathogens has shown efficacy[34] and is practiced in many ICUs around the world.

In sum, I believe that it is now time for the use of dedicated stethoscopes with *all* ICU patients and a case can be made for all hospitalized patients. The complaint that the cheap stethoscopes many hospitals purchase for isolation rooms are barely functional can be obviated by purchasing higher quality stethoscopes in bulk with a unique and garish pattern on the tubing (eg, iridescent orange or striped) to deter theft, the major impediment to hospitals purchasing more expensive, high-quality institutional stethoscopes.

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Promising advances in antiseptic surface technology to prevent surface microbial contamination[35,36] may allow a return to the routine use of personal stethoscopes in the future.

Dennis G. Maki, MD
Divisions of Infectious Disease and Pulmonary/Critical Care Medicine
Department of Medicine
University of Wisconsin School of Medicine and Public Health
Madison, WI

Correspondence: Address to Dennis G. Maki, MD, Divisions of Infectious Disease and Pulmonary/Critical Care Medicine, Department of Medicine, University of Wisconsin School of Medicine and Public Health, 5227 UWMF Centennial Building, 1685 Highland Avenue, Madison, WI 53705-2281 (dgmaki@medicine.wisc.edu).

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