Contamination of stethoscopes and physicians' hands after a physical examination

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Abstract

Objectives: To compare the contamination level of physicians' hands and stethoscopes and to explore the risk of cross-transmission of microorganisms through the use of stethoscopes.

Patients and Methods: We conducted a structured prospective study between January 1, 2009, and May 31, 2009, involving 83 inpatients at a Swiss university teaching hospital. After a standardized physical examination, 4 regions of the physician's gloved or ungloved dominant hand and 2 sections of the stethoscopes were pressed onto selective and nonselective media; 489 surfaces were sampled. Total aerobic colony counts (ACCs) and total methicillin-resistant *Staphylococcus aureus* (MRSA) colony-forming unit (CFU) counts were assessed.

Results: Median total ACCs (interquartile range) for fingertips, thenar eminence, hypothenar eminence, hand dorsum, stethoscope diaphragm, and tube were 467, 37, 34, 8, 89, and 18, respectively. The contamination level of the diaphragm was lower than the contamination level of the fingertips ($P < .001$) but higher than the contamination level of the thenar eminence ($P = .004$). The MRSA contamination level of the diaphragm was higher than the MRSA contamination level of the thenar eminence (7 CFUs/25 cm² vs 4 CFUs/25 cm²; $P = .004$). The correlation analysis for both total ACCs and MRSA CFU counts revealed that the contamination level of the diaphragm was associated with the contamination level of the fingertips (Spearman's rank correlation coefficient, $\rho = 0.80$; $P < .001$ and $\rho = 0.76$; $P < .001$, respectively). Similarly, the contamination level of the stethoscope tube increased with the increase in the contamination level of the fingertips for both total ACCs and MRSA CFU counts ($\rho = 0.56$; $P < .001$ and $\rho = .59$; $P < .001$, respectively).

Conclusion: These results suggest that the contamination level of the stethoscope is substantial after a single physical examination and comparable to the contamination of parts of the physician's dominant hand.

TABLE 1. Standardized Physical Examination[a]

1. Hand rubbing with alcohol-based formulation
2. Handshake
3. Palpation of radial artery for pulse measurement
4. Palpation of cervical and supraclavicular lymph nodes
5. Lung auscultation
   Posterior chest (6 locations)
6. Auscultation of heart (4 areas: pulmonic, aortic, tricuspid, and mitral)
7. Examination of abdomen
   Inspection and auscultation (4 quadrants)
   Percussion (evaluation of ascites and liver size)
   Superficial and deep palpation (including rebound tenderness)
   Palpation and auscultation of femoral pulses
8. Lower extremity examination
   Inspection of skin (color, temperature, and edema)
   Palpation of posterior tibial arteries
9. Final handshake

[a] The physical examination was conducted with and without sterile gloves by trained medical practitioners.

TABLE 2. Characteristics of Patients Enrolled at the University of Geneva Hospitals, Geneva, Switzerland[a]

Characteristic	Type of contamination study[b]		
	Total ACC (n=33)	MRSA (n=38)	Total (N=71)
Sex: male	21 (63.6%)	22 (57.9%)	43 (60.6%)
Age (y)	67±15	72±15	68±16
Hospital ward			
Internal medicine	33 (100%)	27 (71.1%)	60 (84.5%)
Orthopedics	0	11 (28.9%)	11 (15.5%)
Antibiotic use[c]	10 (30.3%)	13 (34.2%)	23 (32.4%)
Central venous line	3 (9.1%)	3 (7.9%)	6 (8.5%)
Indwelling urinary catheter	2 (6.1%)	13 (34.2%)	15 (21.1%)
Presence of skin wound	4 (12.1%)	17 (44.7%)	21 (29.6%)
Mean time since last bath/shower (h)	10±7	9±5	10±6
Type of bathing			
Shower	17 (51.5%)	8 (21.1%)	25 (35.2%)
Sponge bath by self at the sink	16 (48.5%)	19 (50.0%)	35 (49.3%)
Sponge bath by health care workers in bed	0	10 (26.3%)	10 (14.1%)
Unknown	0	1 (2.6%)	1 (1.4%)
MRSA decontamination[d]	NA	1 (2.6%)	1 (1.4%)

[a] ACC = aerobic colony count; MRSA = methicillin-resistant *Staphylococcus aureus*; NA = not applicable.
[b] Data are presented as mean ± SD or as No. (percentage).
[c] Includes amoxicillin-clavulanate (3), cefazolin (1), ceftriaxone (3), trimethoprim/sulfamethoxazole (2), ciprofloxacin (1), cloxacillin (2), clindamycin (1), imipenem (2), clarithromycin (1), metronidazole (3), and vancomycin (1).
[d] Only patients colonized with MRSA.
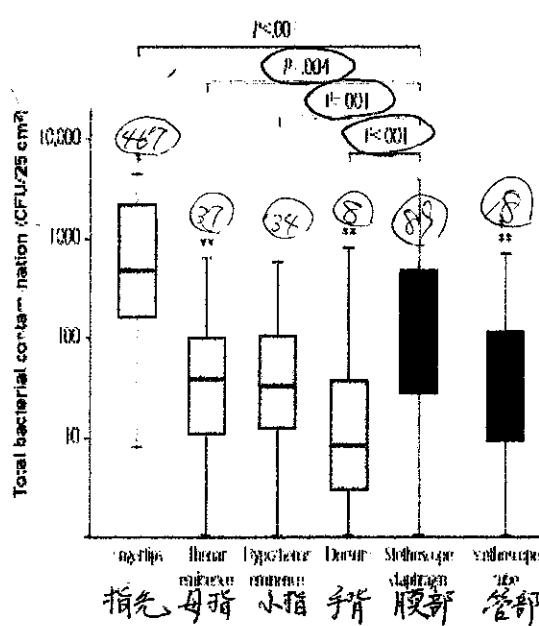
FIGURE 1. Total aerobic colony count recovered from physicians' gloved hands (orange boxes) and stethoscopes (blue boxes) after a single physical examination. Results are presented on a logarithmic scale. The top and bottom of the box plots represent the interquartile ranges, and the horizontal lines represent the median values. The error bars extend to the maximum and minimum values. Differences between levels of contamination were tested using Wilcoxon paired rank-sum tests. CFU = colony-forming unit. *$P < .001$ compared with stethoscope tube. **$P = .04$ compared with stethoscope tube.

ACCs
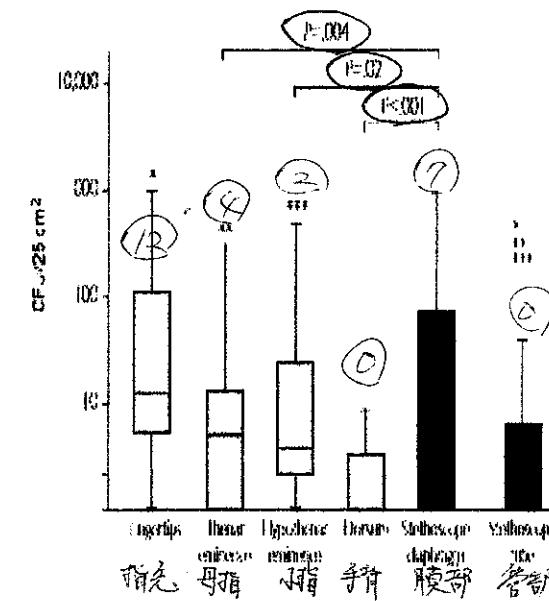
FIGURE 2. Methicillin-resistant *Staphylococcus aureus* CFU counts recovered from physicians' hands (orange boxes) and stethoscopes (blue boxes) after a single physical examination. Results are presented on a logarithmic scale. The top and bottom of the box plots represent the interquartile ranges, and the horizontal lines represent the median values. The error bars extend to the maximum and minimum values. Differences between contamination levels were tested using Wilcoxon paired rank-sum tests. CFU = colony-forming unit. *$P < .001$ compared with stethoscope tube. **$P = .02$ compared with stethoscope tube. ***$P = .008$ compared with stethoscope tube.

MRSA