

Study Shows Contaminated Keyboards and How to Clean Them

By Debra Wood, RN, contributor



William A. Rutala, Ph.D., MPH, recommends hospitals disinfect computer keyboards daily and when visibly soiled to decrease the risk of disease transmission.

Computers have put information at nurses' fingertips, but a recent study found the keyboards can harbor harmful pathogens. However, the researchers identified which disinfectants produce the best results without damaging laptops or altering the letters on the keys.

"We were not surprised by the degree of microbial contamination," said William A. Rutala, Ph.D., MPH, University of North Carolina Health Care's director of Hospital Epidemiology and a professor in the UNC School of Medicine. "All of the computers we evaluated were contaminated with two or more organisms, although most of the isolates were traditional skin flora or microorganisms in the environment."

The researchers collected and tested specimens from 25 computers in the burn intensive care unit, cardiothoracic intensive care unit and six short-term nursing units at UNC.

Every keyboard tested positive for coagulase-negative staphylococci or CoNS, which can cause bloodstream infections in hospitalized patients. Diphtheroids were found on 80 percent of the computers and *Micrococcus* species on 72 percent of the keyboards. They also found vancomycin-susceptible *Enterococcus* species and oxacillin-resistant and oxacillin-susceptible *Staphylococcus aureus*.

Next up, the team evaluated the effectiveness of six different disinfectant wipes, commonly used in the health-care setting, and containing sterile water, phenol, alcohol at 80 ppm or quaternary ammonium as the active ingredient. The scientists purposely contaminated laptops with three types of bacteria, and then cleaned each one with a different product, wiping each keyboard from side to side 25 times per day for 12 days, with 10 minutes of drying time provided between wiping episodes.

All of the products successfully removed or inactivated at least 95 percent of the bacteria.

"We weren't sure if the disinfectants would hurt the plastic or the electronic circuitry," Rutala said. "But we found none of the disinfectants had any visual effect on the appearance of the letters or keyboard, and the laptops worked without any functional problems."

In a second round of testing, the researchers recontaminated certain keys on the computers, to provide a control and test area, with vancomycin-resistant *Enterococcus* bacteria and *Pseudomonas aeruginosa* six, 24 and 48 hours after they had been disinfected, and then measured the sustained effectiveness of the wipes. Only the quaternary

ammonium proved successful in preventing a new growth of the Enterococcus bacteria and limiting growth of Pseudomonas aeruginosa.

“They continued to kill microorganisms after the initial application period,” Rutala said.

Based on the results of the study, Rutala and the team recommended that UNC Hospitals disinfect keyboards daily and when they are visibly soiled. Nursing personnel have assumed this task. In addition, health-care professionals are asked to use the computer in a clean manner, after washing their hands and not with contaminated gloves or hands.

Mobile computers used by patients to check email or surf the Internet are disinfected between patients.

“The [recommendations] have been implemented to minimize the role [of computers] in transmission of some pathogens that might be located on keyboards as well as some other environmental surfaces,” Rutala said. “We would recommend similar policies for other health-care facilities.”

Rutala believes the entire hospital environment, including other electronic items, is contaminated with microorganisms and potential reservoirs of infection. He explained contact with the bacteria may not transmit disease if the dose is not significant, the recipient is not susceptible to the pathogen or there is not a port of entry.

A 2003 Israeli study investigated the presence of multidrug-resistant Acinetobacter baumannii, often found in hospitals, on 124 randomly screened physicians and nurses from various units in a tertiary-care hospital. Thirty of the clinicians’ hands and 15 of the cell phones tested positive for the bacteria, with only 10 percent co-contamination of both hands and cell phones. Researchers attribute that to the small sample size and that cultures were obtained only once.

The risk of transmission from any fomite to patients would decrease if health-care personnel washed their hands after contact with computers or other objects before touching the patient. However, multiple studies have demonstrated poor compliance with those Centers for Disease Control and Prevention guidelines.

“We don’t want to cause people to be fearful of the environment,” Rutala concluded. “But with prudent precautions, you can minimize the role of environmental contamination in disease transmission.”

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