

## Cross-Contamination of Computer Keyboards / Mouse, Mobile Devices and TV Remotes

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### Introduction:

Research based evidence concludes that computer keyboards / mouse and other input devices spread infections in healthcare settings, dental clinics, schools and in other communal environments.

According to The Centers for Disease Control and Prevention, Hospital-acquired infections (HAIs) are a leading cause of death in the U.S. healthcare arena, with an overall estimated annual incidence of 1.7 million cases and 100,000 deaths. HAIs in U.S. hospitals generate an estimated \$28.4 billion to \$45 billion in excess healthcare costs annually. Furthermore, the Centers for Medicare and Medicaid Services no longer provide reimbursement over and above the typical Inpatient Prospective Payment System rate for care required to battle HAIs.

The research abstracts below strongly support that computer keyboards and other input devices are a source of bacteria and cross-contamination that can lead to HAIs. Therefore, washable keyboards, mice, TV remotes and mobile products with antimicrobial product protection should be put in place along with proper disinfection protocols to reduce the risk of cross-contamination that can lead to infectious disease.

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### Study Abstracts: Keyboards / Mouse in Healthcare Setting

#### Infection Control & Hospital Epidemiology

**Bacterial Contamination of Keyboards: Efficacy and Functional Impact of Disinfectants, Rutala et al.**

Specimens were collected from 25 computer keyboards at various locations inside UNC Healthcare System to determine the level of microbial contamination. Cultured Results: coagulase-negative staphylococci (100% of keyboards), diphtheroids (80%), Micrococcus species (72%) Bacillus species (64%), nonfermentative gram-negative rods (36%), propionibacteria (28%), alpha streptococci (21%), Aspergillus niger (20%), viridans streptococci (8%). Data suggest that microbial contamination of keyboards is prevalent and that keyboards may be successfully decontaminated with disinfectants. Keyboards should be disinfected daily or when visibly soiled or if they become contaminated with blood.

#### American Journal of Infection Control (AJIC)

**Computer Equipment Used in Patient Care within a Multi-Hospital System:**

**Recommendations for cleaning and disinfection, Neely et al.**

Ensure that working with computer equipment is included in policies/procedures for hand hygiene. Specifically, when working with keyboards or mice in high-risk areas disinfect and glove hands. When cleaning or disinfecting computer hardware, use the same type of cleaner or disinfectant and the same frequency of cleaning or disinfecting as would normally be used to clean or disinfect other devices in that area.

#### Infection Control and Hospital Epidemiology

**Bacterial Contamination of Computer Keyboards in a Teaching Hospital, Schultz et al.**

Researchers tested 100 keyboards in 29 clinical areas for bacterial contamination. 95 were positive for microorganisms. Streptococcus, Clostridium perfringens, Enterococcus (including one vancomycin-resistant Enterococcus), Staphylococcus aureus, fungi, and gram-negative organisms were isolated. Computer equipment must be kept clean so it does not become another vehicle for transmission of pathogens to patients.

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## Study Abstracts: Keyboards / Mouse in Healthcare Setting

### American Society for Microbiology

Researchers discovered that MRSA can survive on computer keyboards for up to 6 weeks. For the study, two strains of MRSA were inoculated in triplicate onto coupons made of bed linen, keyboard covers and acrylic fingernails. At selected times over 8 weeks, the coupons were subcultured and surviving bacteria were counted. MRSA survivors remained at detectable levels for 6 weeks on computer keyboard covers. The results clearly demonstrate the need for frequent hand washing and environmental disinfection in health care settings.

### American Journal of Infection Control (AJIC)

**Determining High Touch Areas in the Operating Room with Levels of Contamination, *Link et al.***

The 5 primary high touch surfaces in order were the anesthesia computer mouse, OR bed, nurse computer mouse, OR door, and anesthesia medical cart. Using the OR light as a control, this study demonstrated that a low touch area was less contaminated than the high touch areas with the exception of the OR bed. Based on information and data collected in this study, it is recommended that an enhanced cleaning protocol be established based on the most frequently touched surfaces in the operating room.

### Association of Professionals in Infection Control and Epidemiology (APIC)

#### Guide to Preventing Clostridium difficile Infections

The guide's prevention strategies state "Cleaning and disinfection of computers, including keyboards, should be a normal part of the daily routine. Moving computers must be cleaned before moving from one patient's room or bed space to the next patient or area. Touch screen computer monitors should be cleaned and disinfected the same as other horizontal surfaces and equipment in patient's room at least daily and when soiled.

### Henry Ford Health System

**The Prevalence of Bacterial Contamination of Standard Keyboards in ER, *Pugliese et al.***

14% of keyboards were colonized with 9 different bacteria. Of the keyboards in non-treatment areas, nearly 32% were contaminated, versus 9% in treatment areas. Due to the threat of the germs potential spread to patients, Henry Ford's Information Technology and Infection Control department recommended exchanging traditional keyboards in the ER for washable, silicone rubber models.

### Northwestern Memorial

Samples obtained from the keyboards and keyboard covers revealed growth of MRSA and VRE at 24hrs. Transmission studies revealed that increased contact with the inoculated keyboards (from 1 to 5 touches) increased recovery of bacteria on hands. The transmissibility rate from keyboard covers was not appreciably different. VRE and MRSA are capable of prolonged survival on both computer keyboards and keyboard covers. After any contact with computer keyboards, both gloved and ungloved hands frequently become contaminated. Researchers found that a good way to prevent the transmission of this type of infection is for health care workers to wash their hands and to have computer keyboards disinfected on a regular basis.

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## Study Abstracts: TV Remotes in Hospitals & Hotels

### University of Arizona

Microbiology Professor / leading expert on infectious disease, Dr. Charles ranks the TV remote control as the highest carrier of bacteria in a patient's hospital room compared to the toilet bowl handle, bathroom door and call buttons, among others. Among the bacteria found, MRSA the dangerous antibiotic-resistant bacteria were only discovered on the remote controls. There were no traces of it on any other objects tested.

### University of Houston

A study on contamination levels in hotel rooms found high levels of aerobic bacteria and coliform (fecal matter) on TV remotes. Tests showed bacteria levels between 2 and 10 times higher than levels permissible in hospitals.

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## Study Abstracts: Phones / Tablets in Healthcare Setting

### American Journal of Infection Control (AJIC)

Disinfection of iPad to Reduce Contamination with *Clostridium difficile* and Methicillin-resistant-*Staphylococcus aureus*, *Kiedrowski et al.*

Given the limitation of the damp cloth to eliminate all pathogens, especially *C difficile*, nonporous cases or covers for iPads and screen protectors may allow the use of disinfecting agents without directly exposing the device.

### American Journal of Infection Control (AJIC)

Use of Portable Electronic Devices in a Hospital Setting and Their Potential for Bacterial Colonization, *Khan et al.*

Sampling was conducted over a 3-day period on devices at 2 large medical centers. 53 out of 204 (25.9%) swabs yielded at least 1 pathogen: Gram-positive organisms were cultured from nearly all devices (93.4%; 99/106) and Gram-negative organisms were found on 21.7% (23/106). As with other fomites, these devices represent a potential reservoir for the transmission of pathogens.

### International Journal of Infection Control

Mobile phones and nosocomial infections, *Badr et al.*

Study demonstrated that hospital staff members pick up pathogens from mobile phones after thoroughly washing their hands and concludes mobile phones act as a reservoir for microorganisms.

- Before touching the mobile phones, the disinfected hands showed no appreciable pathogen levels.
- After touching mobile phones, bacterial contamination on hands increased to 93.7% (same rate phones)
- Routine disinfection of mobile phones reduces the risk of cross-contamination and antimicrobial additive materials may be effective in reducing the risk of cross-contamination.

### Annals of Clinical Microbiology and Antimicrobials

Are We Aware How Contaminated Our Mobile Phones Are with Nosocomial Pathogens, *Ulger et al.*

200 HCWs were screened; samples from the hands of 200 participants and 200 mobile phones were cultured. 94.5% of phones demonstrated evidence of bacterial contamination with different types of bacteria. The gram negative strains were isolated from mobile phones of 31.3% and the ceftazidime resistant strain from the hands were 39.5%. *S. aureus* strains isolated from mobile phones of 52% and those strains isolated from hands of 37.7% were methicillin resistant. Distributions of the isolated microorganisms from mobile phones were similar to hands isolates. Mobile phones used by HCWs in daily practice may be a source of nosocomial infections in hospitals.

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## Study Abstracts: Keyboards / Mouse in Educational Setting

### District of Columbia Department of Health (DCDOH)

The DCDOH investigation of a Norovirus outbreak in an Elementary School reported that non-cleaned computer equipment (keyboards and mice) and person-to-person contact resulted in illness. Laboratory results from a computer mouse and keyboard in first-grade classroom tested positive for norovirus subtype GII. DCDOH recommended cleaning computer equipment (mice and keyboards) and other shared surfaces that were overlooked during the February 8 cleaning with a 1:50 concentration household bleach solution.

### Association of Professionals in Infection Control and Epidemiology (APIC)

Microbial Contamination of Computer Keyboards in a University Setting, *Anderson et al.*

The keyboards of multiple-user (student) and single-user (staff) computers located on a university campus were sampled to assess microbial contamination. The average number of microorganisms present on multiple-user computer keyboards was significantly greater than on single-user keyboards, and the number of keyboards harboring potential pathogens was also greater for multiple user computers. It's recommended that regular cleaning and disinfection of computers be used to reduce the microbial load, especially for multiple-user workstations.