



# Washable Keyboards Helps Hospitals Tackle Cross Contamination

# TABLE OF CONTENTS

Washable Keyboards Helps Hospitals Tackle Cross-Contamination .....	<b>3</b>
Testing Positive for Pathogens .....	<b>3</b>
Neglecting Keyboards.....	<b>4</b>
Responding to an Outbreak.....	<b>5</b>
Bringing New Technology Onboard .....	<b>6</b>
Sources.....	<b>7</b>



# Washable Keyboards Helps Hospitals Tackle Cross-Contamination



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By Karin Lillis

**H**armful pathogens like *Clostridium difficile* (*C. diff*) and methicillin-resistant *Staphylococcus aureus* (MRSA) still plague healthcare organizations nationwide. At any given time, at least 1 in 25 patients has at least one healthcare-associated infection (HAI), according to the Centers for Disease Control and Prevention (CDC). In 2011 alone, U.S. hospitals reported an estimated 722,000 HAIs — and an estimated 75,000 patients died as a result of those infections.

Surface disinfection — from floor to ceiling and everything in between — is crucial to preventing the spread of deadly bacteria and viruses. Initiatives commonly focus on handwashing and cleaning high-touch areas like bed rails, call buttons and door handles, but one piece of equipment is often overlooked — computer keyboards.

Are keyboards really a culprit? The research says “yes.”

“Keyboards have become reservoirs for pathogens because of the increased use of computers in patient areas,” writes disinfection expert William A. Rutala, PhD, MPH. Yet research shows that regular disinfection of hospital keyboards can kill pathogens and help keep them at bay. The challenge, experts say, is finding an electronic product that can withstand harsh cleaning agents regularly used in the healthcare setting.

## Testing Positive for Pathogens

In a widely publicized study, Rutala and colleagues sampled 25 keyboards on a burn intensive care unit, cardiothoracic ICU and six short-term care units in the University of North Carolina Health System. Each keyboard was contaminated with at least two pathogens — and all tested positive for coagulase-negative staphylococci (CoNS). The keyboards also tested positive for 13 other kinds of bacteria — including diphtheroids on 20 computers (80 percent) and *Micrococcus* species on 72 percent of the keyboards tested. Sixty-four percent of the keyboards in the study cultured positive for *Bacillus* species. The researchers

also found vancomycin-susceptible *Enterococcus* species on 12 percent of the keyboards; oxacillin-resistant *Staph aureus* on 4 percent; and oxacillin-susceptible *Staph aureus* on 4 percent. Rutala and colleagues tested six disinfectants — one each containing chlorine, alcohol or phenol, and three containing quaternary ammonium. All of the disinfectants, the researchers said, removed or inactivated more than 95 percent of the pathogens.

Next, the researchers wanted to determine how long — and if — the cleaning agents could prevent new bacterial growth after the initial disinfection. They contaminated seven laptop keyboards with vancomycin-resistant *Enterococcus* and *Pseudomonas aeruginosa* 6, 24 and 48 hours later. They found that the disinfecting wipes continued to kill the bacteria. Specifically, the quaternary ammonium product prevented new VRE growth and limited *Pseudomonas* growth, the researchers reported.

“Our data suggest that microbial contamination of keyboards is prevalent and that keyboards may be successfully decontaminated with disinfectants,” Rutala and colleagues wrote. “Keyboard should be disinfected daily or when visibly soiled or if they become contaminated with blood. Additionally, mobile computers used by patients should be disinfected between patient uses. Ideally, computers used by a patient under isolation precautions should remain in the patient’s room until no longer needed and should then be disinfected before use by another person. Our data demonstrate that keyboards can be safely and successfully decontaminated with disinfectants, such as quaternary ammonium compounds.”



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## Neglecting Keyboards

In a more recent study, researchers at a teaching hospital in Italy measured pathogen levels on stethoscopes, computer keyboards and telephone handsets on four hospital wards. Gabrielle Messina, a research professor of public health at the University of Siena, and colleagues measured total bacterial count and *Staphylococcus* species, *Enterococcus* species, *Pseudomonas* species, *Escherichia coli*, *Acinetobacter* species and *Clostridium difficile*. Samples were taken from 99 objects, including 37 telephone handsets, 27 keyboards and 35 stethoscopes. The handsets and keyboards showed a significantly higher total bacterial count than the stethoscopes, the researchers said.

Before cleaning, 93 percent of the keyboards tested positive for *Staphylococcus* species and 78 percent for coliforms. After disinfection, the researchers said, the bacterial load dropped to zero in most cases.

“Neglecting the cleaning/disinfection of computer keyboards and the long survival of some bacteria are critical in the role of HAIs. In fact, although healthcare professionals may clean and disinfect their ‘personal’ medical devices, they may still be contaminated by hospital computer keyboards and telephone handsets and transmit infections. Both these devices are used with the hands, which are the top causes of transmission of bacteria,” the researchers wrote. “The emergence of resistant bacteria, hospitalization of older and critical patients, high turnover of healthcare staff making process standardization difficult,

“  
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lack of process organization between units and non-observation of protocols are all areas in need of improvement to prevent HAIs. Environmental disinfection has a central role in the primary prevention of HAIs.”

## Responding to an Outbreak

How are hospitals in the real-world setting meeting the challenges contaminated keyboards present? Two Florida healthcare systems — to prevent the spread of potentially deadly bacteria and viruses — have looked to submersible keyboards and other computer equipment that can withstand hospital cleaning agents.

At the UF Health Shands Hospital, one outbreak is one too many, says Marie Ayers, RN, CIC, interim director of infection prevention and control.

The facility — a level 1 trauma center, tertiary care and teaching hospital in Gainesville, Fla. — had an outbreak of Acinetobacter on its burn unit. Ayers quickly looked to the keyboards, and found that equipment carried most of the bio-burden — swabs obtained from keyboards on the unit revealed unacceptable levels of Acinetobacter.

“Outbreaks of Acinetobacter infections typically occur in intensive care units and healthcare settings housing very ill patients. Acinetobacter infections rarely occur outside of healthcare settings,” the CDC notes. Especially at risk are acutely or chronically ill patients who are on a ventilator, patients hospitalized for long periods of time and those with open wounds, the CDC says. Urinary catheters can also increase a patient’s risk of contracting an Acinetobacter infection. The bacteria spreads from person-to-person contact, the CDC says, or when someone touches a contaminated surface.

“We ended up rebuilding the unit and cleaning up. We started to look at features that we could bring to the unit that would help us prevent the spread of infections. Keyboards are a horrible source of pathogens,” Ayers says. She and her colleagues had seen Seal Shield’s submersible keyboard at a recent APIC conference.

“The Seal Shield guys actually had a keyboard in an aquarium, and told us to fish it out and use it. I pulled out a mouse from the bottom of the tank and used it. That sold me right there,” Ayers says.

“Our nurses were so devastated by the outbreak and so interested in what they could do to stop the spread of bacteria and viruses,” Ayers said. “We let our nurses pick the keyboard we would use on the unit. We actually took a whole box up to them and told them to test them all out.”

Ultimately the hospital provided Seal Shield keyboards throughout its entire burn unit. The nurses, Ayers says, selected a white keyboard so it was “easier to see dust, dirt and debris.”

The infection prevention staff then taught nurses on the burn unit the right way to clean the keyboards.



In the case of a patient with C. diff, we always use bleach — and we can actually submerge the keyboards in a 10:1 bleach/water solution.

“We don’t really submerge the keyboards as much as we spray them down between every patient,” she says, unless the keyboard is visibly contaminated with bodily fluid or tissue.

The nurses picked the keyboard and Ayers and her staff have not heard any complaints. The keyboards, she says, are working well. Nurses are responsible for spraying down the keyboards a few times a day and at the end of every patient transfer.

UF staff use Sani-Cloth wipes “in all different shapes and sizes,” Ayers says — including bleach, quaternary with alcohol and quaternary products. “In the case of a patient with C. diff, we always use bleach — and we can actually submerge the keyboards in a 10:1 bleach/water solution.”

The hospital also trained its environmental services staff to properly clean the keyboards. “The biggest thing we did, too, is adding housekeeping to assist us in cleaning surfaces that previously they couldn’t touch — like keyboards. They can absolutely spray it down and clean it. We encourage them to do so,” Ayers says.

Submersible keyboards like Seal Shield’s should be “the future and the standard for everyone in healthcare. Proactively switching to a product that we can use and clean makes sense. If we clean everything and encourage cleaning high-touch areas, why not start with the keyboard?”

## Bringing New Technology Onboard

Orlando Health purchased the Seal Shield products as part of its medication barcoding initiative. The equipment is part of a cart that is wheeled in and out of patient rooms as nurses deliver medication — including patients in isolation.

“That’s the kicker — especially with C. diff patients. Anything that goes in those rooms has to be cleaned,” says Scott Brown, director of infection prevention and control. “Multidrug resistant organisms are our biggest concern — we target and track MRSA and C. diff. To a lesser extent, we see VRE and the carbapenem-resistant organisms.”

Before bringing any equipment onboard, Orlando Health’s information technology staff approached Brown with one question: “What features do you need to have in the equipment we purchase?”

“The first step was giving them what we needed to see, in terms of products that could withstand our cleaning agents (quaternary/alcohol compounds and bleach). They did their research and brought back the Seal Shield product to us. We reviewed it and saw it was able to stand up to the cleaning products we use,” Brown says.

If necessary, the keyboards can even completely wet down or submerged in water.

The nurse who uses the medication cart on his or her rounds, is primarily responsible for its cleaning, Brown says. Infection prevention staff conduct spot-checks to monitor compliance.

“We have certain questions we ask during our environmental-care walks,” Brown says. “We want to make sure certain pieces of equipment are cleaned on a regular basis or when



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contaminated with gross soilage. The nurses are more responsible for any medical equipment that travels between patients. For other common areas and high-touch surfaces like call buttons and tables, we look to environmental services staff.”

Brown anticipates that as keyboards are replaced and other initiatives launched, the hospital will look to similar products that can withstand its cleaning agents.

“Whether IT or hospital is purchasing any type of equipment, hospitals need to keep asking manufacturers, ‘What can this be cleaned with?’ You’ve got to look at the tech specs. If it won’t work with your standard cleaners, you may have to look elsewhere,” Brown says.

“You need to involve your infection prevention department. They’re the ones who can tell you which cleaning products the hospital uses,” Brown adds. “It’s a whole lot easier for the hospital to buy equipment that you’ll be able to use and clean with what you currently have in place — rather than trying to adapt your cleaning disinfectants as new products come onboard.”

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Seal Shield. Infection research for computer keyboards and mobile devices.