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Keyboard and Mouse Acting as Reservoirs for Pathogens

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Keyboards in ICUs may serve as reservoirs for microorganisms, which may be transferred via the hands of personnel to patients causing nosocomial infections.

Reviewing the Evidence

It is estimated that at least 2 million patients in the US acquire nosocomial infections annually. The prevalence of nosocomial infections ranges between 3.5% of all treated infections in hospital (Garner et al. 1988) to more than 30% of the treated infections in ICU (Spencer 1996; Vincent et al. 1995). In one out of three cases, nosocomial infections are caused by exogenous modes of infection. Their most common mode of transmission is the hands of medical staff (Pittet et al. 1999). Manual cross-transmission of microorganisms via computer components at the patients' bedside might introduce an additional risk for critically ill patients, considering the frequent contact of medical staff with these fomites. ICU bedside computers may play a role in the transmission of nosocomial pathogens, as shown by recent studies and reviews (Hartmann et al. 2004; Neely et al. 1999; Neely and Sittig 2002). The same has recently been reported for computer interfaces (Bures et al. 2000; Neely et al. 1999; Neely and Sittig 2002), potentially causing nosocomial infections, an important cause of hospital morbidity and mortality resulting in increased medical costs (Jarvis 1996).

Neely et al. (1999) reported that Acinetobacter baumannii has been found more often on computer keyboard covers than on any other object in patient rooms. This coincided with an increase in patient colonizations, suggesting a link between contaminated computer keyboards and patients.

Bures et al. (2000) cultured a number of microorganisms, including methicillin-resistant Staphylococcus aureus (MRSA), Enterococcus spp., and Enterobacter spp., from keyboards. However, the twofold increased contamination rate for keyboards (24%) in comparison to faucet handles (11%) was not statistically significant. Furthermore, they detected similar rates of computer hardware contamination regardless of location in the ward. However, a direct connection between infected patients and keyboards was shown for MRSA using pulse-field gel electrophoresis, a particularly sensitive molecular genetic technique for distinguishing isolates of the same genus and species.

Devine et al. (2001) cultured MRSA from computer keyboards in two hospitals. Incidences were consistent with the significantly higher rate of MRSA transmission (24%)found at one of the hospitals.

In our own study (Hartmann et al. 2004), we found greater colonisations of microorganisms on keyboards and mice (6%) than for other user interfaces, e.g. infusion pumps and telephone handsets (3%). The sampled microorganisms contained a small quantity of Entercoccus sp. and S. aureus, located mostly in patient rooms. S. epidermidis was also sampled in patients' rooms, especially on computer interfaces.

Reviewing the Solutions

More frequent contact with keyboards than with perfusors and ventilators may explain the higher contamination rate of keyboards and mice, possibly causing cross-transmission of pathogenic organisms. Direct contact of nurses and physicians with both the patient and the bedside computer terminal puts the patient at higher risk. Thus, updating computer infection control procedures would seem justifiable. Plastic keyboard and mouse covers with regular cleaning policies lead to a reduction of contamination (Neely et al. 1999). However, the benefit of such measures in reducing nosocomial infections has not yet been clearly demonstrated (Dharan et al. 1999). Hence, the additional costs incurred by these measures do not yet seem justified.

Also, plastic keyboard covers do not provide secure protection against bacterial transmission, considering that frequent use leads to a quick recontamination of these surfaces. Without hand washing or gloving, staff may, even without direct patient contact, lead to a transmission of pathogens (Neely and Maley 2001). Hence, it is recommended that the same infection prophylaxis used for direct patient contact should be applied when dealing with computer hardware.

Although Dharan et al. (1999) report a reduction of the colonisation rate of microorganisms through enforcement of a surface disinfection policy, this did not reduce the rate of nosocomial infections. Hence, proper hand disinfection is still the mainstay of any preventive measure for reducing infections (Hugonnet and Pittet 2000a&b) and should be extended to fomites within the patient's proximity and other locations in the ward, including computer keyboards and mice in the ICU setting.

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