Brief report

Eyewear contamination levels in the operating room: Infection risk

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Key Words:
Infection control
Infection prevention
Surgical case
Personal protective equipment
Health-care acquired infection
Health care worker infection
Cross-contamination
Microbial contamination
Antimicrobial

We investigated eyewear contamination levels in the operating room to assess infection risk and inform protocol development. Microbial contamination after use was found in 37.7% of disposable and 94.9% of reusable eyewear pieces. After disinfection, 74.4% of reusable eyewear also cultured positive. Disposable eyewear may reduce intercase contamination risk. Reusable eyewear may carry ongoing bioburden and, thus, contribute to operating room environment risk. Eyewear with antimicrobial material or components could reduce risk. Alternative decontamination methods for reusable eyewear should be evaluated.

As a result, depending on the type of eyewear used, the possibility of an unknown splash event, and the likelihood of error in assessing risk, it can be inferred that eyewear can both prevent ocular transmission and remain a source of contact and cross-contamination. Studies have proven similar environmental risk related to medical equipment-to-human transmission. Infection-control protocols may need to be altered in relation to eyewear use. To date, however, few clinical resources indicate if disposable or reusable eyewear is more or less effective in the infection-prevention task.

A study of eyewear use in an operating room (OR) setting was designed to further best-practice infection-control protocol development. The primary aim was to gather data helpful in informing risk (ie, of infection and cross-contamination). A secondary aim was to gather data helpful in informing eyewear product selection and decontamination efforts.

The in-place protocol specifies eyewear be selected based on anticipated level of injury, exposure, and vision needs. Protocol mandates that disposable eyewear be discarded immediately after use and reusable eyewear decontaminated in accordance with defined criteria. Over a 30-day study period, the type of eyewear worn by OR personnel was recorded, with prompt removal before exiting the OR suite. All eyewear was cultured for organism growth. Disposable products also were cultured for organism growth after use was found in 37.7% of disposable and 94.9% of reusable eyewear pieces. After disinfection, 74.4% of reusable eyewear also cultured positive. Disposable eyewear may reduce intercase contamination risk. Reusable eyewear may carry ongoing bioburden and, thus, contribute to operating room environment risk. Eyewear with antimicrobial material or components could reduce risk. Alternative decontamination methods for reusable eyewear should be evaluated.

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The in-place protocol specifies eyewear be selected based on anticipated level of injury, exposure, and vision needs. Eyewear used in the OR includes disposable and reusable products, depending on individual choice. Protocol mandates that disposable eyewear be discarded immediately after use and reusable eyewear decontaminated in accordance with defined criteria. Over a 30-day study period, the type of eyewear worn by OR personnel was recorded, with prompt removal before exiting the OR suite. All eyewear was cultured for organism growth. Disposable products also were cultured for organism growth after use was found in 37.7% of disposable and 94.9% of reusable eyewear pieces. After disinfection, 74.4% of reusable eyewear also cultured positive. Disposable eyewear may reduce intercase contamination risk. Reusable eyewear may carry ongoing bioburden and, thus, contribute to operating room environment risk. Eyewear with antimicrobial material or components could reduce risk. Alternative decontamination methods for reusable eyewear should be evaluated.
twice, before and after decontamination. Swabbing followed an established technique and surfaces included ear and head pieces. A piece of disposable eyewear, direct from packaging, acted as control.

To determine the level of microbial contamination and for disinfection efficacy testing, a single sterile swab moistened with trypticase soy broth (TSB) was wiped over the entire eyewear product surface. The swab was placed in 2 mL TSB and immediately transported to the laboratory. After the swab in the TSB was vortexed for 1 minute in a Fisher Scientific Vortex Genie 2 (Waltham, MA) on the highest setting, 100 mL specimen was plated onto TSB agar with 5.0% sheep blood by use of the spread plate technique. The specimens were incubated at 37°C for 48 hours. Isolates were identified on the basis of Gram’s stain findings, colony morphology, detection of hemolysis on sheep blood agar, and colony pigmentation, as well as results of the tube coagulase test (for Staphylococcus species), detection of sodium chloride, and results of the bile esculin test (for Enterococcus species), and detection of conidia by microscopy (for Aspergillus species). Susceptibility testing was performed on S aureus and enterococcal isolates by use of antibiotic-containing agars (6 mg/mL for oxacillin and 6 mg/mL for vancomycin). All testing was completed under the direction of the investigator.

Eyewear was collected from personnel participating in 71 surgical cases in 4 ORs. Power tools were used in 26.7% of cases. Three hundred fifteen individual pieces of eyewear—including 276 disposable and 39 reusable pieces of eyewear—were isolated and cultured for microbial contamination after use. Nearly half, 44.8%, of all pieces cultured positive for contamination, specifically 37.7% of the disposable pieces and 94.9% of the reusable pieces.

Reusable pieces also were isolated for disinfection studies. After use, reusable pieces were disinfected with a germicidal wipe containing a quaternary/alcohol-based solution. The surface disinfectant was allowed to dry for 2 minutes in accordance with guidelines. After disinfection 74.4% of the reusable pieces contained microbial growth. Although the number of reusable eyewear pieces evaluated was low, the data on persistent contamination following disinfection is very valuable (Fig 1).

Of all pieces that tested positive for contamination, coagulase-negative Staphylococcus colonies grew in 43.9% positive specimens, gram-positive cocci in 36.1%, Bacillus in 10.6%, diptheroids in 5.6%, and Micrococcus species in 3.5%.

It can be concluded that eyewear can increase cross-contamination and infection risk, particularly in high-risk spray or splash environments. Disposable eyewear can reduce intercase risk if not reused between cases (it may not, however, reduce risk within a case). Reusable eyewear, or eyewear with reusable components, may pose a risk of carrying ongoing bioburden, due to an inability to disinfect all surface details, and thereby may increase risk to OR health care workers and patients. Because it reduces bioburden on medical equipment, antimicrobial materials or components on eyewear may assist in cross-contamination and infection prevention.

Our results also suggest alternative methods for disinfection should be evaluated for reusable eyewear.

References