



# HOSPITAL EMPLOYEE HEALTH



THE PRACTICAL GUIDE TO KEEPING HEALTH CARE WORKERS HEALTHY

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## Can you kill microbes without hurting healthcare workers?

*Occ health teams up with infection prevention for safer cleaning*

In the fierce battle against healthcare-associated infections, healthcare workers have unwittingly become collateral damage, developing skin irritation, headaches, and even asthma from cleaners and disinfectants. To address those health hazards, infection preventionists and occupational health professionals have come together in an unprecedented collaboration.

The National Institute for Occupational Safety and Health (NIOSH) gathered more than 40 experts from various fields to review what is known about cleaning and disinfection of hospital surfaces and to identify knowledge gaps and research needs. Their

conclusion: Hospitals should engage interdisciplinary teams to evaluate the hazards of their cleaning and disinfecting products.<sup>1</sup>

“The [multidisciplinary] model we used in our working group can also

be used in healthcare settings,” says **Paul Henneberger**, MPH, ScD, NIOSH research health scientist in Morgantown, WV, and co-chair of the Cleaning and Disinfecting in Healthcare Working Group.

“The difference would be that the professions involved would go beyond infection prevention and occupational

health,” he says. “It should also include the people who are actually doing the work — the environmental

“[T]HE DECISION TO KEEP USING A PRODUCT THAT IS CAUSING THE EMPLOYEES’ ASTHMA SYMPTOMS HAD SERIOUS CAREER AND LIVELIHOOD CONSEQUENCES FOR THOSE EMPLOYEES.”

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services workers, nurses, and technicians who would be impacted by any policies and practices.”

By their nature, cleaning and disinfecting products must be toxic enough to kill a wide range of microbes, including *Clostridium difficile* spores. Almost a half-million people develop *C. difficile* infection annually, and about two-thirds of the cases are associated with an inpatient stay, according to the Centers for Disease Control and Prevention. Hospitals are under intense pressure to reduce those and other infections.

But studies show that hospital workers exposed to cleaning and disinfecting products have an increased risk of asthma and other respiratory problems.<sup>2</sup> And anecdotally, the use of new products has led to complaints of skin and throat irritation, respiratory problems and headaches. When the Occupational Safety and Health Administration announced a wider focus in hospital inspections, the agency included hazardous chemical use, such as disinfectants, in the scope of review by inspectors. (See HEH, August 2015, page 85.)

“Cleaning and disinfecting agents, especially disinfecting products, are designed to kill organisms. While that’s an essential function in some areas of healthcare, we have to treat them as chemicals that can have human health impacts, as well,” says **Margaret Quinn**, ScD, CIH, professor in the Department of Work Environment at the University of Massachusetts Lowell.

Choosing a product certified as “green” isn’t necessarily the answer. There is no standard definition of a “green” product, and the criteria do not necessarily include human health effects, said the working

group, which was convened through NIOSH’s National Occupational Research Agenda.

## New product triggered symptoms

When a new cleaning product was introduced into a large health system as part of an effort to combat *C. difficile*, environmental services workers began complaining of symptoms: burning eyes, inflamed throat, headaches, difficulty breathing.

Some unit managers switched to a different product, while others insisted that the product was necessary, says **Mark Catlin**, health and safety director of the Service Employees International Union (SEIU).

What the workers really needed was a methodical evaluation by infection control and employee health, he says. Was there an effective product with fewer health hazards? Was there a safer way to use the product? What protective measures, such as better ventilation or respirators, could reduce the risks?

“You would want the manager of environmental services, occupational health and safety, and frontline workers to work together to figure out how to introduce a new product so it prevents infections and workers don’t get sick,” he says. “What I hear from the workers is that the issue of controlling hospital-acquired infections is a big push that overrides everything else.”

Healthcare has a higher rate of work-related asthma than other industries. In New Jersey, one of a handful of states that conducts surveillance, almost 18% of cases of work-related asthma identified from

1993 to 2011 were in healthcare — more than in any other industry. Cleaning products, particularly bleach and ammonia, have been linked to work-related asthma.

In one case cited by the working group, 18 operating room employees developed respiratory symptoms, including two cases of work-related asthma, when a new disinfecting product containing quaternary ammonium compounds was introduced. The hospital switched to a product that didn't cause symptoms, but then switched back when tests showed that the alternative wasn't effective against *Staphylococcus aureus*. The two employees with asthma had to leave the OR. One was reassigned and the other lost the job.<sup>1</sup>

“Because of the need to balance risks — chemical exposures versus infectious disease — finding safer alternatives is not simple or straightforward in a hospital setting,” says **Justine Weinberg**, MSEHS, CIH, industrial hygiene research scientist in the Occupational Health Branch of the California Department of Public Health. “But the decision to keep using a product that is causing the employees' asthma symptoms had serious career and livelihood consequences for those employees.”

Reducing the hazard doesn't just mean seeking an alternative product, notes Weinberg. New disinfection methods, such as UV light, may replace some chemical use. Hospitals also should consider whether they are overusing disinfectants, such as disinfecting floors in areas where that isn't necessary.

“There should be a systematic assessment to determine what areas and surfaces can be cleaned only and which should be disinfected,” Weinberg says. (*For key steps to*

*reducing chemical hazards, see related story, page 101.*)

Environmental services workers aren't the only ones at risk from cleaning and disinfecting agents. Henneberger and colleagues tracked workers in 14 occupations at five hospitals for 216 shifts. They found that nurses perform cleaning activities on about one-fourth of their workdays, and some technicians are involved in frequent equipment cleaning.<sup>3</sup>

A 2003 survey found that nurses were more likely to have asthma than physicians, respiratory therapists or occupational therapists, and exposure to cleaning or disinfecting products doubled the risk of asthma.<sup>4</sup> **George Delclos**, MD, MPH, PhD, professor in the Division of Epidemiology, Human Genetics, and Environmental Sciences at the University of Texas School of Public Health in Houston, is now repeating that survey.

To prepare for the survey, Delclos and his colleagues are conducting focus groups and walk-throughs to learn more about how cleaning products are used. Employee health professionals should also take the time to “walk the beat” and learn about the work practices of environmental services, says Delclos, who was a member of the working group and lead author of the original study of asthma among nurses and other clinicians.

Employee health professionals also should be alert for health effects, he says. “Be on the lookout for employees with asthma symptoms, especially if they cluster or if [employees] describe an incident that immediately preceded the onset of certain symptoms,” he says. “Use them as sentinel events to take a closer look.”

Problems may stem from work

practices — how the product is diluted, or whether it is sprayed or wiped. “Sometimes a product that has been used for a long time goes from not having a health effect to having a health effect because of the way it's applied,” he says.

But whatever a hospital does to resolve health effects, it must continue to use products that kill dangerous microbes, says Quinn.

“The infection preventionists on our working group reminded us that infection is also an employee hazard,” she says. “We're not trying to stop the cleaning and disinfecting processes. We want to reduce the infection risks both for patients and employees. We need to think about ways to do that while reducing the risk of the chemicals.”

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# Rapid onset of asthma in healthcare workers

Case reports linked to cleaning products

The following case reports from a recent comprehensive NIOSH report<sup>1</sup> provide compelling examples of work-related asthma from environmental surface cleaning and disinfecting exposures in healthcare.

## **A hospital environmental services worker in Michigan:**

A man in his 20s, lifetime nonsmoker, worked in a hospital environmental services department for two years with no health problems. He developed asthma after the introduction of a new cleaning product that immediately caused him to wheeze and become short of breath. The cleaning product contained the quaternary ammonium compounds didecyl dimethyl ammonium chloride and alkyl dimethyl benzyl ammonium chloride.

He was treated at his hospital's emergency department after his initial exposure, and he subsequently had one hospitalization and three additional emergency department visits until use of the cleaning product was discontinued after manufacture of the product ceased. He requires medication on an ongoing basis to manage his asthma symptoms. His case was identified in the Michigan Work-Related Asthma Surveillance Program.

**A medical records clerk in a clinic in California:** A 57-year-old woman, nonasthmatic, lifetime nonsmoker, worked as a receptionist and records clerk in a medical clinic. Her desktop, phones, and computer keyboard were wiped by a coworker with

disinfectant wipes containing the quaternary ammonium compounds, alkyl dimethyl benzyl ammonium chloride and dimethyl ethyl benzyl ammonium chloride.

**BASED ON MEDICAL ADVICE, THE RECEPTIONIST STOPPED WORK THREE YEARS AFTER HER INITIAL INCIDENT. SHE CONTINUES TO HAVE DIFFICULTY BREATHING AND REQUIRES MULTIPLE MEDICATIONS TO MANAGE HER ILLNESS.**

Immediately on contact with the phone, the receptionist developed burning and vision loss in her left eye and then experienced difficulty breathing. Initially uncertain what caused the reaction, the clinic medical staff administered oxygen, advised her to wash her hands, and sent her to the workers' compensation physician. She was diagnosed with work-related asthma. Over a six-month period, when the wipes were used on office surfaces, the receptionist's

respiratory symptoms worsened. Use of wipes was discontinued in the offices and when the wipes were used elsewhere in the clinic, the receptionist was instructed to leave the building.

Two years later, after changing buildings, she was sent to the emergency department when instruments were cleaned in a room next to her office and again after cleaning and disinfecting surfaces in the clinic waiting room with the same quaternary ammonium compounds. Based on medical advice, the receptionist stopped work three years after her initial incident. She continues to have difficulty breathing and requires multiple medications to manage her illness. Her respiratory sensitization has become more generalized and she now needs to restrict her contact with other chemicals, including some personal care products (J. Weinberg, Industrial Hygiene Research Scientist, California Department of Public Health, personal communication, 2014).

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# NIOSH: Key steps to reduce respiratory risk

Steps include conducting OSHA hazard training, assessment

Most of the chemical and disinfecting products used in healthcare do not have specific occupational exposure limits, but all hazardous chemicals are covered by the Hazard Communication Standard of the Occupational Safety and Health Administration. That requires a written hazard communication program that provides for a list of all known hazardous chemicals in the workplace, proper labeling, employee access to safety data sheets, and employee training. Training also must occur whenever a new product is introduced ([www.osha.gov/dsg/hazcom/](http://www.osha.gov/dsg/hazcom/)).

In its report published in the *American Journal of Infection Control*,<sup>1</sup> the Cleaning and Disinfecting in Healthcare Working Group of the National Institute for Occupational Safety and Health's National Occupational Research Agenda offered the following advice about reducing respiratory hazards related to cleaning and disinfection in hospitals:

- Follow the manufacturers' instructions for the selection and use of cleaning and disinfection products. Avoid using products that provide a higher level of disinfection than needed for a particular application.
- Use cleaning and disinfection products that are less harmful to human health and the environment, when possible.
- Use automated diluting systems that reduce direct personal contact (respiratory and dermal) with concentrated products and meter correct dispensing

proportions, when possible.

- Use the manufacturers' recommended amount of product and contact times to accomplish the level of cleaning and disinfection needed. Exceeding the recommended amount of product does not lead to increased effectiveness for removing microorganisms and may pose health risks to healthcare workers, patients, and other building occupants.
- Choose chemical application methods that minimize aerosol production. Spraying usually generates higher airborne exposures than wiping and can lead to skin and respiratory health risks. The toxicological category of the substance should be considered; therefore, spraying of more toxic substances is especially discouraged.
- Use ventilation when cleaning and disinfecting products are applied in small rooms, such as a single-patient bathroom, examination room, or utility closet where products may be mixed.
- Conduct an occupational hazard assessment of cleaning and disinfecting tasks. When chemicals are used in the workplace, employers should conduct a hazard assessment to evaluate the cleaning needs of the facility, the safest cleaning chemical options, and alternative, safer cleaning methods. As in all work environments, appropriate PPE must be provided to workers. PPE may include gloves, eye protections, face shields, protective clothing, or respirators. Guidelines for PPE usage and the proper time table to replace

them depend on the physical and chemical properties of the cleaning and disinfecting products, routes of exposure, intensity of exposure, duration of exposure, and frequency of PPE use.

- Educate and train users effectively. Cleaning and disinfecting chemicals can have a spectrum of health impacts, and education and training needs to be done so that employers and workers can be actively engaged to develop and apply a critical-thinking process to select the appropriate cleaning and disinfecting chemicals, practices, and technologies that both prevent infection and chemical exposures. OSHA requires worker training under the OSHA Hazard Communication Standard. Workers without this training should not use these products.
- Ensure that the OSHA hazard communication training has been completed in the language of the employees using the products, automated dilution systems are demonstrated, and different products for different uses are well-labeled.

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# FDA concerned about healthcare workers constant exposure to antiseptics

*Proposed rule seeks data on alcohol hand rub risk to pregnant HCWs*

**A**t any given time there must be well over a million nurses and other female healthcare workers of childbearing age protecting patients by killing transient bacteria on the hands with alcohol hand rubs. Logically, a subset of those will become pregnant, possibly begin breast-feeding, with many continuing their work in healthcare and complying with the constant reapplication of alcohol-based antiseptics to protect patients. Could hand hygiene, the cardinal principle of infection control, be putting mother and child at risk?

The Food and Drug Administration wants to know the answer to that question and quite a few others. As it currently stands, alcohol rubs and other healthcare antiseptics are being used in the absence of updated scientific data on the effects of prolonged exposure to healthcare workers, particularly those who are pregnant or breast-feeding. Employee health professionals have until Oct. 28, 2015 to submit comments on a controversial proposed rule by the FDA calling for a comprehensive review of the active ingredients in healthcare antiseptics like alcohol-based hand hygiene solutions.<sup>1</sup>

“Alcohol-based healthcare antiseptics are not only used frequently in the healthcare setting, but they are also recommended for use by authoritative bodies such as the CDC,” **Colleen Rogers**, PhD, lead microbiologist in the FDA’s Division of Nonprescription Drug Products (DNPD) said at a preliminary hearing

on the proposed rule. “There are no data on the effects of systemic alcohol exposure due to healthcare antiseptic use during pregnancy, but maternal alcohol ingestion is the leading known cause of developmental and cognitive disabilities in children and a preventable cause of birth defects. Based on alcohol exposure data from non-pregnant adults, ‘moderate’ hand rub use led to a maximum systemic exposure equivalent to approximately 10% of the alcohol in a glass of wine or a bottle of beer,” Rogers said.

“The implications of even this low exposure are unclear, given that no known safe threshold exists for fetal alcohol exposure,” she added.

## A huge setback

The FDA would have to find compelling evidence to limit the use of alcohol rubs in hospitals, as a former CDC outbreak investigator made it perfectly clear what was at stake.

“This would lead to increased healthcare-associated infection rates and take U.S. infection control backwards at least 15 to 20 years,” warned **William Jarvis**, MD, an independent infection control consultant who spoke on behalf of industry at the FDA hearing.

Healthcare settings nationwide transitioned from soap and sinks to the alcohol hand rubs after the Centers for Disease Control and Prevention recommended the move in 2002 guidelines that cited improved compliance by healthcare workers and high efficacy against

nosocomial pathogens. The notable exception is *Clostridium difficile*, a spore former that may require use of soap and water. Citing the worst-case scenario, Jarvis said removing alcohol rubs and returning to the old soap and water approach would have a devastating effect on patient safety. It would require more healthcare worker time, likely undermining compliance and providing less killing power than alcohol even when workers do comply.

“[The] rest of the world has moved forward [with alcohol rubs],” he said “The WHO has their worldwide Hand Hygiene Campaign. All of this would occur during a time when antibiotic-resistant pathogens are on the rise and infection prevention is needed more than ever. Given that hand hygiene is thought to be the most important method to decrease healthcare-associated infections, patient safety would be significantly adversely impacted.”

The FDA proposed rule requests additional scientific data to support the safety and effectiveness of certain active ingredients used in healthcare antiseptics marketed under the over-the-counter drug monograph.

## Continue to use products

“The FDA recommends that healthcare personnel continue to use these products consistent with infection control guidelines while additional data are gathered,” the agency said in a statement.

“Healthcare antiseptics are primarily used by healthcare professionals in hospitals, clinics, doctors’ offices, outpatient settings and nursing homes. They include hand washes and rubs, surgical hand scrubs and rubs (with or without water), and patient preoperative skin preparations, including pre-injection preparations. The most common active ingredients in healthcare antiseptics marketed under the over-the-counter drug monograph include alcohol and iodines. These products are different from consumer antiseptics, such as antibacterial soaps and hand sanitizer rubs, which are not part of this proposed rule.”

The FDA would require manufacturers who want to continue marketing healthcare antiseptic products to provide additional data on the active ingredients’ safety and effectiveness. This would include data to evaluate absorption, potential hormonal effects, and development of bacterial resistance. Once the proposed rule is finalized, ingredients for which adequate safety and effectiveness data have been provided would continue to be available, the FDA concluded in the proposed rule.

Given the unprecedented national emphasis the last few years on reducing HAIs and staving off a post-antibiotic era, members of the antiseptic industry have been understandably taken aback by the data demands.

“First, let’s remember we’re speaking about a healthcare setting where a significant number of infections do occur. The pathogens are becoming more and more virulent, and we have fewer effective therapies. So infection prevention is critical,” **Dave Mackay** of GOJO Industries told the FDA. “These products have been used safely for many decades. They are the current

standard of care. Despite the decades and frequency of use, there have been no identified chronic health related issues. Yet the benefit to the patient is undisputed.”

The nation’s two leading infection control healthcare epidemiology associations cautiously endorsed the FDA action while emphasizing that hand hygiene, surgical skin preps, and other antiseptics are essential to prevent healthcare-associated infections (HAIs), which cause 75,000 patient deaths annually. The statement by the Association for Professionals in Infection Control and Epidemiology (APIC) and the Society for Healthcare Epidemiology of America (SHEA) reads in part:

“APIC and SHEA strongly agree with FDA’s advice that these products continue to be used consistent with infection control guidelines while additional data is being gathered. Healthcare antiseptics are an important component of infection control strategies in hospitals, clinics, and other healthcare settings, and remain a standard of care to prevent illness and spread of infection. ... Since all infection prevention and control guidelines are evidence-based, it is important to stay up-to-date on safety and effectiveness data to protect healthcare personnel and their patients.”

The FDA cited new scientific information and concerns expressed by outside scientific and medical experts on FDA advisory committees. The work practices and science have changed since the FDA began reviewing healthcare antiseptics in the 1970s. Among the changes cited by the agency are its own safety standards, the frequency of use of some of the products, hospital infection control practices, new technology that can detect low

levels of antiseptics in the body, and increased knowledge about the impact of widespread antiseptic use. The research paradigm is different as well, with the FDA looking for data on the effects on healthcare workers — not the traditional focus on the safety and efficacy in patients.

“This seems obvious, but it’s an important point that is very pertinent to our discussion because it results in a different benefit/risk profile than we’re used to thinking about since the benefit of the drug occurs in a different person than the risk,” **Theresa Michele**, MD, director of the DNDP at the FDA, said at a Sept. 4, 2014 hearing on the proposed rule.

For example, new lines of research suggest that for at least some healthcare antiseptic active ingredients, systemic exposure (full body exposure as shown by detection of antiseptic ingredients in the blood or urine) is higher than previously thought, the FDA states. The agency is particularly concerned about the effects of repeated daily exposure to antiseptic active ingredients.

The frequency of dosing is a particularly critical area of concern for the FDA.

“I mean, if you really think about it with the healthcare antiseptics, [healthcare workers are] probably the poster child for maximal use when it comes to frequency of dosing,” said **Dennis Bashaw**, PhD, director of the FDA’s office of clinical pharmacology. “You use it when you come in the room. You use it when you leave the room. You use it before you start a procedure. You do it over and over again. There’s no other topical dermatological that you’re going to use as many times per shift, per 8-hour, 10-hour, 12-hour period, as you’re going to use a topical healthcare antiseptic.”

The chemicals diffuse through the skin and accumulate as they are constantly replenished, an effect that may be compounded by healthcare workers who develop irritated and chapped or broken skin. While there is little data on the effects of alcohol on healthcare workers, there is even less on the other major antiseptic ingredient, iodine.

“One small study showed

an increase in urinary iodine concentration after a single day of surgical scrub use,” Bashaw said. “Although we don’t have a lot of information about absorption as a result of healthcare antiseptic use, data on iodine absorption are available. Iodine is known to cross the placenta. It is also actively concentrated in the mammary gland and secreted in breast milk.”

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# Consumer group challenges FDA exclusion of chlorhexidine in antiseptic review

*Claims ‘the safety and efficacy of chlorhexidine not substantiated’*

The Food and Drug Administration is being taken to task for a failure to include chlorhexidine in its recently announced plan to review the safety of active ingredients in antiseptics used in healthcare.

A group that includes Consumers Union, publishers of *Consumer Reports*, submitted a comment to the docket for the proposed rule, stating: “We would like to strongly recommend the inclusion of chlorhexidine in this initiative. Chlorhexidine is undergoing a rapidly expanding role in the prevention of hospital acquired infections. Many researchers are advocating the use of chlorhexidine every day on every patient in the ICU. However, we feel both the safety and efficacy of chlorhexidine has not been substantiated. There are significant concerns regarding the developing of antibiotic resistance and the long term effects of expanded chlorhexidine usage on the patient’s and facility’s microbiome.”<sup>1-3</sup>

The exclusion problem may have arisen because the FDA proposed rule is primarily focused on the effect of antiseptics on healthcare workers, while chlorhexidine is often

used to decolonize and eradicate the bacterial flora on patients’ skin. Such practices have been shown to reduce infections with methicillin-resistant *Staphylococcus aureus* (MRSA) and other pathogens.

However, the advocacy group warned that researchers have found evidence of bacteria developing resistance to chlorhexidine. They cited a study that found patients who were bathed daily with chlorhexidine were more likely to develop central-line bloodstream infections with reduced susceptibility to the skin prep solution.<sup>4</sup>

In addition, the group cited “significant concerns regarding industry influence and research integrity of chlorhexidine. There have been at least four articles which have compared chlorhexidine plus alcohol to another antiseptic but attributed the increase in efficacy to chlorhexidine alone.<sup>3</sup> ... Therefore we recommend that chlorhexidine be included in the FDA’s proposed regulation calling for more complete safety and effectiveness data on antiseptics.”

Among those signing off on the comment were Kevin T. Kavanagh,

MD, MS, Health Watch USA, Lexington, KY 40509; Lisa McGiffert, Consumers Union Safe Patient Project, Austin, TX; and Jean Rexford, Connecticut Center for Patient Safety, Fairfield, CT.

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# Removing PPE incorrectly may be common problem

*PPE 'doffing' problems may go well beyond Ebola*

Fewer than one in six healthcare workers followed the correct recommendations for removal of personal protective equipment (PPE) after patient care, likely contaminating themselves and increasing the risk of transmission to others, researchers report.<sup>1</sup>

Observations of workers for the study took place October 13-31, 2014. With Ebola still very much in the news at that time, the findings are somewhat surprising, but likely would be similar at many other hospitals.

"Very few facilities report this kind of data, but I think it is highly likely that we are just one of many [hospitals]," says **Nasia Safdar**, MD, PhD, co-author of the paper and infectious disease epidemiologist at William S. Middleton Veterans Hospital in Madison, WI. "There's no national benchmark for [PPE] compliance and there's no requirement to routinely collect this sort of information. We assume that things were happening because there is a policy, but really people were not able to comply because they had competing priorities [or other reasons]. It just never reached anyone's radar until Ebola happened. I think this is a good time if we want to change practice using Ebola and MERS as the reason. We tell them about MERS and Ebola, but also about *C. diff* and MRSA and the things that we [frequently] see in this country. And who knows what could be coming tomorrow?"

What came yesterday was severe acute respiratory syndrome (SARS), which hit Toronto healthcare workers hard in 2003 with respiratory

infections that were sometimes fatal. Donning and doffing of protective gear was an issue during the outbreak, which involved a coronavirus similar to today's MERS.

Though Safdar's was a relatively small study involving 30 healthcare workers, the findings echo similar PPE issues in Ebola care and training. For example, in Centers for Disease Control and Prevention training, donning and carefully doffing the protective gear was emphasized in a routine and ritual observed by a partner, says **Rupa Narra**, MD, a CDC Epidemic Intelligence Service officer and one of the Ebola trainers.

"Doffing seemed to be a common theme in breaches or problems," Narra says. "The responders felt like they needed the most practice in doffing, and we agreed. That is the most critical part of the process. It is just small things like making sure not to touch the inside of the suit with a dirty glove and making sure they are washing their hands with chlorine during every step of what is about a 15-step process."

As occupational health and infectious disease colleagues try to translate the lessons of Ebola to day-to-day practice, proper removal of PPE has been a recurrent theme. Of particular concern, Safdar and colleagues found that workers had a very difficult time following the correct doffing process when using contact precautions that require much less PPE — and have no respiratory component — than pathogens like Ebola and MERS.

In the study by Safdar and colleagues at the University of

Wisconsin, a trained observer watched healthcare workers entering and exiting rooms where patients were under designated isolation precautions on various units of the hospital. For removing PPE, the CDC recommends that gloves should be removed first, followed by the "gentle" removal of the gown from the back while still in the patient's isolation room. Of the 30 workers observed removing the gear, 17 removed the gown out of order; 16 wore their PPE out into the hallway; and 15 removed their gown in a manner that was not gentle, which could cause pathogens from the gown to transfer to their clothes.

Overall, 43% of HCWs (13 of 30) removed their PPE in the correct order. However, only 17% removed their PPE in the correct order and properly disposed it in the patient room. Only 13% of the workers (4 of 30) removed their PPE in the correct order and did so gently as recommended. Twenty-three percent (7 of 30) failed to remove their gloves gently. Another 40% incorrectly removed their PPE in the hallway, outside of the designated isolation area in the patient room. Fifty-seven percent (17 of 30) incorrectly removed their gown before removing their gloves. Half (15 of 30) incorrectly removed their gown with a lot of movement, including wriggling their arms out and pulling the whole gown over their head with or without untying it as instructed. On the positive side, 60% (18 of 30) of workers properly disposed of their PPE in the patient room. In the end, only four

healthcare workers followed all CDC recommendations for the removal of personal protective equipment (PPE) in the correct order and manner after patient care.

“We found that many HCWs did not tie the back of their gown, leading to the gown falling over the patient and increasing the risk of contamination,” the authors report. “Additionally, many HCWs removed their PPE — both gowns and gloves — by rolling the equipment against their previously uncontaminated

work clothes or bare hands before disposal. These breaches of PPE removal protocol may be due to a lack of awareness of the proper protocol, time constraints, or lack of realization of the importance of proper PPE removal.”

The next step is feeding the results back to workers, which has been shown to be an effective way to improve compliance with the hand hygiene, Safdar says.

“We are now consistently over 95% [compliance] with hand

hygiene,” she says. “I think that ought to be possible to do with PPE too, but we are just at the beginning with this,” she says. “We do frequent audits to see if any change is happening [and to assess] barrier compliance.”

## REFERENCE

1. Zellmer C, Hoof SV, Safdar N. Variation in health care worker removal of personal protective equipment. *Am J Infect Control* 2015;43(7):750-751. ■

# The Ebola effect: HCWs working in teams could protect co-workers, patients from other infections

It's hard to write “silver lining” and “Ebola” in the same sentence, but something powerfully good could come out of the horrific outbreak: a new safety culture in U.S. hospitals that better protects healthcare workers and patients. But it won't be easy.

The entrenched hierarchical culture that still prevails in healthcare was imploded as step one by the highly successful Ebola response teams. Instead, clinicians formed teams of equals, essentially systematized every step of patient care and occupational health, and practiced transparency by removing traditional barriers to open dialogue during clinical care. Applying approaches used in the care of the 10 Ebola patients treated in the U.S. would cause some culture shock, as healthcare workers were empowered to speak up about a breach or oversight that may endanger other healthcare workers or the patient.

“There's no hierarchy. You were not only allowed to, but expected to go up to anybody else and

say, ‘The back of your gown isn't taped,’ or, ‘I saw you accidentally touching your visor,’” said **Philip Smith**, MD, medical director of the Nebraska Medicine Biocontainment Unit in Omaha. “It was a classless society, and that's the only way we could get it done and achieve maximal safety.”

Smith participated in an opening panel session on Ebola recently in Nashville at the annual conference of the Association for Professionals in Infection Control and Epidemiology (APIC). He was asked how this “level playing field” culture was established and maintained.

“We really put a premium on it,” Smith said in the panel discussion. “We did it in our drills and in real life. Basically, if somebody came up to me and said, ‘I made a suggestion to Dr. X and they didn't like it,’ Dr. X was not invited back. It [extends to] leadership, too — they loved to catch us. I would say ‘thank you.’ And at our next team meeting I would stand up and say, ‘thank you [again], you may have

saved my life.”

One of only four medical biocontainment units in the country, the Nebraska unit has a staff of volunteers that continuously train to prepare for any and all emerging infections and bioterror agents.

But could such attention to detail — such equanimity among doctors and nurses, for example — be applied to day-to-day infection control? Some of the volunteers in the Ebola care unit took their team's mindset back to their regular jobs at the University of Nebraska Medical Center, but found a very different reaction from co-workers.

“They went back to their normal floors and when they found someone not washing their hands or changing a dressing without gloves, they mentioned this to them,” Smith said. “The person would not say thank you — they would growl at them. This in a way caused more frustrations. This is something we have to do and it is something that we can do: Insist on a level playing field.” ■

# Ebola vaccine highly effective in trials, but worker PPE education still critical

Initial reports of a highly effective Ebola vaccine trial may provide the final piece to douse the simmering, historic outbreak in West Africa. Using the technique that eradicated the scourge of smallpox from the wild, an international research team put a “ring” around new cases in Guinea by tracking down and immunizing their contacts.

“While the vaccine up to now shows 100% efficacy in individuals, more conclusive evidence is needed on its capacity to protect populations through what is called ‘herd immunity,’ the WHO reports. “To that end, the Guinean national regulatory authority and ethics review committee have approved continuation of the trial.”

As the outbreak escalated and overran containment efforts last year, some questioned why vaccine development wasn’t begun after the deadly virus first emerged in 1976 in the Congo near the river that shares its name. “There was no way for pharmaceutical companies to profit and our NIH budget had been cut, it has not been a priority for researchers — as if the lives of Africans did not matter,” says **Walter Tsou**, MD, MPH, a professor of health policy at the Center for Public Health Initiatives at the University of Pennsylvania in Philadelphia.

The new VSV-EBOV vaccine was developed by the Public Health Agency of Canada. The vaccine was licensed to NewLink Genetics Corp, and on November 24, 2014, the company entered into an exclusive agreement with Merck & Co., which assumed responsibility to research, develop, manufacture, and distribute the investigational vaccine. In addition

to other financial support, the project was funded by the Canadian and U.S. governments. After safety trials in primates and a small group of human volunteers who were monitored constantly, the vaccine trial began last March and now includes some 4,000 contacts of 100 Ebola cases.

One arm of the research is being conducted by the international Médecins Sans Frontières (MSF, aka Doctors without Borders) group, which has administered the trial Ebola vaccine to 1,200 of its frontline workers in Guinea, including doctors, nurses, paramedics, laboratory staff, cleaning staff, and burial teams.

“These results are promising and we should definitely make this vaccine available to at-risk groups as soon as possible,” the group said in a statement posted on its website. “But it is also of crucial importance to keep working on all the pillars of an Ebola response including contact tracing, health promotion, and isolation of infected patients.”

Patient isolation will still be critical because it would be frankly incredible if the vaccine showed a 100% efficacy over time. In addition, even immunized workers will have to take care not to expose patients and unvaccinated colleagues to blood and fluid contamination on their protective gear.

During the Ebola outbreak in

West Africa that is now making its last stand, 510 healthcare workers have given their lives trying to save others. The deaths translate to a mortality rate of 58% of the 880 healthcare workers infected as of July 26, 2015, the WHO reports. As of that date, the outbreak case count had climbed to 27,748 cases with 11,279 reported deaths, the WHO reported.

Factors cited by the WHO for the occupational Ebola infections include shortages of personal protective equipment, improper use of PPE, and for much of the outbreak, far too few medical staff for the overwhelming number of cases. In such circumstances, healthcare workers demonstrate a compassion that contributes to working in isolation wards far beyond the number of hours recommended as safe, the WHO notes.

With a few exceptions — like some of the U.S. healthcare workers — many of the infected caregivers were treated under the very conditions of the epidemic they were fighting, making it difficult to deliver the full measure of care needed. Consider that the two deaths among the 10 cases treated in the U.S. translates to a mortality rate of 20%, suggesting that part of the reason Ebola is so deadly in Africa is that the level of patient care demanded cannot be adequately delivered. ■

## COMING IN FUTURE MONTHS

- Reducing needlesticks by replacing active safety devices with passive ones
- What phlebotomy device lowered sharps injuries almost fourfold?
- With new nurses getting injured, it’s time to use lifting machines in nursing schools
- Healthcare worker vaccinations: controversies and challenges



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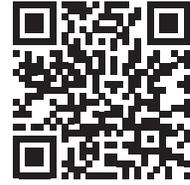
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To earn credit for this activity, please follow these instructions:

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## CNE QUESTIONS

- 1. In a case cited by the NIOSH working group, 18 operating room employees developed respiratory symptoms when a new disinfecting product containing quaternary ammonium compounds was introduced.**  
A. True  
B. False
- 2. Which of the following safety tips for using healthcare cleaning products was recommended by the NIOSH work group?**  
A. Choose chemical application methods that minimize aerosol production.  
B. When doing terminal room cleaning make sure the ventilation for the room is set on "negative pressure."  
C. Avoid putting a large amount of liquid cleaning product in open mop buckets near patient care areas.  
D. All of the above
- 3. The Food and Drug Administration was criticized by a consumer advocacy group for not including which of the following in its review of the safety of antiseptics used in healthcare?**  
A. Quaternary ammonia compounds  
B. Glutaraldehyde th  
C. Chlorhexidine  
D. Antibacterial soaps
- 4. The Ebola mortality rate for infected healthcare workers in Africa was 58% in late July. What is the mortality rate for the cases treated at American facilities?**  
A. 5%  
B. 10%  
C. 15%  
D. 20%

## CNE OBJECTIVES

After reading each issue of *Hospital Employee Health*, the nurse will be able to do the following:

1. Identify particular clinical, administrative, or regulatory issues related to the care of hospital employees;
2. Describe how the clinical, administrative and regulatory issues particular to the care of hospital employees affect health care workers, hospitals, or the healthcare industry at large;
3. Cite solutions to the problems faced in the care of hospital employees based on expert guidelines from relevant regulatory bodies, or the independent recommendations of other employee health professionals.

# Hospital Employee Health

## Confidential Salary Survey

This confidential salary survey is being conducted to gather information for a special report. Watch in coming months for your issue detailing the results of this survey and the overall state of employment in your field.

**Instructions:** Select your answers by filling in the appropriate bubbles **completely**. Please answer each question as accurately as possible. If you are unsure of how to answer any question, use your best judgment. Your responses will be strictly confidential. Do not put your name or any other identifying information on this survey form.

1. What is your current title?

- A. employee health nurse
- B. employee health manager
- C. employee health director
- D. infection control practitioner
- E. occupational health director
- F. other \_\_\_\_\_

2. What is your highest degree?

- A. LPN
- B. ADN (2-year)
- C. diploma (3-year)
- D. bachelor's
- E. master's
- F. PhD
- G. MD
- H. other \_\_\_\_\_

3. What is your sex?

- A. male
- B. female

4. What is your age?

- A. 20-25
- B. 26-30
- C. 31-35
- D. 36-40
- E. 41-45
- F. 46-50
- G. 51-55
- H. 56-60
- I. 61-65
- J. 66+

5. What is your annual gross income from your primary healthcare position?

- A. Less than \$30,000
- B. \$30,000 to \$39,999
- C. \$40,000 to \$49,999
- D. \$50,000 to \$59,999
- E. \$60,000 to \$69,999
- F. \$70,000 to \$79,999
- G. \$80,000 to \$89,999
- H. \$90,000 to \$99,999
- I. \$100,000 to \$129,999
- J. \$130,000 or more

6. In which area is your facility located?

- A. urban
- B. suburban
- C. medium-sized city
- D. rural

7. In the last year, how has your salary changed?

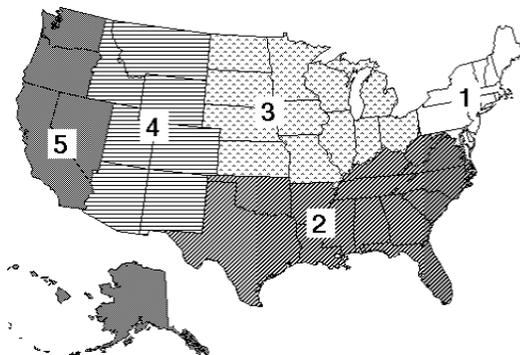
- A. salary decreased
- B. no change
- C. 1% to 3% increase
- D. 4% to 6% increase
- E. 7% to 10% increase
- F. 11% to 15% increase
- G. 16% to 20% increase
- H. 21% increase or more

8. What is the work environment of your employer?

- A. academic
- B. agency
- C. health department
- D. clinic
- E. college health service
- F. consulting
- G. hospital
- H. private practice

9. Please indicate where your employer is located.

- A. region 1
- B. region 2
- C. region 3
- D. region 4
- E. region 5
- F. Canada
- G. other



10. Which best describes the ownership or control of your employer?

- A. college or university
- B. federal government
- C. state, county, or city government
- D. nonprofit
- E. for-profit

11. How long have you worked in employee health?

- A. less than 1 year
- B. 1-3 years
- C. 4-6 years
- D. 7-9 years
- E. 10-12 years
- F. 13-15 years
- G. 16-18 years
- H. 19-21 years
- I. 22-24 years
- J. 25+ years

13. Which certification best represents your position?

- A. RN
- B. COHN-S
- C. NP
- D. CIC
- E. FACOEM
- F. LVN
- G. CCM
- H. Other \_\_\_\_\_

15. If you work in a hospital, what is its size?

- A. <100 beds
- B. 100 to 200 beds
- C. 201 to 300 beds
- D. 301 to 400 beds
- E. 401 to 500 beds
- F. 501 to 600 beds
- G. 601 to 800 beds
- H. 801 to 1,000 beds
- I. >1,000 beds
- J. I don't work in a hospital

12. How long have you worked in healthcare?

- A. less than 1 year
- B. 1-3 years
- C. 4-6 years
- D. 7-9 years
- E. 10-12 years
- F. 13-15 years
- G. 16-18 years
- H. 19-21 years
- I. 22-24 years
- J. 25+ years

14. How many hours a week do you work?

- A. less than 20
- B. 20-30
- C. 31-40
- D. 41-45
- E. 46-50
- F. 51-55
- G. 56-60
- H. 61-65
- I. 65+

**Deadline for Responses: Nov. 2, 2015**

Thank you very much for your time. The results of the survey will be reported in an upcoming issue of the newsletter, along with an analysis of the economic state of your field. Please return this form in the enclosed, postage-paid envelope as soon as possible. If the envelope is not available, mail the form to: Salary Survey, AHC Media LLC, P.O. Box 550669, Atlanta, GA 30355.